2021 World Congress on Health Economics

July 12 - 15, 2021 | Virtual

The program is current as of Wednesday, August 4th, 2021. Please refer to the online program at ***https://healtheconomics.confex.com/healtheconomics/2021/meetingapp.cgi/Home*** *for updates.*

The scheduled events take place in Greenwich Mean Time (GMT).

Monday

11:00 AM –11:45 AM MONDAY [Special Sessions]

Meeting of the Financing for Universal Health Coverage Special Interest Group

11:00 AM –11:45 AM MONDAY [Special Sessions]

Meeting of the Early Career Researcher Special Interest Group

11:00 AM –12:00 PM MONDAY [Special Sessions]

Meeting of the Economics of Children's Health and Wellbeing Special Interest Group

11:00 AM –12:00 PM MONDAY [Special Sessions]

Meeting of the Mental Health Economics Special Interest Group

11:00 AM –11:45 AM MONDAY [Special Sessions]

Meeting of the Economics of Palliative and End-of-Life Care Special Interest Group

11:00 AM –12:45 PM MONDAY [Special Sessions]

Meeting of the Economics of Obesity Special Interest Group

11:00 AM –11:45 AM MONDAY [Special Sessions]

Meeting of the Equity Informative Economic Evaluation Special Interest Group

11:00 AM –12:00 PM MONDAY [Special Sessions]

Meeting of the Teaching Health Economics Special Interest Group

11:30 AM –12:30 PM MONDAY [Special Sessions]

Meeting of the Health Workforce Special Interest Group

11:45 AM –12:45 PM MONDAY [Special Sessions]

Meeting of the Health Systems' Efficiency Special Interest Group

12:00 PM –12:45 PM MONDAY [Special Sessions]

Meeting of the Health Preference Research Special Interest Group

12:00 PM –12:45 PM MONDAY [Special Sessions]

Meeting of the Immunization Economics Special Interest Group

12:00 PM –12:45 PM MONDAY [Special Sessions]

Meeting of the Economics of Genomics and Precision Medicine Special Interest Group

1:00 PM –2:30 PM MONDAY [Special Sessions]

CENTERPIECE SESSION: Structural Discrimination and Inequalities

MODERATOR: **Winnie Yip**, Harvard T.H. Chan School of Public Health

SPEAKER: **Belinda Archibong**, Columbia University; **Marcella Alsan**, Harvard Kennedy School; **Gita Sen**, Public Health Foundation of India (PHFI)

2:30 PM –3:30 PM MONDAY [Social Events]

Socializing and Networking I

2:30 PM –3:30 PM MONDAY [Special Sessions]

Early Career Researcher Mentoring Session I

3:45 PM –4:45 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Evaluating the Effectiveness and Cost-Effectiveness of Population- and System-Level Interventions in Low- and Middle-Income Countries

SESSION CHAIR: **Marc Suhrcke**, Centre for Health Economics

Do Quality Improvement Policies Work for All? Heterogeneous Effects and the Impact of Baseline Quality Levels

PRESENTER: **Finn McGuire**, Centre for Health Economics at the University of York

Background: Due to shortfalls in the quality of health facilities, quality improvement (QI) initiatives are being implemented by a growing number low- and middle-income countries. These programmes have a common goal of improving and regulating the quality of health care provided by facilities through the outlining of standards and provision of inputs and assistance to meet these standards. In addition to aggregate improvements in quality, distributional concerns are important for QI policies in order to reduce variations in health care quality and reduce health inequalities. However, it is not a given that QI policies target the constraints which create such quality variation in the first instance.

Methods: We study the Ideal Clinic Realisation and Maintenance programme (ICRMP) implemented in health facilities in South Africa, specifically assessing whether the effects of the programme are sensitive to pre-existing quality levels. Our primary identification strategies are based on exploiting variation in the timing of policy changes across facilities. First we implement a difference-in-difference (DiD) approach to estimate treatment effects across subgroups defined by pre-treatment quality measures. However, this approach requires parametric specification of subgroups and makes restrictive assumptions on the linear additivity of treatment effects. To overcome this we use non-linear difference-in-differences methods proposed by Athey & Imbens (2006). This approach, known as Changes-in-Changes (CiC), allows for flexible estimation of the full distribution of counterfactual outcomes in the absence of treatment to estimate the quantile treatment effects of the reform. Further, the model is robust to additional possible sources of confounding.

Results: We find that the programme improves quality measures for all facility sub-groups defined by previous quality performance. However, the largest gains are made by facilities with higher baseline quality, potentially exacerbating pre-existing variations in health care quality. Our DiD estimates suggest the programme improves quality scores by between 6-20 points for the strata of the lowest and highest performing facilities respectively. The results of the CiC model lead to similar qualitative conclusions as the identified effect increases along the distribution of the pre-treatment quality distribution. Our estimates are robust to specifications which attempt to address issues of policy endogeneity, with policy-makers targeting previously improving facilities for enrolment in the QI programme. Further, we examine the components of quality measures driving the observed differences in the effect of the QI programme on quality metrics.

Discussion: Our findings suggest that the full consequences of QI programmes cannot be gauged solely from examination of the mean impact. Individual health facility production processes can differ markedly, and the introduction of new quality standards may consequently have differential impact across the range of input-output relations. In such circumstances, care must be taken in implementing universal QI programmes in order not to exacerbate existing inequalities in the supply of quality health care. As well as highlighting the need for clearer understanding of facility-specific production functions, this suggests careful identification of the specific obstacles to the integration of health care quality policies to individual facilities should be undertaken, enabling the tailoring QI policies to specific local issues.

Cost-Effectiveness of the Brazilian Family Health Strategy

PRESENTER: **Maria Dolores Montoya Diaz**, University of Sao Paulo

AUTHORS: Natalia Ferreira-Batista, Adriano Teixeira, Fernando Postali, James Love-Koh

In this paper we combine impact and economic evaluation methods to assess the cost-effectiveness of the Brazilian Family Health Strategy (ESF), building on observational data from 2007 to 2017. We focus on adult hospitalization for conditions sensitive to primary care as the primary outcome of interest, since one of the ESF objectives is about the reduction of preventable hospitalizations.

The costing relies predominantly on human resource costs (i.e. wages of the ESF professional team), which according to prior estimates account for approximately 80% of the total programme cost. We used hospitalisation data from administrative records of hospitalizations from the National System of Information on Hospitalizations (Datasus/SIH), which refers to inpatients in the public healthcare system. The total value for each hospitalization was given by the Unified Health System (SUS, for Sistema Único de Saúde) reference table. For the costs calculation we linked National Health establishment registry (CNES) to the Annual report of formal employment market (RAIS) to obtain the contract wage and hours of work per ESF team: one doctor, one nurse, one nursing technician and four community workers.

To estimate the effects of the ESF on hospitalization, we used a difference-in-difference analysis that enables heterogeneous response to the length of exposure to the program (controlling for municipality-specific year dummies). This specification addresses the heterogeneity across municipalities given by the variation in time of implementation of the program. Therefore, the potential reduction in hospitalization has been calculated according to different lengths of exposure to the program. Our results show that ten years of ESF exposure have led to a reduction of 5 hospitalizations, which represents 14.2% of the 2017's level of hospitalizations for conditions sensitive to primary care.

Our preliminary results show that the mean adult benefits of avoided hospitalizations attributable to the ESF is US$ 5,547 (R$ 9,466) while the mean ESF costs is US$ 216,497 (R$ 387,604). For the final paper we will complete the following steps: (i) incorporate the benefits (avoidable hospitalizations) for the total population, (ii) refine cost and benefits estimates, (iii) implement strategies to address heterogeneity among Brazilian regions (or States) and (iv) calculate cost-effectiveness estimates.

Assessing the Impact of Universal Health Coverage Interventions on Health System Outcomes in Low-and-Middle-Income Countries: A Critical Review of Methodological Challenges

PRESENTER: **Sumit Mazumdar**, University of York, Centre for Health Economics

The goal of universal health coverage (UHC) involves designing and implementing health system interventions in a manner that extends essential health services to unserved or underserved population segments and adequate protection of financial risks due to costs of seeking medical care, through prepayment or insurance. In response, most low-and-middle-income countries (LMICs) have initiated health system-wide programmes and interventions which aim to address core UHC. While the aims, design and content of these interventions as well as their stages of implementation are highly diverse across LMICs, evidence on their intended impacts remains mixed, but generally positive. Although, most of these interventions combine several strategies and programmatic features and aim to influence a number of outcomes, understanding of the effectiveness of these interventions and delineating the pathways of impact comprise crucial evidence for policy-makers in order to make informed decisions on subsequent reform courses.

In this presentation we review some of the key issues associated with the empirical evaluation of impacts of these large-scale interventions in LMICs and discuss potential solutions that can mitigate these challenges. Among the wide-ranging interventions that are relevant for UHC goals, we specifically focus on those that aim either to expand access to and utilization of essential health services and/or promote financial risk protection,

primarily through government-sponsored national health insurance programmes. We discuss some commonly observed econometric issues in impact evaluation of these programmes and offer potential solutions drawing on recent advancements in the econometrics literature.

Specifically, we review commonly-used approaches that employ comparable treatment and control groups (matching, propensity score and differences in differences approaches), as well as methods that can handle endogenous placement and potential selectivity biases into the different programmes (instrumental variables, regression discontinuity designs). We highlight recently proposed approaches that offer several advancements in estimating average programme impacts, e.g. that can handle multi-valued treatments typical with health insurance programmes having different programme features, and the growing methodological toolkit that allows estimating more granular programme impacts such as treatment effect heterogeneity and distributional impacts.

We also identify some practical challenges in undertaking empirical evaluations associated with availability of required data, information on design or the programmes and their different features and other factors influencing coverage of the programmes across the intended beneficiaries and suggest possible ways of addressing these. We illustrate application of some of the approaches discussed in the context of empirical evaluation of national health insurance programmes in selected LMICs (esp. in Indonesia). On the basis of the survey of this recent literature, we develop a framework that identifies the key evaluation challenges and maps possible solutions.

3:45 PM–4:45 PM MONDAY [Demand And Utilization Of Health Services]

ORGANIZED SESSION: The Role of Premiums for Individually Purchased Private Insurance

SESSION CHAIR: **Timothy Layton**,

ORGANIZER: **Steven C Hill**, US Agency for Healthcare Research and Quality

DISCUSSANT: **Nicholas Tilipman**, University of Illinois at Chicago; **Rebecca Myerson**, University of Wisconsin-Madison

Zero-Price Effects in Health Insurance: Evidence from Colorado

PRESENTER: **Coleman Drake**, University of Pittsburgh

AUTHORS: Sih-Ting Cai, David M Anderson, Daniel W Sacks

The Affordable Care Act's premium tax credit subsidies provide millions of eligible enrollees with the option purchase zero-premium insurance plans, but millions more are ineligible. What difference does a premium of zero make, relative to a slightly positive one? We use regression discontinuity designs to examine zero-price effects in health insurance coverage take-up, plan choice, and coverage duration using administrative data from Colorado's Health Insurance Marketplace from 2016 through 2019. Unlike previous studies, rich variation in premium tax credit subsidies allows us to isolate zero-price effects from non-linear price effects near zero. We find no discontinuity in insurance choices when premiums increase above zero, suggesting that zero is not a special price for customers. However, zero-premiums plans increase on-time enrollment, leading to longer coverage duration, because they reduce the transaction cost of making an initial premium payment. As low-income customers are especially sensitive to these transaction costs, zero premiums may increase targeting efficiency.

Small Premiums or Big Administrative Burdens? Nominal Contributions and Disenrollment in the Massachusetts Connectorcare Market

PRESENTER: **Adrianna McIntyre**, Harvard University

The nongroup market for health insurance, which serves individuals who don't have access to coverage through an employer or public programs, is known to experience high levels of churn. However, the reasons for disenrollment from this market are poorly understood. Using an administrative data set from the Massachusetts Health Connector that includes information on reasons for termination, we aim to clarify these dynamics. To obtain causal estimates, we leverage plausibly exogenous premium changes for the 2017 plan year, using a difference-in-differences approach to study enrollment consequences of introducing a nominal premium for plans that previously did not require a monthly contribution from enrollees. We show that nearly one in five enrollees who face a new, nominal (< $10) premium are terminated for nonpayment by the end of the new plan year. Two-thirds of this attrition manifests at the end of January 2017, implying that a significant number of affected enrollees never initiated premium payments. As a first-order matter, enrollment inertia is an important determinant of these outcomes; all affected enrollees had the option to switch into a zero-premium plan offered by a different carrier at the start of the plan year. Comparing termination rates across plans that imposed different-sized premiums suggests that this disenrollment is predominantly driven by the administrative burden of initiating and sustaining premium payments, though there does appear to be a modest role for affordability. We do not find evidence that enrollees who face new nominal premiums are more likely to voluntarily terminate their coverage than their zero-premium counterparts.

How Affordable Is Individually Purchased Private Coverage for Higher-Income Families?

PRESENTER: **Paul Jacobs**, US Agency for Healthcare Research and Quality

AUTHOR: Steven C Hill

Individual private insurance purchased outside of employer or group plans has been at the center of market-based efforts to increase insurance coverage in the U.S., and the affordability of these plans is key to the success of those strategies. While the Affordable Care Act sought to increase coverage by providing tax credits to purchase individual coverage on regulated Marketplaces, those with income above four times the poverty line do not qualify for subsidies and can face substantial financial burdens when purchasing coverage. Higher Marketplace premiums reduce enrollment, increasing the likelihood individuals forego coverage (Drake and Anderson, 2020), with uninsurance potentially leading to stinting on care.

We measure the financial burden of Marketplace coverage as premiums and potential out-of-pocket costs—deductible or out-of-pocket maximum levels—as a share of adjusted gross income (Banthin, Cunningham, and Bernard, 2008). To provide an accurate picture of Marketplace costs, we link respondents in the American Community Survey (ACS) to premium and cost-sharing information at detailed geographic levels, including states with federally-run and state-based Marketplaces. Plan information is from the Center for Medicare and Medicaid Services' Marketplace Public Use Files and, for some states in 2015, the Plan Finder files. We estimate financial burdens among individuals and families with incomes above four times the federal poverty line (FPL) and either covered by nongroup insurance or uninsured. With the enhanced sample size of the ACS, our study provides new information on affordability for this group, especially trends from 2015 through 2019 as well as more detailed geographic and subgroup analyses that could not be identified in previous studies with smaller samples. The geographic detail is useful for informing state-specific strategies to increasing coverage, such as the impact of state reinsurance programs intended to reduce consumers' premiums.

We study the burden of the lowest cost, 25th percentile, and median plans at three levels of benefit generosity (bronze, silver, and gold) available to each family. Preliminary results for 2015 show substantial variation in financial burdens associated with Marketplace plans, even if we just consider premiums for individuals and families in a narrow income band, above 400% and not exceeding 500% of FPL, and plans at the 25th percentile of the distribution of premiums. The median cost for families in this income range would be 12.0% of income for the bronze plan and 14.8% for the silver plan. The median cost for families residing in metro areas would be 11.7% of income and 13.2% for families in non-metro areas. For adults purchasing single coverage for themselves, the burden of premiums varied considerably by age: the median cost of these Bronze plans for individuals 43 to 47 years old would be 5.6% of income, and the median for individuals 60 to 64 years old would be 12.5% of income. Our paper will summarize trends across years, geographic patterns, and assess state's strategies to increase coverage by reducing premiums, providing key information to policymakers interested in expanding coverage.

3:45 PM–4:45 PM MONDAY [Cross-Cutting Themes And Other Issues]

Intervention Evaluation

MODERATOR: **Heather Brown**, Newcastle University

Does Long-Term Care Provision Reduce Health Care Utilization: A Novel Approach to Longitudinal Mediation Analysis

PRESENTER: **Andrej Srakar**, Institute for Economic Research
AUTHORS: Boris Majcen, Tjasa Bartolj

The paper addresses causal relationship between long term care and health care utilization of the elderly. The expansion of long-term care (LTC) may improve health system efficiency by reducing hospitalizations and paves the way for the implementation of health and social care coordination plans. The combination of population ageing and social change suggests that in the coming years, there will be a greater demand for formal LTC (e.g. personal care, community care and institutional care provided in people's homes or nursing homes and assisted living facilities) funded by government programmes, private LTC insurance or individuals' out-of-pocket payments. We draw upon the longitudinal evidence from Survey of Health, Ageing and Retirement in Europe (SHARE) for different European countries to derive causal estimates of the effects of receiving different types of LTC on health care utilization, and utilize a novel methodological solution to analyzing this causal inference problem based on mediation analysis using health indicators as mediators. To solve for multiple reverse causality we use longitudinal mediation analysis, namely cross-lagged panel models (Selig and Preacher, 2009; Bernal Turnes and Ernst, 2016). While being a highly under-researched methodology, the latter is based on stringent parametric/distributional assumptions which we correct by constructing nonparametric and Bayesian nonparametric estimators, based on local polynomial dynamic panel regression perspectives and centered Dirichlet process mixtures, combining approaches of Kim et al. (2019) and Dunson, Yang and Baird (2007). The latter allows also for the causal identification of direct and indirect effects with a more commonly used potential outcome approach. We explore the properties of both estimators in a Monte Carlo simulation study, comparing performance to parametric estimators for cross-sectional and longitudinal mediation. The results of both parametric and nonparametric modelling confirm positive effects of LTC provision on reducing health care utilization with both direct and indirect significant effects in most criteria. The results also allow a highly granular perspective on relationship between long term and health care provision and serve as a basis for calculation of total effects of changes in long term care provision on cost savings in health care system, by different criteria. The article provides a novel methodological possibility, not used so far in the analysis of the relationship between long term care and health care, and an application of two novel nonparametric and Bayesian estimation approaches, first of such nature for longitudinal mediation analysis and one of rare to date for structural equation type causal modellings in general.

Systems Change Research: Return on Investment Analysis of Placing a Clinical Librarian in a Hospital Critical Care Unit

PRESENTER: **Ned Hartfiel**, Centre for Health Economics and Medicines Evaluation (CHEME), Bangor University
AUTHORS: Girendra Sadera, Victoria Treadway, Catherine Lawrence, Rhiannon Tudor Edwards

Background: Economic evaluation of systems change is challenging and less common than health technology assessment. Previous research indicates that timely information provided by clinical librarians can contribute to outcomes such as improved patient care and time savings for hospital staff. What is unknown is the financial return on investment (ROI) of a clinical librarian in a critical care unit.

Objective: The aim of this study was to assess, from the perspective of the hospital payer, the ROI of placing a part-time clinical librarian in a hospital critical care unit over a 15-month intervention period. A positive ROI indicates that a clinical librarian can deliver cost savings and value for money, which is especially important during times of financial constraint and calls for efficiency savings. Estimating the ROI of clinical librarian activities is aligned with the current NHS Long Term Plan which focuses on maximising health outcomes generated from NHS services, while minimising costs, as part of systems change.

Methods: ROI was estimated from quantitative and qualitative data collected from a purposive sample of critical care staff who used clinical librarian services during 2018-2019. ROI was determined by comparing the total costs of employing a clinical librarian with the total monetised benefits of implementing the intervention. Total benefits were estimated from ROI questionnaires and interviews with participants (n=24), and from financial information provided by administrative staff. Based on findings from ROI questionnaires and interviews, the following outcome categories were monetised: time savings for critical care staff, professional development for nurses and improved patient care.

Results: The results showed that a part-time clinical librarian in a critical care unit could generate a positive ROI. A range of clinical librarian services contributed effectively to the professional development requirements of critical care staff. Additional benefits were associated with time saved in searching for information for clinical staff, with some incidences of cost avoidance. When total monetised benefits were compared with total costs, the clinical librarian intervention generated a positive ROI of £1.18 to £3.03 for every £1 invested.

Discussion: Systems change in health and social care is challenging to evaluate using a gold standard RCT approach. NICE has recommended cost benefit analysis and related methods such as ROI in the evaluation of public health interventions, and there is increasing interest in natural experiment methodology in systems change research. This novel study generated promising results indicative for commissioners seeking to improve patient care and deliver value for money. Quantitative and qualitative data indicated that time saving, support for professional development and improved patient care were important outcomes. To improve generalisability, multisite studies using standardised ROI tools are recommended. The development of a core set of outcomes would enable direct comparison of results in future studies.

Conclusion: Information provided by clinical librarians can save clinician's time, support professional development and improve patient care. From an NHS payer perspective, this study showed that a clinical librarian intervention on a critical care unit could generate value for money.

Designing an Effective Intervention to Increase Uptake of HIV and Pregnancy Prevention Services at Drug Shops in Tanzania: Integrating Behavioral Economics and Human-Centered Design for Motivating Behavior Change

PRESENTER: **Jenny Liu**, University of California San Francisco
AUTHORS: Calvin Chiu, Lauren Hunter, F Abigail Cabrera, Rachel Willard-Grace, Aarthi Rao, Prosper Njau, Sandra I McCoy

Background: New person-centered approaches are needed to encourage uptake of preventive sexual and reproductive health (SRH) services for adolescent girls and young women (AGYW; ages 15-24) in sub-Saharan Africa. In Shinyanga, Tanzania, we aimed to develop and operationalize an intervention to motivate AGYW to seek SRH services (contraception and HIV self-testing kits) available at community drug shops.

Theoretical framework: We drew upon the strengths of two complimentary approaches that focus on uncovering hidden influences on behavior. We used the empathic process of human-centered design (HCD) to generate insights defining AGYW and shopkeepers' needs and motivations, and design a highly-tailored intervention. To enhance scientific rigor and reproducibility, we used behavioral economics (BE) principles to diagnose biases underlying observed insights and address them with evidence-based nudge strategies leveraging influential emotional and environmental factors on individual decision-making. We hypothesized that integrating these approaches would increase the likelihood that the problem is defined from users' perspectives and the resulting intervention would be relevant, acceptable, and effective.

Problem definition: During formative interviews with and observations of AGYW and shopkeepers, we identified several behavioral biases underpinning observed insights. Shopkeepers were agents of a moral imperative to control AGYW's behavior rooted in social norms against AGYW sexuality; AGYW were often hassled or denied SRH products which shopkeepers deemed "inappropriate," (social norm) despite shopkeepers wanting recognition as health providers (ego). AGYW frequented drug shops during mundane errands for others, but could not readily explore SRH products behind the counter (lack of salience). Despite fearing pregnancy and irrespective of cost barriers, many AGYW sought SRH products only after engaging in higher-risk behaviors, undervaluing future prevention benefits compared to immediate benefits of maintaining sexual relations (present bias). Misinformation about contraception's risks and benefits also reduced demand among AGYW (incorrect beliefs).

Solution: Given these insights and biases, we designed Malkia Klabu ("Queen Club"), a loyalty program through which AGYW could earn small-value prizes, discreetly use card symbols to request free SRH products, and access hands-on informational SRH displays at "girl-friendly" drug shops. Our 4-month randomized study of 20 drug shops found that Malkia Klabu increased uptake of HIV self-testing kits and contraception among AGYW customers. Endline interviews with AGYW and shopkeepers showed that many were motivated by specific program features in ways consistent with hypothesized BE constructs. For AGYW participants, excitement about club membership replaced the fear associated with SRH care-seeking (affect heuristic), SRH was more salient during shopping routines, prizes motivated repeat visits to further encourage uptake of free SRH products at each visit (present bias), and nonverbal symbol communication normalized requesting for SRH (social norm); we did not find

evidence that membership itself acted as a commitment toward SRH goals. Among shopkeepers, participation led to more recognition as a health provider (ego), represented a commitment as a "protector of AGYW," and increased customer traffic.

Conclusion: Integrating HCD and BE can be an effective approach for developing innovative and effective interventions that simultaneously meet the different needs of different economic actors in support of public health priorities.

3:45 PM –4:45 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Evaluating Productivity Losses

MODERATOR: **Stephen Mac**, Institute of Health Policy, Management and Evaluation, University of Toronto

Adopting a Patient's Perspective in the Economic Evaluation of Health Interventions

PRESENTER: **Rui Fu**, Institute of Health Policy, Management and Evaluation, University of Toronto

AUTHORS: Vivian Ng, Michael Liu, David Wells, Emre Yurga, Dr. Eric Nauenberg

Health technology assessment (HTA) guidelines are being constantly upgraded to account for the increasing complexity of interventions. Current guidelines for evaluating the cost-effectiveness of health interventions commonly recommend the use of a payer and/or a societal perspective. This raises the concern that the resulting reimbursement decision may overlook the spectrum of impact an intervention could have on patients/caregivers. In this paper, we argue that a potential solution is to supplement a societal- or payer-perspective economic evaluation with a separate evaluation assuming exclusively the patient and/or caregiver perspective. This perspective is defined to encompass household-level affordability and other patient/caregiver experiences including adherence, unintended side effects and burdens on daily living. We present five broad categories of health interventions where a patient/caregiver perspective analysis may provide insights that lead to findings that may be incongruent with the findings from a payer and/or societal perspective. These include interventions that cross the definitional boundary between drugs and non-drug technologies; interventions that significantly affect patient adherence to protocol; interventions that represent revolutionary treatments—or even cures—for genetic disorders; interventions with an incremental cost-effectiveness ratio in the southwest quadrant of the cost-effectiveness plane; and interventions previously approved for coverage but now targeted for potential disinvestment. Real-world examples of health interventions that fall into the five categories are discussed in detail. Practical recommendations are also made regarding how to incorporate patient/caregiver inputs into an economic evaluation that may lead to improvements in patient-centered care particularly in times of tight fiscal constraint.

Feasibility and Validity of the Valuation of Lost Productivity Questionnaire in Caregivers

PRESENTER: **Wei Zhang**, University of British Columbia

AUTHORS: Aaron Gelfand, Julie Sou, Rick Sawatzky, Katrina Prescott, Alison Pearce, Dr. Aslam Anis, Christine Lee

Background:

The Valuation of Lost Productivity (VOLP) questionnaire was initially developed to measure and value work productivity losses in terms of work time losses and associated costs in people with health problems. These losses include work stoppage, absenteeism and presenteeism (reduced work productivity while at work). However, caring for people with health problems affects the work productivity of their caregivers. Existing questionnaires assessing caregiver work productivity losses have limitations, namely, their presenteeism measurement method, a 0-10 scale. This can lead to larger time loss estimates of presenteeism compared to direct time estimate methods. We adapted the VOLP into a caregiver version to capture work productivity losses of caregivers.

Methods:

After reviewing the VOLP and other existing questionnaires measuring caregiver work productivity losses, the research team developed an initial questionnaire draft. This was improved using one-on-one interviews with caregivers and converted to an online format using Qualtrics. The Work Productivity and Activity Impairment (WPAI) questionnaire for caregivers was included to test validity. The online version was administered to 400 caregivers in Canada, recruited through a market research company, using pre-defined quotas. We defined caregivers as individuals caring for a family member or friend living with a chronic condition.

Main outcomes included VOLP and WPAI presenteeism and absenteeism. Absenteeism was measured using work time missed in different recall period (3 months in VOLP vs. 1 week in WPAI). VOLP presenteeism was measured using a direct hour estimating method. WPAI presenteeism was measured using a 0-10 scale method. Validation methods were similar to the VOLP patient version and interpreted using standard definitions.

Results:

Preliminary results found low correlations between VOLP and WPAI outcomes, observing a higher correlation between absenteeism (0.49) than presenteeism (0.36). Correlations between VOLP outcomes and time spent on caregiving responsibilities (caregiving hours) ranged from negligible to low, with a higher correlation for absenteeism (0.39) than presenteeism (0.22). Correlations between WPAI outcomes and caregiving hours ranged from negligible to low, with a lower correlation for absenteeism (0.27) than presenteeism (0.35). Controlling for care-recipients' condition severity resulted in illogical correlations trends. Dividing groups by severity resulted in negligible effect size. Dividing groups based on the median of caregiving hours resulted in small effect size.

Discussion:

Correlations between the VOLP and WPAI were higher than those between VOLP and other measured outcomes. However, the lower correlations between VOLP and WPAI presenteeism may reflect differences in measuring presenteeism. The findings are consistent with previous validation results for VOLP patient version.

The stronger correlation between VOLP absenteeism and caregiving hours than WPAI absenteeism may be attributed to different recall periods. The weaker correlation between VOLP presenteeism and caregiving hours than WPAI presenteeism may again reflect their different constructs.

The low discriminatory capability estimated by the effect size for condition severity, and the illogical correlation trends may be due to the small subgroup sample size or indicate the difficulty caregivers have in assessing the severity of their care-recipients' conditions.

Incorporating Family Spillover Costs and Health Consequences in the Cost-Effectiveness of Child Health Interventions

PRESENTER: **Ramesh Lamsal**, University of Toronto

AUTHOR: Wendy Ungar

Background: That a child's health condition can have significant effects on the health and well-being of family members (spillover effects) is well established. Consequently, treating the child's condition affects the welfare of the family. However, these spillover effects are ignored in conventional patient-based cost-effectiveness analysis (CEA) adding to uncertainty in decision-making. The objective was to investigate how spillover effects occur in families of a child with disabilities or chronic illness and present a framework for their inclusion in CEAs.

Methods: A review of the literature was conducted to find studies that examined the burden incurred by the family members of a child with chronic illness or disabilities. A separate review was undertaken to identify theories that emphasize using a family-approach in providing care and understanding the costs and consequences.

Results: The conceptual framework illustrates costs, health, and well-being spillover effects occur in family members through informal caregiving and family effects. A framework for including spillover effects into CEAs, where family health utility is derived using an appropriate mathematical function incorporating health utilities of all family members and applied to the child's life years for QALY calculation is proposed.

Conclusions: A child's health condition generate spillover effects on family members, which are not adequately considered in CEA and by decision-makers. The proposed theoretical framework for incorporating spillover effects can contribute to improved evidence for funding services to optimize the health and well-being of children and their families.

Paid and Unpaid Productivity Losses Due to Premature Mortality from Cancer in the European Union in 2018

PRESENTER: **Ms. Marta Ortega Ortega**, Complutense University of Madrid

AUTHORS: Paul Hanly, Alison Pearce, Isabelle Soerjomataram, Linda Sharp

Purpose: When someone dies prematurely from cancer this represents a loss of productivity for society. This loss can be valued and provides a measure of the cancer burden. We estimated paid and unpaid productivity lost due to cancer-related premature mortality in Europe in 2018.

Methods: Lost productivity was estimated for all cancers combined and 23 cancer sites by countries in Europe adn for all Europe as a whole. Deaths aged 15-64 by cancer site, age, sex and country were abstracted from GLOBOCAN 2018. Unpaid time lost was derived from Eurostat. Paid and unpaid (housework, caring, volunteering) productivity losses were valued using the Human Capital Approach, making adjustments for labour force participation and unemployment. Costs are in €2018.

Results: 347,149 premature cancer deaths occurred (60% male) in Europe in 2018. The total value of productivity lost due to cancer was €104.6 billion. 50.6% was accounted for by lost paid work, 20.9% was due to unpaid work undertaken by employed people and 28.5% unpaid work by non-employed people. Females accounted for 36.6% of the paid work losses but half (48.9%) of the unpaid work losses. Losses were highest in Western Europe (€52.0 billion). The most costly cancer was lung (€21.7 billion), followed by breast (€10.7 billion). The average cost/death for paid work was €152,398, with. Hodgkin lymphoma the most costly cancer (€293,385) and uterine the least costly (€79,187). The average cost/death for unpaid work among the employed was €63,137, and for the non-employed was €85,692.

Conclusions: The value of lost productivity due to cancer is significant and almost half is due to unpaid work losses. This highlights the importance of considering both paid and unpaid work when assessing the economic burden of a disease to inform strategic policy decisio-making.

3:45 PM –4:45 PM MONDAY [Evaluation Of Policy, Programs And Health System Performance]

ORGANIZED SESSION: Making Health Systems Strengthening Interventions Work for Financing for Universal Health Coverage: Lessons from Nigeria

SESSION CHAIR: **Kelechi Ohiri**, Health Strategy and Delivery Foundation

ORGANIZER: **Yewande Ogundeji**, Health Strategy and Delivery Foundation

Understanding the Costs and Financing Gaps for Primary Health Care Services in Nigeria (A Kaduna case-study)

PRESENTER: **Yewande Ogundeji**, Health Strategy and Delivery Foundation

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Background

Like other LMICs, Nigeria has made impressive strides in health system strengthening and health financing in a bid towards achieving Universal Health Coverage (UHC). However, decision-makers are continuously faced with health financing questions, that seek to understand the adequacy of government contributions for healthcare needs of its population, as well as the cost of health to individuals. This study aimed to assess the funding gaps between the government's current spending and the estimated cost of services for providing primary healthcare services through the public health system and community level in Kaduna state.

Methods

A costing model was designed to estimate the annual cost of providing healthcare services through two primary health channels: Primary healthcare facilities and community health services. We applied a bottom-up costing methodology and staff time study approach to estimate the resources required to deliver services across all PHCs in the state. The model estimated the primary health coverage through a Normative and Actual approach. We assessed previous budgets and expenditure estimates to benchmark the state spending and estimate funding gaps in delivering services across PHC service delivery channels - PHC, clinics (HP), posts (HP) and community level. All analyses were completed on Microsoft excel.

Results

The annual average cost of providing health services in Primary Health Centers (PHC) was estimated at ₦58million ($190,000) with drugs and commodities (56%) as the major cost driver. The funding gap analysis shows that the government funds only 4% of the resources needed at the PHCs, with an average spend of ₦346($1) per patient, compared to the estimated cost of ₦9,327($30) per patient. The gaps are also apparent across priority services. For example, government spending for MNCH services was estimated at ₦621($2) per patient, compared\ to an estimated cost of ₦9,117($30) required per patient. Similarly, government spending on immunization was ₦1,243($4) per patient compared to an estimated ₦11,500($38) needed per patient. Only 2% of the estimated cost of drugs and medical supplies was budgeted for by the state. Results from this study also imply that more people seek care at primary facilities than estimated normative coverage projections despite the high gaps in government funding.

Conclusion

Policymakers need to gain better knowledge on the importance of primary healthcare services costing to plan for more targeted health policies and better prioritisation of government budget and health system resources towards achieving universal health coverage. Further research on the value of premiums from state insurance schemes in bridging the funding gaps in the health system and other innovative financing mechanisms should be considered.

The Political Economy of Improving the Fiscal Space for Health through Budget Efficiency in Kaduna, Nigeria

PRESENTER: **Olayiwola Olatawura**, Health Strategy and Delivery Foundation

AUTHORS: Vincent Morah, Yewande Ogundeji, Kelechi Ohiri

Background

The healthcare sector in Nigeria remains underdeveloped and unable to serve the most at-risk population, especially at primary health care (PHC) level. A three-tier system of governance bears large responsibility for the situation overall, with demand, supply and governance issues implicated in the current state of affairs at PHC levels. This is further exacerbated by limited funding of the health sector despite reasonable budgetary allocations due to poor budget performance (on the average less than 50% of the health budget is released and spent). This study aims to identify and investigate factors that influence the health sector budget implementation process and the unique bottlenecks at specific points across Government Ministries, Departments & Agencies (MDAs) in Nigeria, using Kaduna State as a case study.

Methodology

The study utilizes a three-step methodology of document review, in-depth interviews with key officials in the relevant ministries and agencies, and a case study analysis of the fund release for five specific health projects. Documents reviewed included yearly performance reports, approval process documentation and budget commitments from health ministries and agencies. In-depth qualitative key informant interviews were conducted with 18 senior officials and executives across six strategic ministries including the Ministries of Health, Finance and Planning/Budget Commission.

Results

Delays between payment requests for budgeted line items and cash release within the health budget were variable. We identified time lags of one to five months between payment request and commitment release and an eventual outcome of no actual cash releases. Identified within the same system were budget items with a one-month time lag between payment request and commitment release followed by a corresponding cash release. Generally, delays were due to low functional capacity, poor accountability and inefficient processes such as multiple signoffs within relevant agencies. In addition, overall fiscal space in the state was limited. Our findings further showed that commitment of cash release was also subjected to various prioritization processes which were unclear and did not align with any predefined criteria. Although, it appeared that prioritization of budget line items that had their budget released were influenced by potential for counterpart funding and high visibility.

Conclusion

This study revealed critical areas for process improvements and increased accountability and resulted in recommendations including routine cross-sectorial planning and prioritization as well as budget performance reviews. Interventions to streamline budgetary approval release and defined criteria for budgetary release (in a constrained fiscal setting) will improve efficiency and health budget performance.

Fostering UHC through Realistic and Efficient Planning and Evidence-Based Decisions

PRESENTER: **Musleehat Usman**, Health Strategy and Delivery Foundation**Hamza Abubakar**, Kaduna State Primary Healthcare Board

AUTHORS: Olayiwola Olatawura, Kelechi Ohiri, Yewande Ogundeji

Background

Many states in Nigeria develop yearly strategic health plans to improve access, coverage and quality of care. However, service delivery remains poor because many of strategic plans are not implemented due to feasibility and constrained fiscal space (limited funding). Given this, it is necessary to develop efficient strategic health plans that consider resource and impact trade-offs to enable citizens gain access to basic health services despite fiscal constraints. The aim of this study was to develop and demonstrate utility of a realistic service delivery plan that considered efficiency gains, needs, resources, priorities, and implementation time frame using Kaduna state as a case study.

Methods

First, we conducted a fiscal space assessment across 3 scenarios, a low, base and high case, to determine resources available. This was followed by the development of a comprehensive model was designed using Microsoft Excel, allowing us to determine the efficient combination of inputs (e.g. maximum number of facilities, human resources) necessary to achieve desired service access. The range of allowable model options that fit within the determined constraints based on financial projections were presented to the policy makers and State decision makers to co-select the most viable service delivery options.

Findings

Our findings demonstrate the efficiency of the service delivery plan (SDP) focused on efficiency gains. One of the SDP models was projected to increase access to 69% while costing N7.9b (US$25m), within the state's resource limit compared to the yearly strategic plan which was estimated to increases access to >80% at N60b (US$16.5b). Policy makers showed strong support for the adoption and implementation of the efficiency focused SDP through the executive Governor's approval of the SDP model.

Conclusions

This study demonstrates the need to shift from input driven models to efficiency focused models when planning healthcare service delivery. It provides an analytical approach towards resource allocation. It also demonstrates the need and utility for an evidence-based approach in resource constrained settings, by providing decision makers viable options to optimize health systems service delivery.

3:45 PM –4:45 PM MONDAY [Supply Of Health Services]

Physicians' Agency

MODERATOR: **Joanne Spetz**, University of California San Francisco

What Motivates Physicians in Their Provision of Health Care? Revisiting the Agency Theory

PRESENTER: **Anne Sophie Oxholm**, University of Southern Denmark

AUTHORS: Dorte Gyrd-Hansen, Christian Bøtcher Jacobsen, Ulrich Thy Jensen, Line Bjørnskov Pedersen

Background: Health economists aim to design policies that encourage physicians to provide high-quality care in a cost-effective way. Health economists typically use agency theory to predict how physicians respond to these policies. In traditional agency theory it is assumed that physicians are motivated by both external rewards (extrinsic motivation) and the benefits to their patients from receiving treatment (altruism). However, empirical studies show that many policy schemes lead to heterogeneous and unintended responses, suggesting that the current theoretical framework may be too simplified, and thus unable to predict physicians' behaviour.

Aim: Our aim is to create a better understanding of what motivates physicians' in their provision of health care, and thereby expand the standard principal-agent framework.

Method: Drawing on key lessons from the social psychology and public administration literatures, we seek to expand the standard principal-agent framework by unfolding physicians' non-pecuniary motives to provide care. In addition to physicians being motivated by patient benefits we propose two additional non-pecuniary components: societal benefits and intrinsic motivation. Using a linear regression model, we estimate the importance of each of these motivational components for physicians' actual provision of health care to patients.

Data: Our sample includes around 1,200 GPs (1/3 of all GPs in Denmark), who responded to a nation-wide survey on motivation in 2019. The survey data includes validated survey questions, which measure the degree to which GPs are motivated by both pecuniary and non-pecuniary motives. We link this survey data with detailed register data on the GPs' provision of services, such as the number of consultations provided, the number of services provided during consultations, the types of medication prescribed etc., during the same time period.

Results: Our analysis is still ongoing. Preliminary findings show that there is significant variation in GPs' degree of pecuniary and non-pecuniary motives to provide care. We expect to find that GPs' provision of health care is not only associated with their degree of extrinsic motivation and altruism towards their patients, but also with their degree of altruism towards society (society benefit) and intrinsic motivation.

Conclusion: We propose a more nuanced view on physicians' utility function by introducing several non-pecuniary motivational components that may affect their supply of health care, i.e. their altruism towards society and intrinsic motivation. This expansion of the standard agency theory can be used to improve the understanding of heterogeneity in physician behaviour, thereby creating more effective health care policies.

Provider Effort, Quality of Care and Overprovision: Are More Conscientious Health Care Providers Less Likely to Supply Unnecessary and Wasteful Care? Evidence from a Standardised Patient Audit Study in Tanzanian Private Health Facilities

PRESENTER: **Jessica King**, London School Of Hygiene & Tropical Medicine

AUTHORS: Timothy Powell-Jackson, Christina Makungu, Catherine Goodman

Introduction

Several standardised patient audit studies have demonstrated a positive relationship between provider effort, as measured by the number of items completed from a checklist of required history taking questions and physical examinations, and correct treatment of the standardised patient. However, it is not clear whether this is because providers who make more effort provide more care overall, both correct or unnecessary, or whether effort is associated with reduced unnecessary care, either through more accurate diagnosis of the correct condition as a direct consequence of the additional effort, or indirectly through those providers who make more effort also being more skilled or more conscientious.

Methods

Undercover standardised patients visited 227 outpatient private-for-profit and faith-based health facilities in Tanzania, carrying out 909 visits and presenting symptoms of four cases: asthma, malaria, TB and common cold. Standardised patients recorded history questions asked and physical examinations carried out by the provider, as well as laboratory tests orders and treatments prescribed. The tests and treatments were then categorised as necessary or unnecessary, and non-mutually-exclusive binary outcomes of whether each patient received correct treatment for their condition and any unnecessary care were defined. Provider effort was measured as the proportion of history taking questions and physical exams completed from an essential checklist defined by an expert panel.

Results

There was a positive relationship between provider effort and correct treatment, with those completing most checklist items being most likely to treat patients correctly. Provider effort was negatively associated with unnecessary care and harmful care. There was a negative relationship between unnecessary care and correct treatment, which partially confounded the relationship between increased effort and reduced unnecessary care: once correct treatment was controlled for, a weaker negative relationship between effort and unnecessary care was still apparent.

Discussion

In line with similar studies, providers who made more effort were more likely to treat patients correctly. Those providers were also less likely to give unnecessary or harmful care, suggesting higher rates of correct treatment cannot be explained by simply more provision of care in general. Giving the correct treatment partially but did not fully explain the relationship between effort and reduced rates of overprovision, suggesting that it is a result of both inherent provider characteristics, such as training, skill level, or conscientiousness, and that an increased number of history questions and physical exams led to better diagnostic accuracy.

Power Dynamics in the Doctor-Patient Relationship: Evidence from the US Military

PRESENTER: **Dr. Manasvini Singh**, University of Massachusetts, Amherst
AUTHOR: Steven Schwab

Research on the patient-physician relationship has largely focused on the information asymmetries and the agency problems inherent to the relationship. There has been far less research on the power differential between the physician and the patient, and its effects on the clinical care provided by the physician.

In the experimental economics and management literature, power and authority have been shown to affect individual motivation, information processing style, incentives, effort, and the allocation of decision rights between cooperating parties. Thus, the power imbalance between the physician and patient (which favors the physician) may lead the physician to either make clinical decisions that do not perfectly reflect patient preferences, provide suboptimal levels of effort, or optimize dimensions of care that do not necessarily maximize patient utility.

In this study, we exploit the plausibly exogenous assignment of physicians to patients in the US military to examine how the relative difference in ranks between physicians and patients affects care. Using over ~1.5 million encounters from the emergency department in military hospitals, we examine whether discordance in military ranks between patients and physicians affect i) intensity of clinical care, ii) observable metrics of clinical quality, and iii) unobservable metrics of clinical quality. We motivate our empirical analyses using a principal-agent framework where physician payoff is a function of effort. In this framework, a reduction in the physician's relative power leads to an increase in total physician effort and/or a reallocation of effort from unobservable to observable dimensions of effort.

Overall, results suggest a reduction in the physician's relative power in the physician-patient relationship is associated with increasing intensity of care and a greater reliance on observable outputs of clinical quality. Specifically, as the physician's rank decreases relative to the patient, patients experience a lower likelihood of having only evaluation and management codes during their ED stay, higher associated RVUs, a greater likelihood of having pain treated with opioids, and more tests performed during their stay. Finally, we examine mechanisms through which power dynamics change within-physician patterns of care, the extent to which these changes can be predicted from physician characteristics, and its effects on patient outcomes.

Primary Care Physician Remuneration and Preventive Cancer Screening: Evidence from Blended Fee-for-Service and Blended Capitation Models in Ontario, Canada

PRESENTER: **Dr. Sisira Sarma**, Western University
AUTHORS: Nibene Habib Some, Rose Anne Devlin, Nirav Mehta, Gregory Zaric

Objectives: In Canada's most populous province, Ontario, two-thirds of the primary care physicians practice in either blended fee-for-service or blended capitation models. Beginning 2006, a large number of physicians practicing in blended fee-for-service models began switching to blended capitation models. It is unclear how such a shift from a retrospective to prospective payment system influences the behaviour of physicians in terms of the provision of preventive health care. In this paper, we investigate screening rates for breast, cervical and colorectal cancer for which physicians practicing in blended fee-for-service and blended capitation models are eligible for identical pay-for-performance incentives.

Methods: The data for this study come from population-based administrative databases from April 1st 2006 to March 31st 2015. Given that switching from blended fee-for-service to blended capitation model is voluntary, we rely on a propensity score matching procedure to ensure that switchers and non-switchers are similar in terms of their baseline demographic and practice characteristics, patient characteristics and expected gain in income by switching from blended fee-for-service to blended capitation. Then we use inverse probability weighting with fixed-effects and high-dimensional fixed-effects regression models to estimate the impact of switching.

Results: We find that switching from blended fee-for-service to blended capitation increase breast, cervical, and colorectal cancer screening rates in the range of 1.15%–1.67%, 0.81%–1.10%, and 1.24%–1.67% per physician per year. Further investigation reveals that this increase was heterogeneous, but largely driven by the provision of services at the extensive margin.

Discussion: Pay-for-performance incentives to improve preventive health care services emerged as one of the policy instruments to address some of the inherent weaknesses of pure payment systems of fee-for-service and capitation in many developed countries, but very little is known about the relative effectiveness of such incentives within fee-for-service and capitation payments. Our study fills this gap by examining screening rates for breast, cervical and colorectal cancer for which physicians practicing in Ontario's blended fee-for-service switched to blended capitation models who are eligible for identical pay-for-performance incentives. We find that that capitation payment induces provision of preventive care to the desired population.

3:45 PM –4:45 PM MONDAY [Specific Populations]

ECONOMICS OF CHILDREN'S HEALTH AND WELLBEING SIG SESSION: Impacts on Children's Health and Wellbeing

MODERATOR: **Lazaros Andronis**, University of Warwick

Economic Evaluation of an Effective Group-Based Parenting Intervention to Promote Early Child Development in Rural Kenya

PRESENTER: **Uzaib Saya**, Pardee RAND Graduate School

AUTHORS: Italo Lopez Garcia, Jill Luoto

Background: Early childhood development (ECD) programs can help address disadvantages for the 43% of children under five in low- and middle-income countries (LMICs) experiencing compromised development. However, very few studies from LMIC settings include information on their program's cost-effectiveness or potential returns to investment. We estimated the cost-effectiveness, benefit-cost ratios, and returns-on-investment for two effective group-based delivery models of an ECD parenting intervention that utilized Kenya's network of local community health volunteers (CHVs).

Methods and Findings: Between October 1 and November 12, 2018, 1152 mothers with children aged 6-24 months were surveyed from sixty villages in rural western Kenya. After baseline, villages were randomly assigned to one of three intervention arms: a group-only delivery model with 16 fortnightly sessions, a mixed-delivery model combining 12 group sessions with four home visits, and a control group. At endline (August 5 to October 31, 2019), 1070 children were retained and assessed for primary outcomes including cognitive and receptive language development (with the Bayley scales of Infant Development, third edition), and socioemotional development (with the Wolke scale). Children in the two intervention arms showed better developmental outcomes than children in the control arm, though the group-only delivery model generally had larger effects on children. Total program costs included provider's implementation costs collected during the intervention period using financial reports from the local non-governmental organization (NGO) implementer, as well as societal costs such as opportunity costs to mothers and delivery agents. We combined program impacts with these total costs to estimate incremental cost-effectiveness ratios (ICER), as well as benefit-cost ratios (BCR) and the program's return-on-investment for the Government (ROI) based on predictions of future lifetime wages and societal costs. Total costs per child were $140 in the group-only arm and $145 in the mixed-delivery arm. Because of higher intention-to-treat (ITT) impacts at marginally lower costs, the group-only model was the most cost-effective across all child outcomes. Focusing on child cognition in this arm, we estimated an ICER of a 0.37 standard deviation (SD) improvement in cognition per $100 invested, a BCR of 15.5 and ROI of 127%. Our estimated benefit-cost ratio and return-on-investment necessarily make assumptions about the discount rate, income tax rates, and predictions of intervention impacts on future wages and schooling, and we examine the sensitivity of our results to these assumptions.

Conclusions: To the best of our knowledge, this study is the first economic evaluation of an effective ECD parenting intervention targeted to young children in sub-Saharan Africa, and the first to adopt a societal perspective in calculating cost-effectiveness that accounts for opportunity costs to delivery agents and program participants. Our cost-effectiveness and benefit-cost estimates are higher than most of the limited number of prior studies from LMIC settings providing information about costs. Our results represent a strong case for scaling similar interventions in impoverished rural settings and, under reasonable assumptions about the future, demonstrate that the private and social returns of such investments are likely to largely outweigh their costs.

Inequalities in Child Health – Trends and Decompositions

PRESENTER: **Sven Neelsen**, The World Bank

AUTHORS: Patrick Eozenou, Dr. Magnus Lindelow

While the burden of child death remains high, improvement in child mortality over the past 30 years have been clear and substantial across most countries (under five mortality dropped by almost 60 percent since 1990). Likewise, the percentage of stunted children dropped by almost 33 percent between 2000 and 2018. The picture is however less clear when we consider inequalities in child health outcomes between and within countries.

Focusing on child health outcomes, we take a systematic look at the existing data to document the long run trends in outcome levels and inequalities, both between and within countries. We test between-country convergence in child health outcomes (i.e we ask whether countries starting with worst health outcomes are catching up over time with countries starting with better outcomes). We also analyze the determinants of inequalities and focus on the role of socioeconomic status and income growth. We conduct this analysis by exploiting over 290 household datasets (DHS or MICS) covering more than 90 countries between 1990 and 2019. Together, these countries represent about 54% of the world population, and for 83 countries with at least two data-points in time, we can conduct trend analysis. To analyze the joint evolution of child outcome levels and inequality, we compute concentration indices (Kakwani 1977, 1980) to measure the degree of inequalities between the poorest and the richest, and we construct the achievement indices for each dataset to measure the trade-off between improvements in outcome levels and the degree of inequality.

We find that child health outcome inequalities between countries have not improved between 1990 and 2019, and that convergence between high mortality/high stunting countries and low mortality/low stunting countries is not supported by the data. Likewise, inequalities within countries have not improved on average despite the important improvement in outcome levels. While this overall trend holds on average in our sample, it is important to note that several countries have managed to both improve child outcomes and reduce within countries inequalities during the same period. We also find that while socioeconomic differences within countries account for most of the variation in child health outcomes, changes in aggregate income is only weakly associated with changes in inequalities.

Income growth alone is unlikely to contribute to reductions in health inequalities within countries. Targeted interventions addressing both health drivers and socioeconomic conditions (cash transfers) are promising vehicles to reduce health inequalities. Policies and targeted interventions explicitly focusing on reducing health inequalities are needed to achieve equitable progress towards the SDGs.

Manna from the Sky? Rainfall Shocks and Child Dietary Quality

PRESENTER: **Elisabetta Aurino**, Imperial College London

AUTHORS: Marisa Miraldo, Chris Millett, Marta Favara

Low-diversity diets impair the development of children and adolescents worldwide, with long-term consequences on their health, productivity and incomes. Weather shocks are key drivers of food security fluctuations for households in lower-income countries. However, evidence on the effects of rainfall shocks on children's diets is limited, which constitutes a major gap for the design and implementation of programs aimed at supporting children's dietary quality, especially after major shocks.

We examine the effects of rainfall shocks on child dietary quality among a longitudinal sample of children from Andhra Pradesh and Telangana, India. Our critical assumption – based on a wide literature - is that rainfall shocks act as food security shocks for Indian households. Specifically, we posit that a positive rainfall shock, by boosting agricultural production and revenues, will likely increase the diversity of children's diets, while the reverse will occur in the face of a negative rainfall shock.

We use matched high-quality weather data from the Climate Prediction Centre (US Department of Commerce) with longitudinal data on children at ages of 5, 8, 12 and 15 years from the Young Lives study. For the identification of the effects of rainfall shocks on children's diets, we exploit spatial and temporal variation in rainfall shocks occurring in the year preceding the child's dietary assessment in each survey round. To the extent these shocks are random, we can identify their effects on children's diets, after controlling for temperature, child fixed effects and age, as well as seasonal and other time-related effects. We also examine heterogeneity by child gender, age, and household backgrounds, which is highly relevant for policies aiming of smoothing food consumption for most vulnerable groups. Further, we test whether changes in children's diets are part of broader changes in household food security. Finally, we investigate some potential mechanisms of transmission of rainfall shocks to local economies, such as changes in local agricultural production, wages, and food prices.

Positive rainfall shocks increase children's dietary quality as compared to average rainfall levels, while negative rainfall shocks have the opposite effect. However, effects sizes are relatively modest, which reflect the low elasticity of of Indian diets to changes in economic circumstances. Further, we find that while shocks do not have heterogeneous effects by gender, they exacerbate pre-existing inequalities in diets by socioeconomic status.

When examining mechanisms, we find that changes in agricultural yields, revenues and wages are likely acting as the key channel of transmission of rainfall shocks on child and household food security. We do not find effects of rainfall on prices in our data, which is consistent with recent literature suggesting that improved access to markets through transport infrastructure and storage have decreased the sensitivity of food prices to rainfall in India Thus, our results suggest that rainfall operates mostly through changes in incomes, rather than prices.

Cash or Cash-Plus? a Systematic Review and Meta-Analysis of Packaged Health and Social Protection Interventions for Infants and Young Children in Low- and Middle-Income Countries.

PRESENTER: **Madison Little**, Centre for Evidence-Based Intervention, University of Oxford
AUTHORS: Keetie Roelen, Brittany CL Lange, Janina I Steinert, Alexa R Yakubovich, Lucie Cluver, David K Humphreys

Background: While there is evidence of cash transfers having beneficial household impacts (such as improved food security), the evidence for improving growth and development outcomes in children is limited. In cases of effective cash transfers, these health improvements often fail to sustain long-term. Cash transfers have therefore begun to be packaged as cash-plus programmes, combining cash with additional transfers, interventions, or services, in hopes of achieving greater impact.

Objectives: This study evaluated whether cash-plus interventions for infants and young children are more effective than cash transfers alone in improving their health and wellbeing.

Methods: A systematic search of 42 databases, donor agencies, grey literature sources, and trial registries yielded 5097 unique articles, of which 17 were included in the review and 11 meta-analysed. Studies were eligible for inclusion if the intervention package aimed to improve outcomes for children under five in LMICs and combined a cash transfer with an intervention targeted to SDG2 (No Hunger), SDG3 (Good Health & Wellbeing), SDG4 (Education), or SDG16 (Violence Prevention). Studies also had to have at least one arm receiving cash alone and examine outcomes related to poverty, malnutrition, morbidity and mortality from infectious disease, cognitive development, or violence against children. Cochrane Risk of Bias and ROBINS-I Tools were used to appraise risk of bias. Random-effects meta-analyses were conducted for an intervention package when there were at least three trials for a given outcome.

Results: Five types of intervention packages were identified, combining cash with nutrition behaviour change communication, food transfers, primary healthcare, psychosocial stimulation, and child protection interventions. Compared to cash alone, meta-analysis results suggest Cash + Food Transfers have added impact in improving height-for-age (d=0.08SD (0.03, 0.14), p=0.02) with significantly reduced odds of stunting (OR=0.82 (0.74, 0.92), p=0.01), but were not more effective in improving weight-for-height or weight-for-age. Meta-analyses also suggest that cash-plus was not more effective than cash alone for Cash + Nutrition BCC in improving anthropometrics; Cash + Psychosocial Stimulation in improving cognitive development; or Cash + Child Protection in reducing parental use of violent discipline or increasing exclusive use of positive parenting. Narrative synthesis evidence suggests that Cash + Primary Healthcare may be more effective than cash alone in reducing mortality, Cash + Food Transfers in preventing acute malnutrition in crisis contexts, and trials of Cash + Child Protection suggest a trend toward reduced violent discipline. Few interventions involved fathers, which may place increased caregiving burden on mothers.

Conclusion: There were a limited number of studies that evaluated cash-plus and cash-only interventions, with interventions for undernutrition and cognitive development being the most frequently evaluated. Nonetheless, findings suggest that few package combinations have added effectiveness. Cash combined with food transfers, primary healthcare, and child protection interventions show the greatest signs of added impact. Packaged cash-plus interventions should address both supply- and demand-side constraints and target the behavioural mediators necessary for health improvements. Ultimately, more research is needed to optimise the impact of cash-plus programmes and ensure that these interventions improve health outcomes among the most vulnerable children.

3:45 PM –4:45 PM MONDAY [Health Care Financing And Expenditures]

Health Insurance Reforms to Improve Health Financing

MODERATOR: **William Savedoff**, Inter-American Development Bank

Effect of Voluntary Private Health Insurance on Health System's Financing in Colombia

PRESENTER: **Norman Maldonado**, PROESA/ Universidad ICESI
AUTHORS: Santiago Mosquera Daza, María Catalina Saavedra, William Garcia

Introduction: Policy decisions to further progress on Universal Health Coverage (UHC) must consider its three dimensions: population, services, and costs. Moving along these dimensions implies financing reforms that must include reducing financial barriers through prepayment mechanisms in the form of compulsory prepaid funding or voluntary health financing[1].

Health systems face severe financial pressures due to population aging, increasing Non - Communicable Disease prevalence, and pressure from new health technologies. Voluntary Private Health Insurance (VHI) plans can reduce the utilization of services included in the Statutory Benefit Package (SBP) and decrease social insurance costs, contributing to health systems sustainability.

Colombia has a universal social health insurance system based on regulated competition. Health Maintenance Organizations (HMOs) bear risk and offer an SBP at a common premium paid by the government. Also, HMOs offer VHI where affiliates can access additional healthcare services that complement or supplement publicly funded SBP.

For the Colombian case, there are no previous estimates of the potential savings that VHI could cause on social health insurance and subsequently on a country's health system funding. The purpose of this paper is to estimate the potential savings that VHI generates on Colombia's social health insurance.

Methods: Using claims data reported to the Colombia Ministry of Health by an HMO for the fiscal period of 2018, we compare the utilization of healthcare services between individuals with both SBP and complementary VHI (N=32,074) with those who only have SBP (N=951,731). We use multivariate regression methods to estimate average differential healthcare utilization, costs, and publicly financed spending. Response variables are (i) the number of claims, (ii) loss costs, and (iii) loss ratio per affiliate. We include age, sex, education, income, and geographical zone as covariates.

Results: The data shows that HMO loss index (the proportion of total losses divided by the earned public premiums) was 113% for affiliates without the VHI, while it was 51% for affiliates with VHI, which suggests the existence of savings for affiliates with VHI. Through the regression analysis we also find a significant reduction in the number of claims and the loss ratio in the statutory benefits package in affiliates with VHI regarding affiliates without the VHI. We document that savings related to having a VHI were about 42% of the average premium paid by the government.

Conclusions: We find that affiliates with VHI present important savings in terms of lower costs for the health system. Consequently, VHI can be a progressive policy tool that can alleviate the pressure for additional public resources on social health insurance by reducing healthcare utilization and the subsequent reduction in costs, which translates into progress on UHC.

[1] *Health financing for universal coverage*. Retrieved December 10, 2019, from https://www.who.int/health_financing/topics/voluntary-health-insurance/role/en/

Public Moral Hazard

PRESENTER: **Juan Rojas**, UCLA
AUTHORS: Martin Hackmann, Nicolas Ziebarth

This paper studies, theoretically and empirically, the economic incentives that arise from the joint federal-state Medicaid funding through Federal Medical Assistance Percentages (FMAP). For every dollar that state governments spend on the health insurance for low-income populations, the federal government provides matching funds at a rate between 50% and 73%. The objectives of this joint funding mechanism are to reduce differences in health care coverage across states while aligning incentives through partial state funding. Although being an issue that is deeply rooted in economics, the economics literature has been relatively silent on this topic. This paper provides a simple theoretical and empirical analysis of the core economic incentives underlying this joint funding mechanism. Specifically, we show that state governments have incentives to first inflate their formal Medicaid spending, just to find ways to then channel back money to the state.

We first sketch in a simple model the main economic incentives that states face, both with and without the possibility to redirect funding through such "intergovernmental transfers" (IGT). Under the existence of IGTs, states could legally redirect money away from their intended use. Several state audits confirmed this practice as systematic and pervasive (Department of Health and Human Services, 2001a,b). We document on a case-by-case basis how pervasive such legal abuse of the funding system has been, both within states over time and across states. For example, we show that the effective matching rate in Pennsylvania was above 90% in 2002. Just considering private providers, we also show that the state effectively even made money—and had effective matching rates above 100%--by redirecting dollars intended for disadvantages low-income populations. As a consequence, effective 2003, the federal government implemented a reform that banned the hitherto legal practice to redirect monies that private providers received.

Next, we investigate the effects of this 2003 federal reform to ban such practices. For states with an IGT model in place, the returns on state-level Medicaid spending significantly decreased. Consequently, as we will show empirically using state-year level data on state and federal Medicaid spending in a simple difference-in-differences framework, those states reduced their Medicaid spending significantly relative to the control states without a pre-2003 IGT model in place. Another unintended consequence of the reform was that some states, such as Indiana, started to convert formerly private providers such as skilled nursing facilities (SNF) into county-owned facilities. This municipalization was a direct consequence of the 2003 reform is it allowed Indiana to continue to redirect money, intended to benefit low-income nursing home residents. In the last part of the paper, we show theoretically how economic incentives change under a joint funding mechanism when the existence of publicly-owned facilities effectively allow for money transfers.

Keywords: Federal Medical Assistance Percentage (FMAP), Upper Payment Limits, moral hazard, cost-sharing, intergovernmental transfers, Medicaid.

JEL Codes: H51, H75, I11, I13, I18, J14.

Impacts of DRGs-Based Payment with Incomplete Coverage: Evidence on Outpatient and Inpatient Care from China

PRESENTER: **Dr. Hao Zhang**, Harvard T.H. Chan School of Public Health

AUTHORS: Dr. Eddy Van Doorslaer, Dr. Zhiyuan Hou, Yang Sun, Jian Wu, Qingyue Meng

Since the 1980s, developed counties have begun to introduce diagnosis related groups (DRGs) for inpatient payment because DRGs enable comparison between hospitals that are otherwise incomparable and have the potential to increase hospital transparency, efficiency, and quality. Despite the thin and mixed literature evaluating DRGs payment, low- and mid-income countries have begun their transition in recent years. Given their poor historical data and infrastructure, countries often introduced DRGs to a selection of conditions or hospitals, as recommended by DRGs payment manuals. However, incomplete coverage undermines the yardstick competition underpinning DRGs. Therefore, rigorous evaluation of such DRGs payment is critical in guiding the transition to DRGs.

This study aims to fill the knowledge gap by evaluating a DRGs-based payment reform initiated in 2011 in a low-capacity setting – two rural counties in China. The new payment replaced fee-for-service for a selection of inpatient conditions at county hospitals and the lower-level township health centers (THCs). Adapting to local data limitations and health care needs, grouping of conditions was based on Chinese diagnoses as opposed to ICD codes and payment rates were set based on best practice specified in clinical pathways as opposed to cost data. To limit upcoding, restrictions were set on the proportions of intermediate- and high-severity cases in a diagnosis. To deter skimping on care, clinical pathways were imposed, and compliance was one aspect in year-end performance evaluation that determined the payment of 10% of the budget.

Exploiting a pre-existing survey – the National Health Services Survey, we first selected control counties from the same province by matching on county socioeconomic conditions, and then used difference-in-differences to estimate 2nd year treatment effects on inpatient and outpatient care for DRGs-covered and non-DRGs-covered conditions, respectively. Our results suggest that, while incidence of hospitalizable illness remained comparable between treatment and control counties, treatment counties saw a significant increase in hospitalization rate conditional on illness, mostly driven by non-DRGs-covered conditions. Further examination of patient flow, length of stay (LOS), and expenditure suggested that clinical pathways increased the days THCs had to keep DRG-covered patients but reduced the daily revenue they generated. In response, THCs referred more DRG-covered patients up and admitted more non-DRGs-covered patients and kept them for longer. Treatment county hospitals admitted the majority – but not all – of those DRG-covered patients. LOS and expenditure decreased significantly for DRG-covered patients, but satisfaction with physicians' explanation of medical problems and of treatment plan and trust in medical staff also decreased significantly. No significant effects were found on non-DRGs-covered patients at county hospitals, except for a lower satisfaction with physicians' explanation of medical problems. We also found evidence of upcoding in the form of admitting outpatients with a DRG-covered condition – spinal disc herniation. Overall, our results show variable treatment effects on different measures and by different provider levels, as well as a new form of upcoding that has been less studied. Future DRGs-based payment needs more careful and tailored design to achieve the intended benefits.

5:15 PM –6:15 PM MONDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Advanced Risk Adjusters and Predictive Formulas for Diagnosis-Based Risk Adjustment

SESSION CHAIR: **Arlene S Ash**, University of Massachusetts Medical School

ORGANIZER: **Randall Ellis**, Boston University

DISCUSSANT: **Richard van Kleef**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam; **Sungchul Park**, Drexel University; **Anna Zink**, Harvard University

Diagnostic Items: A New Framework for Disease Surveillance, Prediction, and Risk Adjustment

PRESENTER: **Randall Ellis**, Boston University

AUTHORS: Heather E Hsu, Jeffrey J Siracuse, Allan Walkey, Karen Lasser, Brian C Jacobson, Corinne Andriola, Ying Liu, Ms. Chenlu Song, Tzu-Chun Kuo, Mr. Alex Hoagland, Arlene S Ash

Importance: U.S. risk adjustment formulas typically rely on a diagnostic classification framework developed decades ago, before the U.S. transition to the International Statistical Classification of Diseases, Tenth Revision (ICD-10-CM) coding. Modern predictive models have not yet been fully adapted to exploit the substantially greater detail now available.

Objective: To exploit richer diagnostic information for better disease surveillance, predicting diverse outcomes, risk-adjusting payments, and assessing quality and performance.

Methods: Physician teams assigned all 72,000 billable ICD-10-CM-diagnoses and their 22,000 currently non-billable more general "root codes" to multiple information dimensions called Diagnostic Items (DXIs) to encode similarity across diagnoses, such that (1) every diagnosis has at least one DXI, (2) codes may have multiple DXI, (3) each DXI has at least 500 cases in the development sample, and (4) DXIs separate diagnoses associated with different annual total per-person costs (concurrently or prospectively). "Main effects" (DXI_1) summarize fundamental diseases reflected in

the diagnoses while DXI_2s provider "modifiers" (e.g., laterality, initial/subsequent/sequelae, and acuity) that refine multiple DXI_1s. To compare the model performance with other systems, we used the Agency for Healthcare Research and Quality (AHRQ) Clinical Classification System Refined (CCSR) for diagnoses as a base model. All predictive models included 30 age-sex dummy predictors and were estimated using stepwise linear regression with iterative variable selection and LASSO estimation methods that penalize model complexity.

Setting: IBM® MarketScan® Commercial Claims and Encounters Database for 2016-2018.

Participants: 65,901,460 privately-insured person-years, of full- or partial-year enrollees ages 0-64 years were randomly split into 59,297,201 (90%) in the development sample and 6,604,259 in the validation sample. All persons were in plans with medical, drug, and mental health/substance coverages.

Measures: Model performance was assessed in the validation sample using the R-squared, predictive ratios of actual over predicted outcomes by prediction percentiles, Cummings measure, mean absolute deviations, and the "sum of negative residuals," (SNR) a proxy for profitability under perfect selection. We examined three kinds of information for prediction: 30 sex and age group dummies alone; the CCSR (adding 540 clinical categories); and our new DXI system, with our preferred model including all three sets.

Results: The DXI classification system contains 3,472 DXIs with 2,431 DXI_1 main effects and 1,041 DXI_2 modifiers. Stepwise regression using $p < 0.001$ thresholds for inclusion selected 68% of the DXI to predict the concurrent annual cost. Its validation sample R^2 is 0.57 compared to 0.52 for the base model. Most (80+%) of the gains came from DXI_1 main effect variables rather than the DXI_2 modifiers. Predictive ratios find the DXI model doing better in the upper and lower tails, and SNR implies a modest reduction in perfect selection profitability relative to the CCSR base model. Other concurrent and prospective models predicting visits, hospitalizations, use of lab tests, and spending subsets also show significant improvement.

Conclusions and Relevance: This new DXI clinical classification systems can improve predictions over existing diagnosis-based systems and reduce potential profits from biased selection enabled by existing risk adjustment formulas and performance benchmarks.

Boston Universal Diagnostic Cost Groups (BU-DCGs): A Machine Learning Algorithm for Creating Gaming-Resistant Risk-Adjusted Payment Formulas

PRESENTER: **Corinne Andriola**, Boston University

AUTHORS: Randall Ellis, Jeffrey J Siracuse, Mr. Alex Hoagland, Heather E Hsu, Allan Walkey, Karen Lasser, Tzu-Chun Kuo, Arlene S Ash

Our new machine learning (ML) algorithm parsimoniously estimates clinically-directed models paralleling those in existing Marketplace and Medicare risk-adjustment formulas. These models improve upon standard ML models that lack transparency and clinical coherence, underpay low-frequency conditions, and cannot readily accommodate large claims datasets. Clinicians organized the Ellis et al. (2021) Diagnostic Items (DXIs) into 225 hierarchical clusters (HIER), assigning each DXI an Appropriateness-To-Include (ATI) score to examine model sensitivity to different thresholds of diagnostic vagueness and gameability. We automated the Ash et al., (1989) Diagnostic Cost Group (DCG) algorithm by sequentially assigning DXIs within each HIER to DCGs sorted from highest to lowest incremental cost based on regression coefficients. As with the HHS-HCC model for the ACA, presence of a higher-ranked items remove lower-ranked ones before forming the next DCG. We assess model performance using validation sample R^2s, mean absolute errors, and graphical methods. The base DCG model for predicting top-coded total health care spending has better incentives for payment; despite using only 27% of the base DXI model parameters, it loses little predictive accuracy ($R^2 = 0.568$ versus 0.589). All DCG models predicted better than the ACA model.

Incorporating Acuity, Laterality, Timing, and Other Diagnostic Modifiers into Sophisticated Risk Adjustment Formulas

PRESENTER: **Mr. Alex Hoagland**, Boston University Department of Economics

AUTHORS: Randall Ellis, Karen Lasser, Heather E Hsu, Corinne Andriola, Tzu-Chun Kuo, Jeffrey J Siracuse, Allan Walkey, Arlene S Ash

Current risk models to predict health care utilization and costs rely heavily on main-effects linear prediction, rarely incorporating interactions and nonlinear effects. We explore interactions and nonlinear effects using the rich diagnostic detail in ICD-10-CM codes—specifically diagnostic modifiers that capture information such as disease acuity, timing, and location—to improve predictive power and fairness. Further, we show how this information can be incorporated parsimoniously, so that it does not overly expand the parameter space or introduce gaming incentives. The simplified models with modifiers can be estimated without sacrificing predictive power or mispricing diagnoses. Our findings underscore that utilizing a greater level of modeling complexity complements the greater level of diagnostic detail and may substantively improve risk adjustment algorithms.

5:15 PM –6:15 PM MONDAY [Demand And Utilization Of Health Services]

ORGANIZED SESSION: Using Behavioral Economics to Increase Purchases of Private Insurance

SESSION CHAIR: **Daniel W Sacks**, Indiana University

ORGANIZER: **Rebecca Myerson**, University of Wisconsin-Madison

DISCUSSANT: **Adrianna McIntyre**, Harvard University; **Coleman Drake**, University of Pittsburgh; **Paul Jacobs**, US Agency for Healthcare Research and Quality

The Impact of Personalized Telephone Outreach on Health Insurance Choices: Evidence from a Randomized Controlled Trial

PRESENTER: **Rebecca Myerson**, University of Wisconsin-Madison

AUTHORS: Nicholas Tilipman, Andrew Fehrer, Honglin Li, Wesley Yin, Isaac Menashe

One potential barrier to enrollment in health insurance coverage is the difficulty of selecting a health insurance plan from the available options, many of which are highly complex. We tested the impact of personalized phone calls from service center representatives on take-up of private health insurance in the Covered California marketplace using a randomized controlled trial. The study population comprised 79,522 consumers who had applied for coverage in the Covered California marketplace but had not selected a plan. The rate of enrollment in Covered California insurance was 2.7 percentage points higher among consumers who received a call than among the control group, a 23 percent increase. Consumers who were Spanish speaking or whose application was initiated from the Medicaid system were less likely to enroll without the intervention and showed large relative increases in enrollment. Our findings highlight the value of personalized assistance, particularly for previously hard-to-reach consumers. Furthermore, despite the higher cost of the intervention compared to low-touch approaches, the intervention yields a positive return on investment for the Covered California marketplace.

Nudging Take-up of Subsidized Insurance: Evidence from Massachusetts

PRESENTER: **Timothy Layton**

AUTHORS: Keith M Marzilli Ericson, Adrianna McIntyre, Dr. Adam Sacarny

Incomplete take-up of free and low-cost health insurance remains a puzzle. Failure to enroll in coverage has consequences for the uninsured as well as the health care providers and state budgets that bear the costs of uncompensated care. Moreover, if the marginal enrollee is healthier on average, increasing enrollment may improve competition and reduce premiums in the market by improving the risk pool. Research from other contexts suggests that behavioral frictions or mistakes may play an important role in determining whether households complete the enrollment process.

We conducted a randomized trial to test "nudges" (letters sent by postal mail) that could increase enrollment in the Massachusetts Health Connector, the state marketplace through which eligible residents can obtain subsidized private coverage. Our study design employs three treatment arms: a generic reminder letter, a personalized reminder letter, and a personalized reminder letter with a simplified (check-the-box) enrollment option. Over the course of the study, 58,311 individuals were randomized to one of the four arms.

Nudges were targeted to households that were determined eligible for financial assistance but—for unknown reasons—failed to enroll in an insurance plan. The study population includes adults with incomes below 300% of the federal poverty line who were known to the state insurance exchange (the Massachusetts Health Connector) to be eligible for "ConnectorCare" coverage. Eligibility was known because individuals had either been deemed out of Medicaid or had initiated, but not completed, enrollment in coverage through the Connector.

Preliminary results indicate that the simplified enrollment arm resulted in a statistically significant 10.8% increase in take-up of coverage via the Connector relative to the control arm. Subgroup analyses suggest that the effect was even stronger among enrollees below 150% of the federal poverty line who were eligible for zero-premium plans; among this population, the check-the-box intervention boosted enrollment by 23%.

Our results suggest that in the absence of a "check-the-box" enrollment option, barriers to enrollment are significant, particularly among potential enrollees with lower incomes. Absent a check-the-box option, reminders about eligibility for subsidized insurance coverage can still marginally boost enrollment. This result has important implications for take-up of subsidized private insurance in general and for states like Maryland and Massachusetts that are considering simplifying the enrollment process in particular.

Can Automatic Retention Improve Health Insurance Market Outcomes?

PRESENTER: **Myles Wagner**, Harvard University

AUTHORS: Dr. Mark Shepard, Adrianna McIntyre

Consumer inertia is a major factor in health insurance markets, with well-documented consequences for insurer competition and market outcomes. We highlight a new implication of inertia in settings where maintaining continuity of coverage is a challenge. Using data from Massachusetts' insurance exchange, we find that plan price fluctuations lead to significant spikes in individuals dropping coverage, despite the presence of subsidies. Some people in (formerly) free or cheap plans whose prices increase drop out rather than switch to newly cheaper plans. An "automatic retention" policy that default-switches individuals who lapse paying premiums into a free plan (if available) boosts continuity of coverage and overall enrollment by 10-25%. We find that the policy also increases the effective price elasticity of demand, increasing insurer incentives to compete on prices.

5:15 PM –6:15 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Economics of Tuberculosis in Low- and Middle-Income Country Settings

SESSION CHAIR: **Nicolas A Menzies**,

ORGANIZER: **Allison Portnoy**, Harvard T.H. Chan School of Public Health

DISCUSSANT: **Sedona Sweeney**, London School of Hygiene & Tropical Medicine

The Cost-Effectiveness of Routine Vaccination with the M72/AS01E Tuberculosis Vaccine in South Africa and India

PRESENTER: **Matthew Quaife**, London School of Hygiene & Tropical Medicine

AUTHORS: Rebecca Harris, Chathika Weerasuriya, Gabriela B Gomez, Fiammetta Bozzani, Tom Sumner, Richard G White

Over the last decade tuberculosis (TB) has killed more people globally than any other infectious disease. After nearly a decade of development, a novel vaccine candidate - M72/AS01E - has shown efficacy in phase 2b trials in preventing adult pulmonary TB disease. Although these results were encouraging, we do not know if these will improve population health effectively and efficiently. In this study we estimate the impact and cost-effectiveness of three scenarios of routine adolescent M72/AS01E vaccination in two high tuberculosis burden settings: South Africa and India.

We developed and calibrated age-structured compartmental dynamic TB transmission models to assess the population-level impact and cost effectiveness of a new M72/AS01E-like vaccine, delivered during 2025-2050 to adolescents in South Africa & India. We estimated the impact of a M72/AS01E-like vaccine on mortality and morbidity alongside health system costs of routine vaccination and costs averted from preventing TB disease, assessing cost-effectiveness using country-specific cost-effectiveness thresholds. We assumed vaccine cost per dose was $5 ($1-$9). We assume vaccine efficacy is 50% for a 15 year duration of protection. We model six vaccine introduction scenarios in each country, varying a) whether the vaccine offers efficacy pre-infection or pre- and post-infection, b) the age group vaccinated (10/15/18 year-olds), and c) vaccination coverage (50%/80%). We used lower-bound cost-effectiveness thresholds from Ochalek et al. (2018) to assess cost-effectiveness: $2480/DALY averted in South Africa, and $264/DALY averted.

We estimate the vaccine to be highly cost-effective in South Africa: the least cost-effective scenario explored (50% efficacy, 80% coverage of 15 year-olds) would need to cost seven-times more than the modelled median estimate (USD$337 (UR: $196-657) per DALY averted to not be cost-effective. For India, the picture is mixed. A vaccine with 80% coverage for 10 year-olds with efficacy pre- and post-infection is likely to be cost-effective, and would need to cost twice as much to be cost-ineffective. However, in India, it is unlikely that a vaccine with efficacy post-infection only would be cost-effective. In both settings, vaccinating 50% of 18 year-olds was more efficient (achieved a lower cost/DALY averted) than vaccinating 80% of 15 year-olds.

This is the first cost-effectiveness analysis to use M72/AS01E efficacy data to parameterise a cost-effectiveness analysis of routine vaccination. These findings strengthen the case for continued investment in M72/AS01E vaccine development. It is critical that future development work engages both high-TB burden countries where vaccines would be introduced, alongside potential adolescent or young adult vaccine recipients, to ensure that vaccine characteristics and delivery mechanisms meet their preferences and needs.

Health and Economic Implications of an Isoniazid Preventive Treatment (IPT) Expansion Program Among People Living with HIV (PLHIV) in Tanzania

PRESENTER: **Jinyi Zhu**, Harvard University

AUTHORS: Goodluck Lyatuu, Christopher R Sudfeld, Nicolas A Menzies

Background:

Tuberculosis (TB) is the leading cause of mortality among people living with HIV (PLHIV). Isoniazid preventive therapy (IPT) is an effective intervention to prevent progression from latent TB infection to TB disease and has been recommended by the WHO among all PLHIV without contraindications. According to the WHO and UNAIDS Global Reports, Tanzania is one of the 30 high TB burden and 22 high HIV-burden countries, and therefore expanding effective coverage of IPT is critical in reducing the burden of active TB incidence and TB deaths among PLHIV. Understanding the associated health and economic implications can inform the decision-making of such expansion programs.

We aimed to evaluate the economic and health consequences of an IPT expansion program among adult PLHIV in the Management and Development for Health (MDH) program in Dar es Salaam, Tanzania, in which the IPT coverage among PLHIV initiating ART increased from ~10% in 2014 to ~70% in 2018.

Methods:

We constructed a TB/HIV coinfection microsimulation model that was parameterized using TB and HIV natural history and treatment from a prospective cohort study of PLHIV in the MDH program. We used the model to simulate long-term outcomes for the cohort of 147,870 PLHIV initiating ART in MDH-supported clinics from January 2014 to September 2018. To estimate the health and economic impacts of the IPT expansion program, we used the model to compare two scenarios: 1) no expansion of IPT coverage from 2014 levels, and 2) status quo, with progressive expansion of IPT coverage from 2014 to 2018. In each scenario, we simulated individuals' TB infection, progression, and recovery, as well as the TB preventive therapy, TB treatment, and HIV treatment they might receive. We used a lifetime horizon for this analysis.

Results:

Compared to the counterfactual scenario where IPT coverage had not been expanded, IPT expansion averted 10% (95% CI: 9.0 ~ 11.3%) of TB disease cases and 7.5% (6.0 ~ 9.2%) of all TB deaths in the study cohort, resulting in an average of 0.046 (0.038 ~ 0.058) life years gained, and 0.023 (0.015 ~ 0.032) disability-adjusted life years averted per person. Economic costs included the cost of IPT provision and the additional ART cost resulting from improved survival. These costs were almost entirely offset by the cost savings from TB cases averted, and the mean difference in total lifetime medical cost between the expansion vs. no expansion scenarios was $0.025 ($-0.946 ~ 1.153, 2020 USD) per person.

Conclusion:

Using an IPT expansion program among PLHIV in Dar es Salem, Tanzania as a case example, we estimated that the expansion of IPT coverage among PLHIV resulted in significant reductions in TB incidence and death with minimal cost consequences overall. Our study results highlight the benefit of expanding coverage of IPT among PLHIV in limited-resource settings.

Social Determinants of the Decline in Tuberculosis Prevalence in Viet Nam

PRESENTER: **Nicola Foster**, LSHTM (London School of Hygiene and Tropical Medicine)
AUTHORS: Hai V Nguyen, Edine W Tiemersma, Frank GJ Coebelens, Matthew Quaife, Rein MGJ Houben

Background:

While the ecological relationship between poverty, inequality and Tuberculosis (TB) is well established, there is less evidence of change or distribution of TB burden following economic growth. Between 2007 and 2017, Viet Nam experienced rapid economic development (GDP per capita from 906 in 2007 to 2192) with an equitable distribution of resources (Gini coefficient stable at 36) and a 37% reduction in TB prevalence. We apply econometric and statistical methods to study the associations between change in TB prevalence, individual-level risk factors, household socio-economic status (SES) and provincial poverty.

Methods:

We combined data from the 2007 and 2017 Viet Nam TB prevalence surveys to provincial-level measures of poverty. Households were selected through multi-stage sampling and participants were screened using a symptom questionnaire, digital chest radiography plus sputum smear microscopy and culture. We constructed comparable asset indices using principal component analysis of asset ownership data collected in the prevalence surveys. Illness concentration indices were estimated to measure cross-sectional SES inequality in TB. We used multi-level random effects statistical models, adjusted for clustering to investigate the relationships between household SES and community-level poverty.

Results:

Data from 94156 (2007) and 61763 (2017) individuals screened were included. The mean age was 40.1 (SD = 17.4) years in 2007 and 46.6 (SD = 17.0) years in 2017. We estimated a TB concentration index of -0.10 (SE=0.035, p-value=0.003) in 2007 and 0.07 (SE=0.046, p-value=0.158) in 2017, suggesting that in 2007 TB was concentrated among the poor while in 2017 there was an equalisation of the disease between SES strata). Individual risk factors including age (aOR 1.0 [1.0; 1.0]), male gender (aOR 4.4 [3.4; 5.6]) and symptoms (aOR 0.29 [0.18; 0.46]) were associated with TB. We find some evidence that change in the distribution of TB by household SES is associated with change in TB prevalence (aOR 0.72 [0.50; 1.04]; p-value=0.08).

Conclusions:

We found that equitable economic growth occurred while TB burden reduced and became more equal among the poor and the wealthy.

Application of a Full Public Health Value Assessment Framework to Novel Tuberculosis Vaccines

PRESENTER: **Dr. Allison Portnoy**, Harvard T.H. Chan School of Public Health
AUTHORS: Rebecca Clark, Arminder Deol, Chathika Weerasuriya, Christinah Mukandavire, Roel Bakker, Matthew Quaife, Mark Jit, Richard G White, Nicolas A Menzies

Background:

Over the past decade, tuberculosis (TB) has caused more disease deaths globally than any other single infection. Developing new safe, affordable, and effective TB vaccines that can more rapidly reduce disease incidence and mortality is essential in the End TB Strategy approved by the World Health Assembly. However, the pathway to new vaccine availability and use is expensive and long. While promising candidates exist—particularly the new M72 vaccine—weak market incentives to invest in a disease that disproportionately affects poor people in low- and middle-income countries (LMICs) have created additional challenges to new vaccine development. Articulating the broader health and economic impacts of new TB vaccines, particularly to governments and multinational partners, is thus key to make the case for their expedited development, adoption, and implementation.

Methods:

We undertook a full public health value assessment of TB vaccine introduction. This framework was developed by the World Health Organization (WHO) to provide a more comprehensive assessment of the outcomes of a major policy change or introduction of a new intervention. The framework assesses both epidemiological and socio-economic outcomes, as well as distributional health gains stratified by income distribution, and changes in household financial vulnerability to catastrophic costs. To undertake this assessment, we developed and applied a system of closely linked epidemiological and economic models, calibrated to demographic, epidemiological, and health service data from multiple LMICs. We used this modeling framework to assess the likely future course of TB epidemiology and related outcomes in the absence of a new TB vaccine. We compared this 'base-case' scenario to multiple alternative scenarios representing the introduction of novel vaccines with a wide range of characteristics, and used these results to describe the incremental effects of new vaccine introduction for a broad range of health and economic outcomes.

Results:

In order to assess the full public health value of novel TB vaccines, TB natural history and vaccination scenarios were specified according to the following dimensions: age, socioeconomic status (SES), and HIV status. The TB prevalence rate ratio for high compared to low SES strata was 0.674 (IQR range: 0.575 to 0.801). The range of characteristics for novel TB vaccines included differentiation by vaccine efficacy (50%, 80%), host immune status (post-infection only, pre- and post-infection), implementation (routine vaccination of adolescents, mass vaccination of adults, neonatal BCG replacement or booster), and duration of protection (lifelong, 10 years, boosters every 10 years). The results suggest that effective TB vaccines could have a large impact on disease burden, help narrow health disparities, and be cost-effective if priced competitively.

Conclusions:

Our study provides a full public health value assessment that can help support a range of perspectives and decisions for future development, adoption, and implementation of novel TB vaccines. The results of these analyses will be used by the WHO, Gavi, the Vaccine Alliance, and other global and country stakeholders to inform decision-making around TB vaccine development and introduction.

5:15 PM–6:15 PM MONDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Incentives, Subsidises and Reminders

MODERATOR: **Mylene Lagarde**, LSE

Conditional Economic Incentives to Increase Adherence to Pre-Exposure Prophylaxis Among Male Sex Workers: A Randomized Pilot in Mexico

PRESENTER: **Omar Galarraga**, Brown University

AUTHORS: Sandra Sosa Rubi, Carlos Chivardi, Nathalie Gras-Allain, Galileo Vargas-Guadarrama, Monica Gandhi, Kenneth H. Mayer, Don Operario

We implemented a randomized pilot to measure the extent to which conditional economic incentives (CEI) can help male sex workers (MSWs) increase their adherence to no-cost pre-exposure prophylaxis (PrEP) for HIV prevention. Among MSWs who accepted to take free PrEP, and returned at month 1 for a second pill bottle, we randomized n=100 MSWs to either: *standard of care* (SoC: information, prescription, free PrEP) or *conditional economic incentives* (SoC + incentives contingent on sufficiently-high adherence to PrEP measured objectively).

We assessed the primary outcome (biomarker of PrEP adherence using scalp hair analysis) at project baseline and months 3 and 6, as well as secondary outcomes: clinic attendance/retention, medication possession ratio, self-reported PrEP use, and sexual behavioral disinhibition (number of partners, condom use, incident sexually transmitted infections). Everyone received transportation costs (~$10 USD/each time at baseline, month 3 and month 6). Conditional incentives were based on a grade system based on adherence (high, medium or low based on hair levels indicating 7, 4 and ≤2 doses a week, receiving $30, $20 or no additional incentive, respectively). All incentives were given out in the form of supermarket vouchers.

The inclusion criteria were: male, age>18, self-identified as sex worker who has been paid to have sex with other men within the last 6 months; recruited in Mexico City from various sites including *Alameda Central, Zona Rosa*, or at *Clínica Condesa* (largest HIV Clinic in Mexico City; >16k patients). All eligible men first took part in the standard antiretroviral HIV prevention counseling and PrEP provision through the ImPrEP Project [multi-country PrEP Implementation Project], before random assignment to a research arm. All received HIV/STI testing; those infected were offered treatment.

Baseline results were as follows: Mean age was 29, over half were in a relationship, 42% completed high school and a 44% attended tertiary high school. On average they had 4.4 sexual partners per week. Mean condom utilization with last client was 73%. Most MSWs found clients via Internet ads, chat rooms or mobile applications (89%), and a minority (11%) were street-based. The median price for transactions in an average week was 1000 pesos (~$50 USD) [IQR: 800 to 1500 pesos]. There was evidence of a risk premium: preliminary analyses suggest a 38.8% higher transaction price for condomless sex. Hair samples showed 7% high adherence to PrEP, 76% medium, and 17% low (7, 4 and ≤2 doses respectively). The annual cost per patient was $847 USD: $17 in medical consultations, $200 in medicines, $554 in laboratory tests and $76 in economic incentives. Preliminary results suggest a dose response relationship between incentives and scheduled visits for testing and project participation, with higher incentives associated with higher retention rates. Data collection on the effects of incentives on PrEP adherence, STI incidence, condom use, number of partners, and commercial sex transaction prices will be completed by May 2021 and will be presented at the proposed session.

The Role of Appointment Reminders in the Management of Chronic Disease

PRESENTER: **Claire Boone**, UC Berkeley

AUTHORS: Pablo Celhay, Paul Gertler, Tadeja Gracner

Background: Attending clinic appointments as scheduled is a key component of any attempt to improve control of chronic disease through regular access to screenings, prescriptions, and information from healthcare providers. Yet, appointment adherence remains low. Most common reasons for missing appointments include forgetting or confusing the date, time or location of the appointment; making Short Message Service (SMS) appointment reminders a promising tool to improve chronic care. Controlled or small pilot studies have previously shown efficacy of reminders short-term, but evidence on how their usage at-scale would affect control of chronic disease over time is missing. Here, we evaluate short and long-term effects of SMS appointment reminders sent at-scale on self-management and control of chronic disease.

Methods: We evaluate a nationwide program adopted across primary care clinics in Chile that through the electronic health record system automatically sends SMS appointment reminders (on time, date and location) to patients diagnosed with diabetes (T2DM), hypertension, and/or dyslipidemia. This program began in 2015, but was phased in across clinics over several years (280 out of 435 by December 2018); allowing us to use a difference-in-differences approach. We first study the impact of SMS reminders on patients' retention in care. Addressing non-random selection, we then apply Heckman models to estimate the effects on control of disease and related complications. Lastly, we conduct heterogeneity analyses by patients' baseline risk for cardiovascular events (high, medium, low).

Data: We use a unique panel dataset containing electronic health records from over 800,000 patients with chronic disease, 67% of whom attended clinics that implemented the SMS program by 2018. These data is linked at the patient level to medication withdrawals and hospitalizations, all observed from 2013-2018. We also match clinics by municipality to Chile's 2015 National Socioeconomic Survey to obtain a rich set of municipality-level controls.

Results: SMS reminders improved use of primary care, especially for patients at the highest risk for cardiovascular events at baseline who were 22% more likely to return to care after their diagnostic visit and attended 31% more visits over 2 years. Patients who were sent SMS reminders were also 32% more likely to achieve controlled systolic blood pressure, were 39% less likely to be hospitalized, and 35% less likely to be hospitalized for cardiovascular-related causes. Effects were consistently the largest for patients with the worst metabolic health.

Conclusion: Our findings suggest that when implemented at scale SMS reminders show promise in improving chronic care and health; particularly for those who may need it the most (e.g., patients with poor metabolic health). We also provide evidence demonstrating that reducing patient drop-out with a simple and low-cost nudge can have meaningful positive effects on health outcomes: disease control, health, and hospitalizations. This is likely to be particularly true in a setting where attendance at primary care determines availability of any subsequent care such as prescriptions, tests, and specialist visits.

Price Anchoring or Positive Learning? Examining the Effects of Short-Term Subsidies for Potable Water Delivery Using a Field Experiment in Rural India

PRESENTER: **Drew Cameron**, Yale School of Public Health

Short-term subsidies are a common tool used in low- and middle-income countries to increase the immediate adoption of essential health products. However, evidence of the impact of initial discounts on future demand is both limited and mixed. Reduced prices could be counterproductive, inducing *anchoring effects* in which recipients reference an initial low price, undervaluing products on future offer. Alternatively, subsidies might allow for *positive learning* to dominate, leading to higher future valuation, purchase and use.

This study examines the potential mechanisms through which subsidy provision operates in influencing these future purchase decisions for a novel health product – potable water delivery to 20-liter jugs – recently introduced in the Supaul region of rural Bihar by a local NGO and growing in popularity in the region. In this randomized controlled trial, we enrolled 526 families in a price subsidy experiment receiving either: a) a 50% subsidy on the regular price of water for four weeks or, b) no subsidies, paying the full cost of the regular water delivery for one month. Households in both arms were then followed weekly for an additional month to track water consumption, offer ongoing purchase and answer any questions or concerns.

I find that four weeks after subsidies expire, the proportion of customers among the treatment group was 13.1-percentage points higher than in the control group. Treatment households also continued to purchase 139% more water than control households. My findings show that short-term price subsidies (combined with social marketing and repeat household visits) can be a powerful tool in encouraging households to take up potable water delivery. These results are especially relevant to motivating health behavior change around the sale of non-durable, staple goods requiring ongoing purchase in order to realize health benefits. This study was preregistered (AEARCTR-0004323).

How and When: Cash and Care Effect of Conditional Cash Transfers on Birth Outcomes

PRESENTER: **Cecilia Machado**, FGV EPGE

AUTHORS: Fernando Mattar, Marina Palma

While conditional cash transfers are a powerful tool to alleviate poverty and improve many short run socioeconomic outcomes of targeted families, very little is know about how and when these programs improve in utero conditions of babies. Moreover, there is scarce evidence on weather additional transfers to already eligible families can improve outcomes at birth. This paper fills these two gaps by exploring quasi-random income variation on one of the world's largest CCT programs -- the Bolsa Família in Brazil -- taking advantage of sharp eligibility criteria that are due to birth dates of family members.

Our empirical strategy takes advantage of quasi-experimental variation of Bolsa Família eligible transfers – based on rules that depend on family composition and family member dates of birth – to recover the causal effects of the CCT program. We document that dates of birth of family members are as good as random in determining the transfer amount and are not subject to choice or manipulation. The feasibility of this design takes advantage of program eligibility rules, as well as data availability at a very granular level, including family member dates of birth and longitudinal information on monthly transfers received, as well as a very large sample size, that affords us statistical power to identify even very small effects.

For such, we construct an analysis dataset based on the linkages of several administrative datasets made available to the PI under confidentiality agreement. We link the following five sources of data: registry data on families and individuals targeted for welfare government programs in Brazil (Cadastro Único); monthly payroll data on Bolsa Família with all transfers received; information on the conditionality compliance of beneficiaries (eg., prenatal care visits); natality files with birth outcomes; and mortality files for infant mortality up to age one. We construct the first longitudinal dataset of children born into Bolsa Família, with monthly information on all transfers received by its family, their birth outcomes, as well as time-varying family composition and characteristics.

Overall, the results point to a null effect of additional income on birth outcomes, even when transfer amounts are sizeable. We also find no behavioral responses on conditionality compliance and prenatal care of pregnant mothers. However, additional cash transfers to women meeting adequate prenatal care reduces preterm birth by 6-8 percent, with effects concentrated in transfers that occur in the first trimester of pregnancy. Our findings speak to the role complementarity between prenatal care and family income in producing health at birth: even small amounts of cash transfers can be effective in improving birth outcomes when coupled with adequate prenatal care.

5:15 PM –6:15 PM MONDAY [Supply Of Health Services]

ORGANIZED SESSION: Effort, Financial Incentives, and the Quality of Care in Maternal and Child Health Care: Evidence from Three Lab-in-the-Field Experiments in Sub-Saharan Africa

SESSION CHAIR: **Jed Friedman**, World Bank

ORGANIZER: **Eeshani Kandpal**, The World Bank

DISCUSSANT: **Igna Bonfrer**, Erasmus School of Health Policy & Management

How to Encourage Service Delivery to the Poor: Intrinsic Motivation, Extrinsic Incentives, and Effort

PRESENTER: **Damien de Walque**, The World Bank

Do pecuniary incentives compensate for lack of motivation when workers can choose between multiple tasks with different levels of intrinsic motivation? We examine this question focusing, for the first time, on intrinsic motivation to serve the poor. A lab-in-the-field experiment with 400 health care workers and a novel "virtual clinic" task indicates that pecuniary incentives trigger dramatically different behavioral changes in the presence of this choice. The experimental design recognizes that the poor are often harder to treat and service providers can choose to serve the poor or non-poor. In this context, in contrast to past research, pecuniary incentives have little effect on unmotivated workers but strongly affect the behavior of intrinsically motivated workers. These findings have significant policy implications. For example, in health, where disparities in access of the poor and non-poor are notorious and the difficulties of treating poor patients are well-known, the findings suggest that fixed salaries could be more effective than public policies aimed at providing pecuniary rewards for treating poor patients, by better accounting for the counter-intuitive effects of pecuniary rewards on the behavior of more motivated health care workers.

Incentives, Image Motivation Social Pressure: Evidence from a Large-Scale Experiment with Nigerian Midwives

PRESENTER: **Pedro Rosa Dias**, Imperial College London

We test the relevance of image motivation in a labour market context by setting a large-scale experiment where Nigerian midwives are deployed to work in needy areas. High-powered retention incentives are given to a random subsample of these midwives to encourage them to remain working in these needy communities. This experiment is combined with lab-in-the field games aimed at measuring midwives' image motivation. Our results show that monetary incentives have a strong effect on midwives' perception of the minimum socially acceptable length of service, and hence on the social pressure they feel exposed to. This, in turn, affects their actual length of service. Furthermore, incentives improve retention rates and simultaneously influence the expected motivational composition of the group of midwives who stay (and leave); this alters the motivational signalling associated with the decision to leave the program. We show that it is possible for incentives to cause the midwives who are most intensely motivated by image to decide to leave earlier (crowding-out effect). This indicates that social pressure can, in principle, be influenced by policy makers to promote prosocial behaviour.

The Role of Incentives Versus Signals in Pay-for-Performance: Evidence from an Experiment with Maternity Care Workers in Nigeria

PRESENTER: **Eeshani Kandpal**, The World Bank

Performance-based contracts consist of two components: a signal of what outputs are valued by the principal and incentives for agents to produce those outputs. We separately examine both components through a controlled and incentivized experiment in which we assess health workers' adherence to clinical protocols when they are either offered financial rewards for their actions or are primed with information alone. Specifically, we randomized 1,363 maternity care workers within primary health clinics participating in a performance-based financing pilot in Nigeria to receive either (a) a list with seven common clinical actions during labor and delivery care; (b) the same list with varying rewards for five of these actions; or (c) the same list with varying penalties for the same five actions. As experimental task, workers reviewed records of fictitious patients receiving care for labor and delivery and report what actions they deem appropriate, including actions that are not listed. Overall, we find that workers stated the correct actions about half of the time in the information arm. Relative to the information arm, protocol adherence in the two financial incentives arms. We also find that adherence is higher for incentivized actions relative to those that are neither incentivized nor listed. We do not find economically or statistically significant differences between the reward and penalty conditions.

5:15 PM –6:15 PM MONDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Health and Labour Investment

MODERATOR: **Laura Anselmi**, The University of Manchester

More to Live for: Health Investment Responses to Expected Retirement Wealth in Chile

PRESENTER: **Nieves Valdes**, Universidad Adolfo Ibañez

AUTHORS: Prof. Grant Miller, Marcos Vera-Hernandez

A poorly understood but important way that economic conditions influence health is through the incentives that they create for health investments. In this paper, we study how individuals' current health investments respond to changes in expected future wealth, focusing on Chile's 1981 public pension reform (shifting from a defined benefit to a defined contribution system). We compile detailed administrative pension data linked to a rich household panel survey, and we then exploit discrete breaks in the reform's impact on expected pension wealth across cohorts of Chileans using a fuzzy regression kink (RK) design to estimate how health behavior, use of screening tests and chronic disease diagnoses (whose long-term management is critical to longevity) respond to changes in expected pension wealth. Consistent with theoretical predictions, we find that greater expected pension wealth increases the use of medical services. More generally, our results provide new empirical evidence of forward-looking behavior consistent with the life-cycle (Modigliani and Brumberg 1954) and permanent income (Friedman 1957) hypotheses.

How Does Arthritis Affect Earnings over Time? Insights from UK Panel Data

PRESENTER: **Nasir Rajah**, University of Leeds

AUTHOR: Adam Martin

Background: With an ageing international population comes the need to better understand the effects of diseases which are more prominent amongst older people, such as arthritis. It is estimated that 1 in 3 adults in the United States have arthritis, rising to 1 in 2 among men aged over 65. Arthritis can affect people's lives in many ways, including through its effects on employment (e.g., early retirement, lack of career progression, inability to find appropriate work). Despite this growing need to understand age related diseases in the world of work, very few studies have investigated the effect of arthritis on labour market performance. Previous studies have been hampered by their data limitations, being either very small sample sizes or subjected to methodological biases. This has left a gap in our understanding of how arthritis affects labour market performance over time, including by exacerbating existing inequalities in the labour market.

Data: We harmonise data from the nationally representative UK Household Longitudinal Study (UKHLS or 'Understanding Society') and English Longitudinal Study of Aging (ELSA) collected between 2002 and 2020. Our sample includes 20,684 who reported ever having arthritis and >100,000 who report never having arthritis. Participants with arthritis remain in the panel datasets for 4.5 waves on average (equivalent to approximately 6 years). These datasets are unique because new arthritis diagnoses are recorded in every wave, alongside detailed information about labour market outcomes.

Method: We use propensity score matching on a 1:2 ratio to identify a matched control group of participants without arthritis who have baseline covariates that are comparable to individuals who have arthritis. We then employ a two-part, multilevel mixed effects model, in which the first part uses a logit model to examine the effect of arthritis on labour market participation and the second part analyses the effects of arthritis on log-transformed annual earnings (linear mixed effects). We then analyse how this relationship varies by subgroups (i.e., by gender and employment type). Covariates include: higher education qualification; comorbidities; age; educational attainment in school, gender; ethnicity; geographic location; hours worked.

Results: The results suggest that individuals who have arthritis have on average a 6% reduced probability of being in the labour market compared to those without arthritis. In the second part of our model , the results indicate that those with arthritis who are in the labour market experience a 6% reduction in earnings, on average, compared to people without arthritis. Sensitivity analyses included imputing missing data and using alternative measures of educational attainment. These did not lead to meaningful changes in our results.

Conclusion: Ours is the first study to attribute loss in earnings and reduction in employment to arthritis over a prolonged period of time, laying bare the burden of arthritis on individuals as well as the economy. Arthritis is a major policy concern and results from our study provide fresh impetus for improving understanding of the impact of arthritis and its role in exacerbating labour market inequalities.

Cumulative and Dynamic Effects of Labor Market Conditions on Diseases of Despair

PRESENTER: **Mr. Christopher Lowenstein**, University of California-Berkeley

Midlife mortality due to suicide, drug overdose, and alcohol-related diseases has risen dramatically over the past several decades and contributed to the recent decline in life expectancy in the United States. While the socioeconomic gradient in these causes of death have been extensively documented in recent research, causal evidence linking underlying economic distress to increases in these "diseases of despair" remains mixed. In this study I attempt to estimate causal effects of economic conditions on mortality due to drugs, suicide, and alcohol (DSA) using a Bartik-style instrument for year-on-year county-level employment changes from 2003-2017. Drawing on a series of instrumented two-way fixed effect models, I estimate that a one percentage point increase in the county-level employment-to-population ratio decreases suicide rates by 1.2 to 1.6 percent – an effect that is driven by suicides that do not involve drugs. Subgroup analysis by gender suggest that this protective employment effect is uniquely experienced by men. Preliminary results from distributed lag models indicate that this effect largely materializes in the year following exposure to a short-term increase in county-level employment but does not persist in subsequent years. Contrasting much of the existing work on this topic, my causal models also find evidence that drug-related mortality increases as a function of the employment-to-population ratio, although this finding is more sensitive to alternative model specifications. Current findings suggest that the effects of employment conditions on DSA outcomes are non-trivial but small relative to underlying mortality trends during this time. Differential effects between suicide and drug poisonings in response to short-term employment shocks point to nuanced policy approaches to combat increases in drug, suicide, and alcohol mortality that are unique to the underlying determinants of each cause of death.

5:15 PM –6:15 PM MONDAY [Specific Populations]

MENTAL HEALTH ECONOMICS SIG SESSION: Mental Health Care Access and Delivery

MODERATOR: **Hareth Al-Janabi**, University of Birmingham

Online Care Expansion and Patient Access: Evidence from Talk Therapists

PRESENTER: **Daniel Goetz**, University of Toronto

Direct-to-consumer telemedicine (DCT) options may affect medical costs and patient access not just directly, but indirectly through their competitive effects on incumbent healthcare providers. Using data on private psychotherapy services from the largest mental health search directory in Canada, we evaluate how increasing the number of online competitors shown as search results in a market affects incumbents' exit, pricing, and propensity to offer online care. We find that the entry of DCT competitors increases exit from the directory and reduces incumbents' propensity to offer income-based discounts, but does not change posted prices or online care options. Further analysis suggests that DCT competitor entry induces greater market segmentation, as incumbents focus on high value patients.

Economic Evaluation of a Prison Based Complex Intervention (Engager) for Common Mental Health Problems: A Cost-Utility and Cost-Consequences Analysis

PRESENTER: **Rachael Maree Hunter**, University College London

AUTHORS: Rob Anderson, Tim Kirkpatrick, Charlotte Lennox, Fiona Warren, Richard Byng

Background

People in prison experience a range of physical and mental health inequalities. Evaluating the effectiveness and efficiency of prison based interventions to address inequalities presents a number of methodological challenges. We present a case study of an economic evaluation of a prison based intervention ("Engager") to address common mental health problems.

Method

280 people were recruited from prisons in England and randomised to Engager plus usual care or usual care. Participants were followed up for 12 months following release from prison. Participant responses to the CORE 6 Dimension (CORE-6D), EQ-5D 5 level (EQ-5D-5L) and ICECAP-A were used to calculate quality adjusted life years (QALYs) and years of full capability respectively. Participants also completed a modified version of the Client Service Receipt Inventory (CSRI) to provide information on resource use for health and social care, criminal justice services, education

and employment. The primary analysis is the mean incremental cost per quality adjusted life year (QALY) gained of Engager compared to usual care from a health services cost perspective with QALYs calculated using the CORE-6D. A cost-consequences analysis was conducted to assess the impact of Engager compared to usual care on a range of outcomes.

Results

From a health services cost perspective Engager cost an additional £2,133 per participant (95% Confidence Interval (CI) £997 to £3,374) with a mean QALY difference of -0.017 (95% CI -0.042 to 0.007); Engager was dominated by usual care. There was evidence of a reduction in emergency physical health service use (-0.701 95% CI -1.381 to -0.020) and improved access to substance misuse services (Odds ratio 2.244 95% CI 1.304 to 3.861) 12 months post release.

Conclusion

Engager provides a rare example of a cost-utility analysis conducted in prisons and the community using participant completed measures. Although the results from this trial show a low probability that Engager is cost-effective, the results of the cost-consequences analysis suggest that follow-up beyond 12 months post-release using routine data may provide additional insights into the effectiveness of the intervention and the importance of including a wide range of costs and outcomes in prison based economic evaluations.

Budget Impact Analysis and Needs Assessment of a Localised Counselling Service for People Living with Sight Loss across North West Wales, UK

PRESENTER: **Bethany Fern Anthony**, Centre for Health Economics and Medicines Evaluation (CHEME), Bangor University
AUTHORS: Ned Hartfiel, Steven Thomas, Caroline Draper, Carrie Pester, Rhiannon Tudor Edwards

Background: Almost two million people in the UK are living with sight loss, and this number is predicted to double by 2050. There is a well-established link between visual impairment and diminished emotional and psychological wellbeing. A 2016 UK study reported that 43% of 1,008 consecutive patients at 14 NHS low-vision rehabilitation centres screened positive for depressive symptoms on the Geriatric Depression Scale, 75% of these patients were not receiving any psychological support. This compares with 13% of men and 24% of women in the UK population who were diagnosed with depression in general practice. Across the UK, some clinics have Eye Clinic Liaison Officers (ECLOs) but such provision is patchy. Despite increasing recognition of the need to provide psychological support e.g. counselling services to people living with sight loss, it is not currently known how many people living with sight loss across the UK would consider using counselling services if they were made available to them and what the costs of providing these services would be.

Aim: In a pilot area of north west Wales, this study aimed to assess unmet need and potential uptake of counselling services and to undertake a budget impact analysis of service provision in future.

Methods: We are undertaking telephone surveys with 350 members from the North Wales Society for the Blind (NWSB) out of 1,600 registered members, stratified by age, gender, degree of sight loss and time since diagnosis. The survey includes the short version of the Warwick-Edinburgh Mental Wellbeing Scale, which is a standardised 5-point Likert scale that asks respondents to specify their level of agreement to 7 statements about their mental health and wellbeing within the last two weeks. We conducted an initial budget impact analysis based on published statistics relating to counselling services for depressive symptoms. According to statistics from the Mental Health Foundation, the uptake of offered treatment among people with depression is 53%. NICE recommends between 6 and 10 counselling sessions for people with depression with average costs per session ranging between £40 to £60, depending on counsellor experience and location of service.

Results: Taking into account a 43% prevalence of depressive symptoms among people living with sight loss and a 53% treatment uptake for depression, we conducted hypothetical scenario testing to explore the budgetary impact of the provision of counselling services to NWSB registered members. Of this population, there would be 688 registered NWSB members who may be experiencing depressive symptoms related to sight lost. If 53% of these people sought counselling services at a cost of £50 per session, estimated total costs would range from £109,500 to £178,000 for 6 sessions and 10 sessions for the sight lost population of north west Wales, respectively.

Conclusions: Savings from prevention and appropriate mental health treatment could help offset the cost of providing a psychological counselling service if an unmet need for counselling services for people with sight loss is confirmed by the results from our telephone survey and may provide generalisable findings to the UK.

Transit and Mental Health Treatment: A Study of the Effect of Changes in the Public Transit Landscape on Provider Outcomes and Costs

PRESENTER: **Dr. Shane Murphy**, University of Connecticut
AUTHORS: Jeffrey Cohen, Carla Rash

Illicit substance use and prescription misuse amounts to more than a $600 billion drain on our economy each year. Indirect costs, such as lost productivity and crime, were much higher, and increases in annual opioid deaths suggests that we have yet to change the tide on the opioid crisis. Increasing access and retention in treatment services is a critical step in addressing this health care crisis, and this project examines the impact of transit systems on mental health and substance use disorder treatment.

Limited transit access is a barrier to successful substance abuse treatment. Transportation may also drive inequities in treatment access and retention along socio-economic status and race/ethnicity groups, and by rural/urban location. Health services more closely aligned with transit may adequately, cost efficiently, and equitably serve this substance abuse treatment population, and enhance public health by alleviating the opioid crisis and achieving cost savings. In particular, strong transportation systems can impact substance abuse treatment provider operating costs and patient outcomes.

This study uses a quasi-experimental, empirical estimation approach enables us to address the question: **how do changes in the accessibility of mental health care due to changes in the transit system impact health outcomes and medical care costs?** This study combines provider-level financial data from the US Internal Revenue Service's Annual Extract of Tax-Exempt Organization Financial Data, patient-provider-level mental health outcomes data from the New York Department of Health, and community level transit data from the New York Department of Transit and the American Community Survey. We use changes in public transit availability from expansions and closures of bus and train lines as exogenous shocks and model public health spillovers of public transit for this important population.

5:15 PM –6:15 PM MONDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: The Health Economics of a Shadow Pandemic: COVID-19 and Gender-Based Violence in Latin America

SESSION CHAIR: **Rodrigo Moreno-Serra**, University of York

DISCUSSANT: **Paula Tavares**, World Bank Group

Evidence from Developing Countries on COVID-19 Lockdowns and Violence Against Women: A Literature Review

PRESENTER: **Maria Dolores Montoya Diaz**, University of Sao Paulo
AUTHORS: Fabiana Rocha, Paula Pereda, Noemi Kreif, Samuel Lordemus, Rodrigo Moreno-Serra

The aim of this survey paper is to summarize the evidence from rigorous research studies conducted for developing countries to understand the trends in domestic violence against women after the beginning of the COVID-19 pandemic, and after the implementation of public policies to

address the spread of the disease. This survey: (i) provides an overview of the types of datasets used to estimate the effect of lockdowns on intimate partner violence (IPV); and (ii) reviews the empirical strategies employed to identify causal effects of lockdowns on IPV.

For our preliminary analyses, 66 studies were surveyed on the theme of domestic violence, of which over 80% examined IPV data for adult individuals (our population focus). 41% of the studies reviewed were evidence surveys, while 44% corresponded to empirical studies that examined secondary data for adults. Only 9% of the studies reviewed refer to Latin American countries: two for Argentina, one for Peru and three for Mexico. In 4 (67%) of them, violence against women was found to have increased during the COVID-19 pandemic; in one there was no variation; and in a third, a reduction was identified. Of 30 studies carried out with data from other regions that analyzed the same issue, 60% found an increase in IPV. Among the econometric studies carried out with data from Latin American countries, 50% of these studies employed event-study analyses while 33% adopted difference-in-differences approaches. Among the econometric studies with data from other regions, 8% adopted an event study strategy, 23% difference-in-differences and 19% multiple regression, while the other 50% used alternative econometric methodologies or a combination of these.

Our survey concludes by summarizing what we have learned so far about the relationship between the pandemic's outset and IPV incidence in developing countries, contrasted also with summary findings from high-income countries. Finally, we highlight the main empirical challenges faced so far by studies on this topic and identify promising strategies to address such challenges, as employed in existing and ongoing work.

COVID-19 Lockdowns and Violence Against Women in Brazil

PRESENTER: **Paula Pereda**, University of Sao Paulo
AUTHORS: Maria Dolores Montoya Diaz, Fabiana Rocha, Noemi Kreif, Samuel Lordemus, Rodrigo Moreno-Serra, Isadora Bousquat Arabe, Pedro Augusto Costa Oliveira, Filipe Cavalcanti

This paper investigates the impact of social isolation measures, and its relationship with an emergency financial aid national program implemented during the current COVID-19 pandemic, on the number of femicides in the State of São Paulo, Brazil. Although a growing literature is being produced on the impacts of COVID-19 on domestic violence, very few studies have a specific focus on femicides (defined as the intentional killing of women because of their gender). We analyze rich data for 2018, 2019 and 2020 from the State's police digital record of occurrences, a repository that contains all recorded police station reports of homicides and femicides for the State of São Paulo. We assess lockdown effects on femicides by month, accounting for the distribution of emergency aid aimed at minimizing the household economic effects of the COVID-19 pandemic. We use alternative generalizations of the difference-in-differences approach, with both a binary variable to define the lockdown period and a continuous social isolation index. Our empirical strategy is based on estimation using the changes in different murder "motivations" as control groups (fraud, criminal organization and involvement with drugs) contrasted to changes in femicides, controlling also for city-year and month fixed-effects. Our initial results indicate a sizeable increase in the number of femicides in the post-lockdown period using a binary treatment variable specification, with similar conclusions (although of smaller magnitude) using the continuous social isolation index as the treatment variable. We also find preliminary evidence that higher prevalence of emergency financial aid in a given area has helped mitigate the local rise in femicides post-lockdown.

COVID-19 and Domestic Violence – Evidence from Rolling Quarantines in Chile

PRESENTER: **Francisco Pino**, University of Chile
AUTHORS: Sonia Bhalotra, Emilia Brito, Damian Clarke, Pilar Larroulet

Covid-19 has led to a surge in domestic violence. It is unclear whether this results from income shortfalls and income uncertainty, or from families being locked down together and distanced from their social networks. Identifying causes of domestic violence has always been hard, as systematic data and relevant natural experiments are scarce. Policy responses to Covid-19 provide an opportunity to isolate the underlying mechanisms. Chile has implemented fine-grained rolling quarantine, such that different neighbourhoods within a city have been under quarantine at different times. Quarantines have covered at least half the population, and in some cases lasted more than 100 days. We are gathering rich administrative data covering calls to state sponsored hotlines and to new support channels such as 'silent' Whatsapp lines as well as police records. The data show that calls to the national DV hotline have trebled, while formal crime reporting has tended to fall. This suggests a worrying situation in which just as abuse has spiked, avenues for formal redress have become less accessible. We propose primarily to use the rolling nature of quarantines and geographic dispersion in intensity of COVID-19 contagion to examine the causal effect of COVID-related lockdown on different measures of DV exposure and reporting, characterizing their dynamic path during the pandemic and lock-down period conditional on seasonal/secular trends. We will then attempt to illuminate the relative contributions of economic stress and confinement. We will also be able to comment on effectiveness of newly designed services to encourage reporting during the crisis.

COVID-19 Lockdowns and Domestic Violence: Evidence from a Domestic Violence Hotline in Argentina

PRESENTER: **Santiago Perez-Vincent**, Inter-American Development Bank
AUTHOR: Enrique Carreras

We study the impact of COVID-19 mandatory lockdowns on domestic violence reports and on the use of alternative reporting mechanisms. We use data from calls to a domestic violence hotline in the City of Buenos Aires, Argentina, and employ a difference-in-differences strategy to account for seasonal variations in the number of calls. We take advantage of the fact that the hotline is used not only by victims but also by police stations (which report incidents brought to them) to assess the change in reporting channels due to the lockdown. We find an increase of 32% (almost 6 calls per day) in the overall number of calls. Breaking down the calls by type of violence, we find that this increase is mainly explained by a spike in reports of psychological violence. We find a large substitution between reporting channels: calls to the hotline received from the police fall sharply (-62%) while direct calls from the victims increase by 127%. The results highlight the need to complement social mobility restrictions imposed to combat the pandemic with specific services and reporting mechanisms to register and respond to the domestic violence that these measures might generate.

6:45 PM –7:45 PM MONDAY [Demand And Utilization Of Health Services]

Methods and Measurement: Health Production and Out-of-Pocket Payments

MODERATOR: **Elaine Baruwa**, Abt Associates, Inc

Economic Burden of Subsidized HIV Services on Patients in East Africa

PRESENTER: **Huiling Pan**, Palladium
AUTHORS: Mrs. Catherine Cantelmo, Mr. Bryant Lee, Dr. Arin Dutta

Background

Service delivery costs for HIV are subsidized by the government and donors in Tanzania and Uganda. Less is known about the economic burden still caused by direct and indirect costs faced by clients seeking these services. Bridging this knowledge gap and identifying appropriate interventions have the potential of improving the delivery of key HIV services, access, and utilization in East African countries.

Methods

The USAID and PEPFAR-funded Health Policy Plus (HP+) and Uganda Health Systems Strengthening (UHSS) projects conducted a time-motion study and client exit survey of adults (18+ years) attending health facilities for HIV treatment, testing, prevention of mother to child transmission (PMTCT), pre-exposure prophylaxis (PrEP), and voluntary male medical circumcision (VMMC) services in 7 regions in Tanzania (n=1,185) and 8 districts in Uganda (n=1,509). HP+ and UHSS followed clients throughout their facility visit to ascertain time spent receiving services and then interviewed clients on their out-of-pocket spending (direct costs), transportation costs, and indirect costs incurred during their visit. Indirect cost is defined as lost wages (opportunity cost) and calculated based on reported income, reported transportation time to and from facility, and the time spent at the facility waiting for and receiving HIV services. Economic burden is calculated from the sum of direct medical and transportation costs for one visit divided by monthly household expenditure net of non-discretionary items such as food, standardized by household size. Results are disaggregated by asset-based wealth quintiles, type of HIV service received, and type of facility.

Results

Average costs per visit borne by clients seeking HIV services in both countries were $1.52. In Tanzania, most of this cost was from lost wages (51%) whereas in Uganda, it was from transportation (56%). As expected, only a few clients reported paying out-of-pocket for HIV services as most services are meant to be provided free of charge. Economic burden varied by wealth quintile, service type, and facility type. In Tanzania, economic burden was highest among individuals belonging to the lowest wealth quintile (21%) and lowest among those in the highest quintile (8%), but there were insignificant differences observed among wealth quintiles in Uganda. Clients initiating ART faced the highest economic burden in accessing services (20% in Tanzania, 19% in Uganda). In Tanzania, clients accessing services in hospitals faced a higher economic burden (22%) than those accessing services in other types of facilities, whereas in Uganda, clients accessing services in a Level II health centre faced the highest economic burden (57%).

Conclusion

This study leveraged time-motion study results to estimate opportunity cost to HIV clients. Although service delivery costs are subsidized and user fees are low, HIV clients in East Africa, particularly those in the lowest wealth quintiles and initiating on ART, still face a significant economic burden from accessing HIV services. Countries should consider implementing interventions that reduce this economic burden by providing transportation stipends for the poorest patients, and by reducing opportunity costs through extending clinic hours or reducing visits required to the facility for stable patients.

Longitudinal Follow-up of Prevalence and Risk Factors for Cost-Related Medication Non-Adherence Among Medicare Diabetes Patients at High Risk of Hospitalizations

PRESENTER: **James Zhang**, The University of Chicago

AUTHOR: David Meltzer

Background: Cost-related medication non-adherence (CRN) is a persistent and elusive challenge in the US and around the globe. While there is a burgeoning body of literature on the cross-sectional study of CRN, longitudinal follow-up of CRN is rare. The lack of longitudinal follow-up may lead to under-estimation of the true prevalence rate of CRN and distorted risk profiles for those patients at high risk of CRN. Diabetes has a high prevalence in elderly populations causing disabilities associated with high-cost care. Longitudinal aspects of CRN among these patients are unknown.

Methods: As part of a clinical trial to study a comprehensive care model, 619 diabetes patients with Medicare insurance coverage were enrolled in the study between 2013-2015. They were followed up by survey every 3 months continuously. The survey included questions on the following CRN behaviors: (a) did not fill a prescription, (b) delayed filling a prescription, (c) skipped doses, and (d) split doses to avoid the costs in the past three months. CRN is constructed as a binary outcome with value of 1/0, with 1 assigned if the patient answered yes to any of these four types of CRN behaviors. Patients' age, sex, race, dual Medicare/Medicaid coverage status, and comorbid conditions were also extracted from the intake survey at the baseline during enrollment. The follow-up survey data were included until the end of 2019, before the COVID-19 pandemic set in. We analyzed the cumulative prevalence of CRN and developed a Generalized Estimation Equation (GEE) model to estimate the impact of the socioeconomic conditions and comorbidities on the risk of CRN longitudinally. Our GEE model uses a binomial family function, a probit link function, and an exchangeable correlation structure to address the binary outcome variable and correlation among the longitudinal follow-ups of the patients.

Results: The 619 diabetes patients completed a total of 7,651 follow-up surveys before either drop-out, death, or the truncation of the follow-up due to the COVID-19 pandemic, with a mean of 12.4 surveys (median 12) and an inter-quartile of 6-18 surveys per person. 57% of patients reported CRN at least once in the surveys despite all having Medicare insurance coverage. The GEE model shows that asthma ($p=0.06$), digestive disorder ($p=0.01$), kidney condition ($p=0.02$), liver condition ($p=0.05$), and fair or poor mental health ($p=0.09$) were associated with reporting CRN. Having Medicare-Medicaid dual insurance coverage is protective for CRN ($p<0.01$) even though those patients with dual coverage are generally in worse economic circumstances.

Discussion and Implications: Published national estimates put the prevalence rate of CRN at 11.5% annually among the general Medicare population. However, Medicare diabetes patients at high risk of hospitalization have a CRN prevalence rate 396% higher if followed up longitudinally. This suggests that diabetes patients are falling through the cracks, and more than half of them sooner or later exhibit CRN behaviors. This CRN rate is further exacerbated if the patients have additional comorbid conditions. More research is critically needed to study the longitudinal aspect of patients' CRN behaviors and to identify high-risk patients for intervention.

Health Care Production and Methodological Challenges from Irregular Spacing and the Dynamic Panel Data Structure

PRESENTER: **Dr. Durfari Velandia-Naranjo**, Universidad Nacional de Colombia - Medellín

AUTHOR: Edwin van Gameren

We estimate a health production model in which individuals do not govern their health status (*h*, health or *s*, sick) but only influence the probabilities of being in their preferred health state through investments in preventive and curative care services. In this study, we take the theoretical framework from Zweifel et al. (2009: 89-109) where individuals have sequences of health states (*hhhhssshhhh..., ... hhsssshhhh...)* and make health investments to modify the transition probabilities between states, but not the health stock directly. Health transitions have been analyzed by, among others, Contoyannis et al. (2004a,b), Halliday (2008), Hernández-Quevedo et al. (2008), Carro and Traferri (2014), and Ayllón and Blanco Pérez (2012), and specifically for elderly by, e.g., Buckley et al. (2004) and Diehr and Patrick (2001), but not in a framework of health production with explicit modeling of investments in health. Transitions between good (h) and bad (s) health are analyzed using 2001, 2003, 2012, and 2015 waves of the Mexican Health and Aging Study (MHAS), a panel representative for Mexicans aged 50 and over. A recursive model that simultaneously estimates initial health state, investments in curative services and preventive measures, and final health state is implemented.

We take into consideration methodological challenges coming from the irregular spacing between the survey's waves and the dynamic panel data structure. Following Cappellari&Jenkins (2004), we estimate the model with first-order Markovian transitions processes that control for initial condition effects. They do not use the panel aspect of the data, but instead pool the data and analyze successive pairs of consecutive observations. Requires only a pair (t, t–1), hence useful in panels with limited longitudinal information; accounts for nonrandom attrition and initial conditions. In this methodological scheme, it is essentially assumed that parameters are stable over time we are willing to assume that the transition rate is identical to g for every year from 2001 to 2015. Another methodological draw on the dynamic nature of the panel, using estimators of traditional Dynamic Panel Data Models (DPD) in a context of irregular spacing is inconsistent. Two new estimators are proposed. A generalized method of moments (GMM) based on quasi-differencing (QD) and E-CRE estimator (instrumenting correlated random effects) was estimated by NLS-IV Millimet&McDonough,2017).

With Cappellari&Jenkins (2004) approach results suggest that demand for medical visits or outpatient procedures (curative care) is lower when initial health is bad. Preventive care is measured as changes in eating/exercise habits and has a positive effect on health, but curative care has a negative or no impact on health. Initial health conditions do not have an autonomous relation with final health. Using self-assessed health the results fit better with the theory. Results using dynamic panel data models with irregular spacing are still been estimated.

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6:45 PM–7:45 PM MONDAY [Cross-Cutting Themes And Other Issues]

COVID Health Outcomes and Inequalities I

MODERATOR: **Frikkie Booysen**, University of the Witwatersrand

Impact of Contact Tracing on COVID-19 Mortality: An Impact Evaluation Using Surveillance Data from Colombia

PRESENTER: **Andres Vecino-Ortiz**, Johns Hopkins University Bloomberg School of Public Health

AUTHORS: Juliana Villanueva, Silvana Zapata, Zulma Cucunuba

Background

Contact tracing is a key part of the public health surveillance toolkit. However, it is labor intensive and costly to carry it out. Some countries have faced challenges implementing contact tracing, and no impact evaluations to our knowledge have assessed its impact on COVID-19 mortality. This study assesses the impact of contact tracing in a middle-income country and provides data to support the expansion of contact tracing strategies with the aim of improving infection control.

Methods

We obtained publicly available data on all confirmed COVID-19 cases in Colombia between March 2 and June 16, 2020. (N=54,931 cases over 135 days of observation). We proxied contact tracing performance as the proportion of cases identified through contact tracing out of all cases identified, as suggested by WHO guidelines. We calculated the daily proportion of cases identified through contact tracing across 37 geographical units (32 departments and five districts). Further, we used a sequential log-log fixed-effects model to estimate the 21-days, 28-days, 42-days and 56-days lagged impact of the proportion of cases identified through contact tracing on the daily number of COVID-19 deaths. Both the proportion of cases identified through contact tracing and the daily number of COVID-19 deaths are smoothed using 7-day moving averages. Models control for prevalence of active cases, second-degree polynomials, and mobility indices. Robustness checks to include supply-side variables were performed.

Results

We found that a 10 percent increase in the proportion of cases identified through contact tracing is related to COVID-19 mortality reductions between 0.8% and 3.4%. Our models explain between 47%-70% of the variance in mortality. Results are robust to changes of specification and inclusion of supply-side variables.

Conclusion

Contact tracing is instrumental to contain infectious diseases and its prioritization as a surveillance strategy will have a substantial impact on reducing deaths while minimizing the impact on the fragile economic systems of lower and middle-income countries. This study provides lessons for other LMIC.

Income, Risk and Mental Health: How the COVID-19 Pandemic May be Deepening Health Disparities Among U.S. Workers

PRESENTER: **Ms. Ariadna Capasso**, New York University

AUTHORS: Yesim Tozan, Shahmir H. Ali, Abbey M. Jones, Joshua Foreman, Ralph J. DiClemente, Sooyoung Kim

Background: Public health experts have promoted a number of strategies to contain the spread of COVID-19. The Health Belief Model (HBM) proposes that disease preventive behaviors will be adopted if people: 1) are aware of them; 2) believe that they are effective; 3) perceive the disease as a real threat; and 4) are able to adopt them. This study aimed to test the hypothesis that the adoption of COVID-19 preventive behaviors, such as handwashing, would be associated with knowledge, efficacy beliefs and threat perception, while employment conditions would present barriers to adopting other behaviors, such as staying at home.

Methods: An online survey was administered to U.S. adults in April 2020. Separate logistic regressions were used to assess odds of adopting three COVID-19 preventive behaviors−avoiding leaving home, handwashing and avoiding seeking medical care−among 2845 employed participants.

Results: Overall, adoption of preventive behaviors was high: 77% of participants avoided leaving home; 93% increased handwashing, and 64% avoided seeking medical care. However, these behaviors were significantly less common among essential workers, those without paid sick leave, and those who could not afford to self-quarantine. Controlling for socio-demographic and residence characteristics, those who could not afford to self-quarantine were 59% less likely to avoid leaving home (AOR: 0.41; 95% CI: 0.29, 0.51) than those who could, whereas no significant differences were found with respect to handwashing or avoiding seeking medical care. Worry about exposure to COVID-19 because of not being able to afford missing work was associated with staying at home (AOR: 1.56: 95% CI: 1.10, 2.22), but not with the other two behaviors. Consistent with the HBM, believing not going to work could prevent COVID-19 infection and perceiving higher COVID-19 severity were positively associated with adopting all protective behaviors. No association was found with COVID-19 risk. Compared to non-essential workers, essential workers were 56% less likely to avoid leaving home (AOR: 0.44; 95% CI: 0.31, 0.61) and 61% less likely to practice increased handwashing (AOR: 0.44; 95% CI: 0.31, 0.61).

Conclusions: Findings support that economic vulnerability may present a barrier to remaining at home to prevent exposure to COVID-19 for oneself and others. Findings may warrant adoption of policies such as paid sick and family leave and universal basic income for those in precarious employment conditions, including essential workers.

Women's Economic Empowerment and COVID-19: Results from Kenya, Burkina Faso, Nigeria, and the Democratic Republic of Congo

PRESENTER: **Carolina Cardona**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Philip A Anglewicz, Elizabeth Gummerson, Michele Decker

Background

Women's empowerment is linked to a range of development goals, including maternal health, children's education, and children's health and nutrition. Yet, there is a risk that the COVID-19 pandemic will reverse recent gains in Africa. Research shows that negative shocks, like conflict, loss of economic productivity, and recessions can reduce women's bargaining power within the household. In this research, we examine the impact of the COVID-19 pandemic on women's economic empowerment in four sub-Saharan African regions.

Data

We used longitudinal data from 3,151 women of reproductive age from the Performance Monitoring for Action (PMA) Project. In the fall of 2019, women were interviewed in-person and received a phone follow-up interview between May 28th and July 20th, 2020. The percentages completing the phone interview were 93.9% in Kenya, 75.2% in Kinshasa (Democratic Republic of Congo), 74.7% in Burkina Faso, and 81.7% in Lagos (Nigeria).

Methods

We use two measures of women's economic empowerment. The first is who in the household makes decisions about purchases for daily needs; we focus on instances where women made the decisions at baseline, and either remained the same, changed to husband/someone, or made decisions jointly. The second measure captures a woman's economic reliance on her partner (no reliance, equal reliance, and more reliance, as before COVID-19). We specify a multinomial regression model with site fixed effects to estimate the impact of the COVID-19 pandemic on women's economic empowerment by country, and we also pooled countries together. We control for baseline sociodemographic characteristics—such as parity, age, education, wealth, women's work status, household members, and overall household income loss due to COVID-19. Our estimations implement inverse probability weights to address attrition.

Main Findings

Most households where women alone decided daily household needs at baseline changed over time in Kenya, Burkina Faso, and Lagos. In only 25%, 30%, and 26% of households, the woman remained the sole decision-maker, respectively. Relatively large percentages of women were not economically reliant on their husbands in all settings, ranging from 38% in Kinshasa to 57% in Lagos. However, most became more reliant among those who were reliant before COVID-19—except in Burkina Faso. Across settings, women aged 25-34 and 35-49 have a lower relative risk of changing household decision-making between baseline and follow-up than women aged 15-25. We also see evidence that income loss due to COVID-19 has impacted household decision making. Households with complete or partial income loss due to COVID-19 have a greater relative risk of changing from women alone deciding to husband/other (Kinshasa) and joint (Burkina Faso). Focusing on households where the woman becomes more reliant during COVID-19, we find that women from the highest wealth tertile have a higher relative risk of becoming more reliant on their husbands during COVID-19 in Kinshasa, Kenya, and Burkina Faso.

Next Steps

We hypothesize that community characteristics can slow down the economic impacts of COVID-19; hence, we intend to include community-level measures. We also plan to stratify our analysis by wealth tertiles and household income loss due to COVID-19.

6:45 PM –7:45 PM MONDAY [Specific Populations]

IMMUNIZATION ECONOMICS SIG SESSION: Costs of Vaccine Preventable Diseases, Vaccination Costs and ROI

MODERATOR: **Stephen C Resch**, Harvard T.H. Chan School of Public Health

Adaptation of a Multi-Country Return on Investment Model for Country-Level Analyses: A Case Study of PCV10 in Ecuador

PRESENTER: **Elizabeth Watts**, JHSPH

AUTHORS: Salin Sriudomporn, Ruth Jimbo Sotomayor, Bryan Patenaude

Background: As part of the Decade of Vaccine Economics (DOVE) project, we developed a model to estimate the return on investment (ROI) of vaccination against 10 pathogens in 94 low- and middle-income countries. Using the cost of illness approach to estimate economic benefits of averted illness, we estimated that every dollar invested in immunization programs between 2011 and 2030 would yield an ROI of 22.2, on average. These results have been used by Gavi for global advocacy campaigns but are not specific enough to inform country-level decision making. This study aimed to assess limitations of the data in the multi-country model and adapt the model to the country level. We piloted the tool in Ecuador to produce country-level ROI estimates for the 10-valent pneumococcal conjugate vaccine (PCV10).

Methods: To address the limitations of the multi-country ROI model, we assessed quality and missingness of data to determine which countries suffered from the greatest degree of missing data. We explored the impact of data missingness on uncertainty for country-level estimates for both economic benefits and costs. To limit uncertainty for the country-level analyses, we constructed a data hierarchy for prioritizing sources that should be used for model inputs. To pilot the approach and obtain country- and vaccine-specific data, we deployed the data templates to collaborators at Pontificia Universidad Católica del Ecuador. Collaborators provided data on PCV10 impact against three syndromes—pneumonia, meningitis and sepsis—as well as setting-specific data for treatment costs. Country-specific data on target population size, vaccine price, wastage and buffer stock rate, and detailed data on delivery costs will be used to estimate the total PCV10 costs at national and subnational levels. To fill in data gaps, we used primary data from comparable settings and data from publicly available databases. We combined the estimated averted cost of illness (costs of treatment, transportation, caregiver wages, and productivity loss) and immunization program costs (costs of vaccines, supplies, and delivery) to derive the ROI for PCV10. We expanded the model to generate economic impact estimates for four sub-regions for which we have vaccine impact data.

Results: The data quality assessment of the multi-country model revealed a small degree of missingness in the data. We determined that the use of imputed data, outdated inputs, and national-level average estimates contributed the most to uncertainty in country-level results. Ecuador has access to government data for treatment costs and subnational vaccine impact data that can inform subnational economic impact estimates. A national-level ROI and subnational estimates for economic benefits and costs of PCV10 will be generated in Q1 2021.

Conclusions: The multi-country ROI framework is adaptable to LMIC settings for assessing the economic impact of vaccines at national and subnational levels. The ability to examine subnational ROI is dependent on data availability in the country of interest. Adapting the model to the specific countries provides an opportunity for addressing targeted research questions and aids vaccine decision-making and priority-setting in LMICs. Collaborations with in-country teams can improve the data quality and specificity used to model ROI.

The Incremental Cost, Impact and Cost-Effectiveness of Sustaining Maternal and Neonatal Tetanus Elimination in 59 Priority Countries from 2020-2030.

PRESENTER: **Maria Carvalho**, Avenir Health

AUTHORS: Mr. James E Rosen, Rachel Sanders Sand, William Winfrey, Yvonne Tam, Neff Walker, Rania A Tohme, Tracey S Goodman, Sarah Wood Pallas, Bilal Ahmed, Nasir Yusuf, Azhar Abid Raza, Ulla Kou Griffiths

Background: Tetanus cannot be eradicated, but maternal and neonatal tetanus (MNT) can be eliminated. The MNT Elimination (MNTE) initiative seeks to reduce neonatal tetanus cases to < 1 case per 1000 live births per district in each country annually. Once MNTE has been achieved, it must be sustained through a complementary set of strategies focusing on the long-term protection against tetanus. We sought to understand the costs and the potential impact of sustaining MNTE in 59 priority countries from 2020 to 2030.

Methods: We estimated the incremental cost and cost-effectiveness of sustaining MNTE, including: (1) vaccinating pregnant women with tetanus toxoid-containing vaccine (TTCV) during antenatal care, (2) provision of TTCV boosters at 12-23 months, 4-7 years and 9-15 years, (3) reinforcement of MNT surveillance and monitoring of MNTE sustainability, and (4) skilled delivery to include clean delivery and cord care. We used the Lives Saved Tool and Excel analyses to project the neonatal and maternal lives saved based on four scenarios: Baseline or status quo scenario, in which intervention coverage is held constant through 2030, and Progress, Bold and Ambitious scenarios in which intervention coverage is scaled up to 70%, 80%, and 90% respectively, by 2030.

Results: The cumulative cost of MNTE interventions from 2020 to 2030 in the baseline scenario is US $85.4 billion. Compared with this scenario, the incremental 10-year cost of sustaining MNTE ranges from $4 billion in the Progress scenario to $6.6 billion in the Bold to $14.7 billion in the Ambitious scenario. From 2020 to 2030, compared to baseline, scaling up interventions to sustain MNTE is expected to save about 324,000 neonatal lives (103,000 from tetanus; 221,000 from sepsis) and 28,000 maternal lives in the Progress scenario, 418,000 neonatal (140,000 from

tetanus; 278,000 from sepsis) and 39,000 maternal lives in the Bold scenario; and 558,000 neonatal (180,000 from tetanus; 378,000 from sepsis) and 64,000 maternal lives in the Ambitious scenario, with most lives being saved in Sub-Saharan Africa and South Asia.

Approximately 37.5 million Disability-Adjusted Life-Years (DALYs) are averted in the Progress scenario compared to baseline; with 49.6 million and 66.7 million DALYS averted in the Bold and Ambitious scenarios respectively; most DALYs are averted in Nigeria, Pakistan and India. Across 58 countries (China not included), the incremental cost per DALY averted ranged from $9 to $926 (median $180) in the Progress scenario, from $9 to $5,438 (median $316) in the Bold scenario, and from $16 to $1946 (median $388) in the Ambitious scenario. Sustaining MNTE is cost-effective in 37 countries in the Progress scenario and 39 countries in the Bold and Ambitious scenarios using a threshold of 50% of GDP per capita, and between one-half and two-thirds of countries relative to recommended thresholds for inclusion in Universal Health Care (UHC) packages.

Conclusions: Sustaining MNTE is vital to save newborn and maternal lives, and would be cost-effective in most of the 59 priority countries over the 2020-30 period, especially since these interventions have health benefits beyond those calculated here.

Evaluating the Short and Long Term Impact of Enteric Fever on Families in Nepal: Preliminary Results from the TyVAC Cost of Illness Study

PRESENTER: **Cristina Garcia**, Johns Hopkins School of Public Health
AUTHORS: Elizabeth Watts, Dr. Arun Sharma, Dr. Ram Hari Chapagain, Dr. Krishna Bista, Dr. Ganesh Rai, Dr. Ganesh Shah, Dr. Sanu Raja Shrestha, Dr. Rahul Bajracharya, Dr. Binod Lal Bajracharya

Background: Evidence on the broader economic burden of vaccine-preventable disease is critical to introducing new vaccines, such as the recently licensed typhoid conjugate vaccine (TCV), but few studies have assessed the economic consequences of enteric fever. While Nepal plans to introduce TCV into its National Immunization Program in 2022 and has received approval for Gavi support, competing priorities and new vaccines such as against COVID-19 threaten to delay introduction. To support planning for TCV introduction in Nepal, we estimated the household cost of enteric fever and the proportion of families experiencing catastrophic health spending and medical impoverishment in Nepal. The results presented here are preliminary, and data collection will continue until Q3 2021.

Methods: We prospectively collected resource utilization data and out-of-pocket expenditures from inpatients and outpatients ≥9 months with blood-culture confirmed typhoid and paratyphoid from two hospitals and one private outpatient clinic in the Kathmandu Valley, Nepal. Data was collected from exit interviews and follow-up interviews conducted at 14, 30, and 90 days to collect acute phase and long-term costs and changes in household living standards. Household costs included direct medical, non-medical, and indirect costs paid by the household less amounts paid or reimbursed by third party payers. Out-of-pocket health expenditures including direct medical and non-medical costs were considered catastrophic when the expenditure exceeded 40% of non-food consumption over one month. Long term household impact was assessed based on self-reported changes in living standards and ability to meet basic household needs. All costs were expressed in 2020 US dollars.

Results: Based on the preliminary sample of 41 participants, the average cost per episode of enteric fever was $76 (SD $162) and $283 (SD $224) for outpatients and inpatients, respectively. Most costs were incurred during the acute illness phase with an average duration of 6 days (SD 4 days). Overall, lost productivity comprised 28% of the total cost and was greatest among unpaid work like domestic or family work. Primary sources of financing were savings (95%), existing income (61%), and loans (17%). On average, the out-of-pocket payment represented 87% of monthly household non-food consumption, resulting in 51% of households experiencing short term catastrophe. Because households primarily used savings or income to pay for expenditures, the immediate impact on households might be greater than previously estimated in other studies. Additionally, time spent caring for the sick individual and away from production had long term negative consequences on household finances. Within 3 months of the illness, 20% of families experienced decreased income or consumption due to the illness. Additional spending related to the typhoid-illness after the acute phase increased the number of participants experiencing catastrophic health spending to 63%.

Conclusions: Enteric fever represents a significant economic burden to families in Nepal. High out-of-pocket payments and significant productivity loss beyond the acute illness phase increases the risk of catastrophic health spending, and the long-term consequences have the potential to keep families in a cycle of poverty. Evidence on the broader economic burden of enteric fever is critical to maintaining support for TCV introduction.

The Impact of the COVID-19 Pandemic on the Household Cost of Enteric Fever, Care-Seeking Behaviors, and Household Living Standards Among Families in Nepal: Preliminary Results from the TyVAC Cost of Illness Study

PRESENTER: **Elizabeth Watts**, JHSPH
AUTHORS: Dr. Arun Sharma, Dr. Ram Hari Chapagain, Dr. Krishna Bista, Dr. Ganesh Rai, Dr. Ganesh Shah, Dr. Sanu Raja Shrestha, Dr. Rahul Bajracharya, Dr. Binod Lal Bajracharya, Cristina Garcia

Background: In response to the COVID-19 pandemic, Nepal imposed early lockdowns, but by the end of 2020, community transmission remained prevalent. Globally, the fear of contracting COVID-19 and lockdown restrictions had downstream consequences resulting in care-seeking delays for other illness and decreased utilization of health services, but little data on the impact of COVID-19 exists for Nepal. Using data collected as part of the TyVAC Cost of Illness Nepal Study, we assessed changes in care-seeking behaviors, household income and consumption, and the cost of enteric fever before and after the start of the COVID-19 pandemic. Results presented here are preliminary, and data collection is ongoing until Q3 2021.

Methods: Beginning September 2019, we prospectively collected resource utilization data and out-of-pocket expenditures from individuals ≥9 months with blood-culture confirmed typhoid and paratyphoid from two hospitals and one private outpatient clinic in the Kathmandu Valley, Nepal. Data was collected from exit interviews and follow-up interviews up to 90 days to collect household costs and changes in household living standards. Due to the COVID-19 pandemic, enrollment stopped in March 2020 and resumed in August 2020 following modification to the data collection tools to capture care-seeking delays, type of health facilities where care was sought, and household impact due to COVID-19 illness and restrictions. Household costs of enteric fever, including direct medical, non-medical, and indirect costs, and proportion of households experiencing catastrophic health spending from enteric fever were compared before and after the start of the pandemic. The impact of COVID-19 on income and household consumption were also measured. Statistical tests of difference comparing pre- and post-COVID-19 were assessed using Wilcoxon-Mann-Whitney and chi-square tests where appropriate. All costs were expressed in 2020 US dollars.

Results: Among participants enrolled following the start of the COVID-19 pandemic, 55% reported decreased income and 78% reported decreased household consumption because of COVID-19. Decreased household consumption was mostly for household hygiene items and educational expenses. About 67% reported delays in care-seeking for enteric fever due to COVID-19 with most citing the lockdown as the primary reason, which increased the average length of illness by about one day compared to pre-COVID. The type of facilities where care was sought also changed following the start of the pandemic with 33% initially seeking care for enteric fever at pharmacies compared to only 10% before the pandemic. The average cost of enteric fever increased from $123 (SD $115) pre-COVID to $207 (SD $272) post-COVID, and the proportion of households experiencing catastrophic health spending due to enteric fever increased from 44% to 78% following the start of the COVID-19 pandemic. While not statistically significant, the preliminary results show key differences in care-seeking behaviors and increased cost of enteric fever.

Conclusions: The COVID-19 pandemic has impacted care-seeking behaviors among participants with enteric fever. Increased out-of-pocket health spending because of the delays was catastrophic to households already struggling to cope with reduced income and resources. Additional research is needed to understand the long term impact of COVID-19 restrictions on other illness and on health service utilization.

6:45 PM–7:45 PM MONDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Health Systems Challenges on Quality of Care, Financing, and Staff Motivation in Low-and-Middle-Income Countries: Myth-Busting with Standardized Microdata Evidence from Multi-Country Studies

SESSION CHAIR: **Seye Abimbola**, The University of Sydney

ORGANIZER: **Eeshani Kandpal**, The World Bank

DISCUSSANT: **Gil Shapira**, The World Bank; **Sebastian Bauhoff**, Harvard T.H. Chan School of Public Health; **Elina Pradhan**, The World Bank

Rethinking the Human Resource Crisis in Africa's Health Systems: An in-Depth Exploration of Health Worker Density, Presence, Caseload, and Competencies

PRESENTER: **David Evans**, Center for Global Development

Since the early 2000s, attention on human resources for health (HRH) from the global health community has risen steadily, often highlighting a global shortage in health workers. This study draws on nationally representative data from ten countries in Sub-Saharan Africa to examine a wide array of issues surrounding HRH. Specifically, we use the Service Delivery Indicators data, administered in Kenya, Madagascar, Malawi, Mozambique, Niger, Nigeria, Sierra Leone, Tanzania, Togo and Uganda, to conduct an in-depth analysis of health worker density, presence, caseload, and competencies, and to compare findings to expected results based on "typical assumptions" about HRH in low- and middle-income country health systems. We complement this original analysis with the results of a review examining previous analyses of these same issues. Our findings suggest that a shortage of health workers is not the primary or most immediate problem that countries face. Health workers appear to lack basic competencies and are underworked, and these conditions hold across the public and private sectors. This may in part be the result of a vicious circle, in which undertrained health workers provide low quality care and – as a result – relatively few patients use health facilities, creating little demand for improved preparation of health workers and quality of care. Past efforts to measure the quality of care have often focused on inputs such as equipment, medicines, diagnostics, and guidelines. However, this approach is incomplete, and provider knowledge should be considered as crucial part of any quality measure.

The Impact of Performance-Based Financing on Health Worker Motivation: Evidence from Five Countries

PRESENTER: **Ms. Sneha Lamba**, Johns Hopkins Bloomberg School of Public Health

There have been mounting concerns that while paying health workers for performance (PBF) may improve extrinsic motivation driven by financial rewards, there may be an equal or more powerful crowding-out of intrinsic motivation resulting in an ambiguous effect on overall health worker motivation. These concerns are more important in low and middle income countries (LMICs) where intrinsic motivation driven by factors such as Autonomy, Recognition, Sense of Self or Purpose may be stronger among health providers who perform cognitively complex tasks in sub-optimal settings. We present experimental evidence from PBF interventions in 5 LMICs to disentangle the effect of PBF on intrinsic and extrinsic motivation. Data was collected from health workers in intervention and comparison facilities before and after the roll-out of the PBF interventions (Cameroon (n=540), Nigeria (n=2200, Tajikistan (n=1625), Zambia (n=527) and Zimbabwe (n=757)). Our experimental settings enable us to compare pure control facilities with two viable PBF policy alternatives of enhanced supervision and enhanced financing using difference-in-differences (DID) specifications. Informed by the Self Determination Theory and Cognitive Evaluation Theory we conceptualize motivation and satisfaction (M&S) of health workers as multidimensional constructs to better understand the effect of PBF schemes on sub-constructs of M&S. We use both factor scores from exploratory factor analysis as well as naïve scale scores for each hypothesized sub-construct of M&S as dependent variables in DID regression specifications carried out for each country separately. Overall, in our preliminary analyses we find that PBF had significant positive effects on intrinsic motivation driven by "Recognition" and "Self-Concept" in Zimbabwe and Nigeria but did not significantly affect intrinsic motivation levels in other countries included in the analysis. For satisfaction, we find that PBF had a significant positive effect on satisfaction from "Working Conditions" in Nigeria, Zambia and Tajikistan.

Performance-Based Financing Versus Decentralized Facility Financing for Maternal and Child Health: Evidence from Five Countries in Sub-Saharan Africa

PRESENTER: **Eeshani Kandpal**, The World Bank

In this paper, we use data from 5 LMICS to examine health worker motivation, the third paper will compare PBF to a popular policy counterfactual, decentralized facility financing (DFF). The analysis shows, for Cameroon, Nigeria, Rwanda, Zambia, and Zimbabwe, that financial incentives in the form of PBF are not necessarily superior to DFF. The analysis also shows that pooling the data leads to slightly different findings than might be suggested by individual IEs. For example, in Nigeria, Rwanda, Zambia and Zimbabwe, the individual IEs find that PBF outperformed DFF for institutional delivery. But in the pooled analysis, there is no aggregate effect of PBF on institutional delivery. The difference between the individual IEs and pooled analysis highlights the salience of context as a mediator of the impact of a PBF pilot.

6:45 PM–7:45 PM MONDAY [Specific Populations]

ORGANIZED SESSION: Causal Methods with Observational Data in Palliative and End-of-Life Care: A Systematic Review and New Methodological Advances

SESSION CHAIR: **Pedro L Gozalo**,

ORGANIZER: **Peter May**, Trinity College Dublin

DISCUSSANT: **Sally Stearns**, The University of North Carolina at Chapel Hill

Causal Analyses of Palliative Care Using Observational Data: A Systematic Review of Current Literature and Consideration of Future Opportunities

PRESENTER: **Narae Kim**, University of Southern California

AUTHORS: Jing jing Jiang, Melissa Garrido, Mireille Jacobson, Peter May

We are unaware of any prior review examining the use of causal inference methods with observational data in palliative care. Therefore, we aim to identify, organise and report the evidence on causal inference with observational data in palliative populations, and to consider how these methods might be applied more widely to bridge established evidence gaps. Interventions of the included studies cover interventions, programmes or services for palliative care, and evaluations of palliative medication studies (e.g. opioid dispensing). Outcomes of the included studies encompass any outcome measured that is likely associated with costs and quality-of-life outcomes.

A systematic search was conducted by an information specialist in August 2020 with keywords such as 'palliative', 'terminal care', 'hospice', 'causal inference', 'econometric', 'cost' and 'utilisation.' 684 results were found in EMBASE, Medline, Cochrane Library online database, CINAHL, EconLit, Web of Science, and SCOPUS. After excluding duplicated papers, 294 papers were left for title/abstract screening. Additionally, grey literature searches on NBER, SSRN and arxiv found 0 relevant papers. Further, reviews of nine systematic reviews on palliative care domains identified 11 more papers for the full-text review.

At the time of submission we are reviewing full texts and performing quality assessment using STROBE tools. Our project schedule is to finish by March 2021, well ahead of the Congress, and a full presentation of the review will therefore be possible at that time.

Vector Based Kernel Weighting: A New Method for Analyzing Multi-Valued Treatments in Palliative Care

PRESENTER: **Melissa Garrido**

AUTHORS: Jessica Lum, Yevgeniy Feyman, Steven Pizer

By ignoring endogeneity in observational data analyses, we risk concluding a helpful treatment has no clinical benefit, or concluding a treatment is safe when it actually is harmful. Although it is preferable to account for both observed and unobserved confounding, techniques such as interrupted time series, difference-in-differences, and instrumental variable analyses often require a level of detail that does not exist in secondary data sources. Analysts must often turn to methods that only account for observed confounding, such as propensity scores. However, most guidance for propensity scores focuses on evaluations of a binary treatment. The best way to use propensity scores for multi-valued treatments (e.g., comparison of several medications or of the effects of no palliative care, palliative care in a dedicated unit, and palliative care consultations) is unknown. We used Monte Carlo simulations to examine the impact of propensity score weighting or matching strategies and estimation strategies on inferences about multi-valued treatments.

We compared covariate balance, bias, and efficiency (interquartile range magnitude, root-mean-squared error, median absolute error) of treatment effect estimates after employing five weighting/matching strategies: inverse probability of treatment weights (IPTW), generalized propensity score matching, kernel weights, vector matching, and a new hybrid — vector-based kernel weighting (VBKW). In VBKW, one assigns greater kernel weights to comparison observations with similar propensity score vectors (e.g., similar probabilities of receiving treatments A, B, and C). In our initial simulations (1000 replications each), we estimated propensity scores via maximum likelihood estimation (MLE). We varied degree of propensity score model misspecification, treatment effect heterogeneity, coefficients on confounders, estimand of interest, and sample distribution across treatment groups (unique combinations of these comprised analytic scenarios). In simulations using three treatments, we evaluated 1008 unique analytic scenarios when n=600 and n=1200. In simulations using five treatments, we evaluated 2520 scenarios when n=3000 and 48 when n=9600. We also used 24 scenarios to compare IPTW and VBKW weights estimated via MLE vs covariate balancing propensity scores (CBPS, a semi-parametric method).

IPTW was more likely to produce biased and inefficient treatment effect estimates than any of the other weighting or matching strategies. In contrast, our newly developed method – VBKW – was the most likely to produce unbiased and efficient treatment effect estimates. For instance, with three treatments and n=1200, IPTW produced estimates with AMRB < 20% in 37% of scenarios, while VBKW did so in 95% of scenarios. VBKW outperformed IPTW regardless of whether propensity scores were estimated via MLE or CBPS.

When using propensity scores to analyze effects of treatments that have more than two levels, ensuring comparability across the vector of propensity scores (one for each treatment group) leads to less biased and more efficient treatment effect estimates. We will illustrate the implications of our results for inferences from applied analyses with an example using US Health and Retirement Survey data. We will show how inferences differ when we use IPTW and VBKW to examine the relationship between a decedent's location of death (home, in hospital, other) and bereaved spouse's out-of-pocket health spending.

Last Wishes? Dissecting Medicare Spending at End of Life in the United States

PRESENTER: **Dr. Jing Li**, Weill Cornell Medical College

AUTHORS: Yongkang Zhang, Atul Gupta, Sean Nicholson

It is well documented that a high proportion (one quarter to one third) of annual Medicare spending in the U.S. is concentrated among the 5% of patients at the end of life (EOL). A major barrier to quantifying and studying the determinants of "excess" EOL spending is patient comorbidities: dying patients are typically sicker than those who survivied, and the fact that we spend more on those who died ex post could simply reflect the fact that we spend more on those who are sicker ex ante. Such confounding issue is difficult to address using conventional methods because of the high dimensionality of factors at play, and the intracacies in the relationship between the multitude of factors and probability of death.

Our study adds to the small but growing literature in using "big data" machine learning (ML) techniques to estimate a person-specific probability of dying. We compare spending among decdents and survivors with the same predicited mortality to better dissect the determinants of EOL spending purged of confounding from patient comorbidities. We ask two questions: first, does such spending difference between decedents and survivors reflect patient preferences for aggressive care near the EOL? Second, are EOL patients more likely to be treated by "aggressive" providers, or do providers become more aggressive in treating patients whose prognosis deteriorates/are approaching EOL?

To answer the first question, we stratify the analyses by whether the patients had Alzheimer's Disease and related dementias (ADRD), since cognitive impairment renders ADRD patients less able to express their treatment preferences at EOL. We also draw on supplementary survey data to examine any correlation between speding differences and reported patient preferences for EOL treatment. To answer the second question, we assign each patient to a physician and use a leave-one-out approach to derive each physician's average utilization (aggressiveness of treatment) based on utilization of her patients other than the focal patient. We then determine whether decedent-survivor spending differences are primarily due to them being assigned to physicians with different treatment styles, or due to within-physician differences in how they treat decedents versus survivors.

We use U.S. Medicare claims on a random 20% sample of beneficiaries. Our total study sample includes 7,464,839 patients alive on January 1, 2016, with a one-year mortality rate of 4.65%. We use a random forest ML model to predict a patient's probability of dying in 2016, using her demographics, diagnoses and healthcare utilization in 2015. The weighted mean decedent-survivor difference in 2016 spending conditioning on probability of death is $22,959, or over 240% of the mean spending among survivors ($9,461). We find lower spending difference between decedents and survivors with ADRD (about 9% of total sample, with a mortality rate of 18.8%): the weighted mean conditional difference in 2016 spending is $8,576, or 47% of the mean spending among ADRD survivors ($18,128), providing suggestive evidence that patient preferences play a role in high spending at EOL. We will test robustness of our results in ongoing analyses.

6:45 PM –7:45 PM MONDAY [Supply Of Health Services]

Health Insurance and Funding

MODERATOR: **Mark Edward Votruba**, Case Western Reserve University

The Impact of PEPFAR Funding on Child Morbidity and Mortality: Evidence from Sub-Saharan Africa

PRESENTER: **Uzaib Saya**, Pardee RAND Graduate School

AUTHOR: Zachary Wagner

Background: One of the most dramatic global efforts to scale up HIV-related prevention, care, and treatment services has been through the US President's Emergency Plan for AIDS Relief (PEPFAR) program launched in 2003. Large-scale evaluations have linked PEPFAR's implementation and expansion of antiretroviral treatment (ART) to population-level changes in HIV-related and adult mortality as well as spillover benefits beyond HIV, including increased skilled-birth deliveries, and higher employment. Although a healthier and wealthier adult population could have spillover benefits to children, there is limited evidence on how PEPFAR affected child health outcomes.

Data: In this paper, we use secondary data from 92 household-level Demographic and Health Surveys (DHS) conducted in sub-Saharan Africa between 1995-2018 to empirically address the causal relationship between increased ART availability from PEPFAR and changes in child morbidity and mortality. We construct longitudinal records of child survival by aggregating birth history observations across surveys using complete fertility histories to generate measures for child and infant mortality. We also assess how PEPFAR implementation is related to anthropometric indicators (stunting and wasting), immunization status, and health behaviors for both mothers and their children (e.g. maternal iron supplementation and use of deworming medication).

Methods: We analyze these data using a difference-in-difference analytic strategy, which compares changes in child morbidity and mortality between countries ("focus") that received PEPFAR funding and a group of countries ("non-focus") that did not receive any PEPFAR funding. We complement this with an event study framework to examine how the effect of PEPFAR changes over time. We also use an interrupted time series approach, which assesses how post-PEPFAR outcomes deviate from what would be predicted by the pre-PEPFAR trend.

Results: Descriptive analyses indicate that the "focus" and "non-focus" countries are somewhat similar, which is why we control for pre-trends in the outcomes. After controlling for the pre-trends prior to introduction of the program, PEPFAR focus countries had, on average, 7% fewer under-1 deaths and 4% fewer under-5 deaths per 1000 live births than "non-focus" countries but these differences are not statistically significant. "Focus" countries had lower levels of stunting but these were also not statistically significant. One reason for a null effect in child mortality is that PEPFAR may have crowded out other key child health services. We test this hypothesis by examining child vaccination, deworming, and maternal iron supplementation. PEPFAR focus countries had lowered maternal iron supplementation rates and higher maternal employment than their non-focus counterparts. While the direction of these statistically significant results are consistent with the findings in other literature that there may be some crowd out of essential health services for children in PEPFAR focus countries, we cannot reject a null effect for other health-related interventions.

Conclusion: Although improvements in the well-being of the adult population following PEPFAR are well documented, we do not find evidence that child health improved. One reason for this could be that child health services were crowded out by PEPFAR-funded programs.

The Impact of Insurer Size Increase on Negotiated Prices: Evidence from the ACA in Arkansas

PRESENTER: **Jee-Hun Choi**, Lehigh University

Theoretically, insurer size is a crucial determinant of insurer bargaining power.
However, empirical evidence that an insurer gains bargaining power due to size increase
is limited. Using an exogenous enrollment increase for individual plans in Arkansas
due to unique Medicaid expansion via the Affordable Care Act, I find that size increase
reduces negotiated hospital prices for the largest insurer by 18% despite increased competition. Through the counterfactual analysis using my empirical results, I also show
the significant countervailing effect of insurer size increase may pass on to premium
rates: the plan's premium rates could have been 10.3% higher without the expansion.
My results suggest that a rise in insurer size needs as much attention as insurer market
consolidation, which has been the focus of the literature. In that regard, my findings
provide an important implication for privately provided public health insurance programs because their markets have grown in size steadily without significant changes in
market concentration.

How Does Hospital Market Respond to Universal Health Insurance?

PRESENTER: **Chia-Lun Liu**, University of Pennsylvania

AUTHORS: Shin-Yi Chou, Hsienming Lien, Mary Deily

Studies in the literature that examines the effects of health insurance expansion mostly focuses on healthcare utilization, while the evidence on providers' responses to the health insurance expansion is limited. This paper attempts to fill the gap in the literature by studying the impacts of universal health insurance reform on the supply side. Specifically, we study the implementation of National Health Insurance (NHI) in Taiwan in 1995 and its impacts on the hospital market.

There are two major features of the implementation of this reform. First, before the NHI, the majority of people only obtained health insurance coverage through employment-based health insurance plans. This reform suddenly increased the proportion of the insured population to nearly 100% at the end of 1995. Second, the NHI eliminated price competition among hospitals. Therefore, hospitals do not engage in price competition to attract patients. Hospitals can earn more patients or a higher market share only by raising the quality of healthcare services. We posit that the sudden increase in health insurance coverage and the weak price competition among hospitals have altered the hospital market structure. The empirical strategy exploits the regional differences in the proportion of uninsured elderly before the reform to identify the effects of NHI. The hospital market of an area with a higher share of uninsured elderly before the NHI is expected to be affected more by NHI since the market experienced a greater demand shock compared to areas with a lower pre-NHI uninsured rate.

Our analysis is presented in two steps. First, on the aggregate level, we find that NHI is associated with a decrease in the number of smaller hospitals, but the number of larger hospitals remains unchanged. Further investigation on flow variables of hospital entry and exit suggests a significant number of hospital exit following the reform, where most of the exited hospitals are of a smaller size, a lower staffing level, and less likely to own advanced medical technologies. Second, we analyze the responses of survived hospitals in terms of hospital inputs and medical utilization. We find strong evidence that large-sized hospitals expand by increasing staffing levels and hospital beds. The results also show that the number of inpatients and patient days for large-sized hospitals increases. However, for small-sized hospitals, there is no significant change in hospital outcomes. Our results point to the evidence that NHI drives the hospital market into two distinct trends where large hospitals prosper while small hospitals shrink.

6:45 PM –7:45 PM MONDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ECONOMICS OF OBESITY SIG SESSION: Sugar Taxes

MODERATOR: **Alison Hayes**, University of Sydney School of Public Health

Did Sugar-Sweetened Beverage Consumers Switch to Cheaper Taxed Beverages after Mexico's Tax Was Implemented?

PRESENTER: **Arantxa Colchero**, Instituto Nacional de Salud Pública

AUTHORS: Juan Carlos Salgado Hernandez, Dr. Shu Wen Ng

Objective: To estimate changes in household purchases of taxed sugar-sweetened beverages (SSB) by tertiles of SSB prices (low, middle and high) before and after the implementation of a one Mexican peso per SSB liter in 2014.

Design: Based on urban household purchase data from 2012 to 2015, we calculated unit-value SSB prices for the full period and sorting them on a monthly basis to create monthly price tertiles. We merged these price tertiles to household purchases and created average monthly per capita per day (PCPD) SSB purchases by price tertile at the city level. We assessed SSB purchase switching patterns before and after the tax implementation through price-tertile stratified linear models. The main variable in the models was a dummy variable that allowed us to identify the pre-tax period (2012-13) and post-tax period (2014-15).

Setting: Cities with a population >50,000 inhabitants in urban Mexico.

Participants: 6,645 households aggregated across 54 cities, with 48 months of data.

Results: We found a statistically significant purchase reduction of 14.38 ml/capita/day (p-value<0.001) across taxed beverages from the middle-price SSB after the tax implementation and no statistically significant purchase change for low- and high-price SSB.

Conclusions: Our findings show purchase reductions in the middle-price SSB, which represents ≈30% of the overall SSB purchases in urban Mexico. Larger SSB price increases might lead to purchase reduction across the full price distribution

Taxation on Added Sugar: An Analysis of the Effects on Food Acquisition of Households in Brazil

PRESENTER: **Rhamon Talles**, FGV EESP

AUTHORS: Larissa BARBOSA Cardoso, Marco Tulio Aniceto Franca, Lorenzo Luis Bianchi

BACKGROUND: Food and beverage tax policies have been used in several countries as an important tool to promote changes in eating habits, such as excessive sugar consumption. In general, the consumption of sugar above the recommended values is associated with a series of chronic diseases,

such as obesity and diabetes, requiring the proposition of public policies that improve the quality of food.

OBJECTIVES: The objective of this study is to estimate the price elasticity of demand for food in Brazil in order to assess the potential response of household food consumption to a tax based on the added sugar content.

METHODS: We use microdata from the 2017-2018 Household Budget Survey, which collects information about expenditures made by Brazilian families with items such as drinks and food. We estimate a Quadratic Almost-Ideal Demand System (QUAIDS) to obtain own and cross price elasticities. The food group considered was: Cereals, Vegetables, Fruits, Flours, Baked Goods, Meats, Poultry, Dairy Products, Sugars, Salts, Oils, Sweetened Drinks, Other Drinks, Preparations and Others. We take into account the censored data and the endogeneity present in the expenditure data. The simulated tax was 1% per gram of sugar tax on all products with added sugar.

RESULTS: Households located in rural areas, households with children and adolescents acquire more added sugar. And female-headed households tend to buy less foods high in added sugar, like sugars and sweetened drinks. Most food groups are price-elastic, with the exception of the prepared food group which has -0.12 elasticity. Sweetened beverages (-4,055) and Cereals (-3,223) are more sensitive to price than the other groups, so the variation in consumption is proportionally greater with regard to the variation in price. The tax on foods and beverages with high added sugar content is associated with a greater reduction in household purchases of unhealthy foods. In addition, the tax increases the purchase of healthy foods, such as fruits and vegetables.

CONCLUSION: This study shows that the tax on added sugar should promote a healthier diet, reducing the purchase of foods with a high content of added sugar and increasing the purchase of foods without added and with high nutritional value.

6:45 PM –7:45 PM MONDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ORGANIZED SESSION: Cannabis, Opioids, and Public Health Outcomes

SESSION CHAIR: **Rhet A Smith**, University of Arkansas at Little Rock

DISCUSSANT: **Justine Mallatt**, Bureau of Economic Analysis; **Jacqueline Doremus**, California State Polytechnic University, San Luis Obispo; **Eunsik Chang**, University of Tennessee

Condoning More Codones: Florida's Opioid Trafficking Law and Opioid Mortality

PRESENTER: **Eunsik Chang**, University of Tennessee

Conditional on a set population of opioid-dependents, opioid fatalities are a function of the total quantity available and the ease of accessing that quantity. While other studies examine policy changes affecting aggregate supply, I focus on the effects of easing access by changing the trade costs of moving opioids to heavy users. I exploit a quasi-experiment in Florida that raised the statutory minimum weight thresholds that trigger mandatory minimum sentencing for illegal possession, manufacture, or trafficking in prescription painkillers (oxycodone and hydrocodone). Using synthetic control, I find that the revised legislation increases opioid-related mortality. The corresponding economic cost, based on the value of a statistical life, exceeds the expected benefit from averted incarcerations. Further, I find no effect on the opioid prescription retail dispensing rate.

Investigating Sources of Variation in Opioid Overdose Rates: The Role of Injuries

PRESENTER: **Justine Mallatt**, Bureau of Economic Analysis

While on-the-job injuries are cited as a possible cause of differing opioid misuse severity across the landscape of the United States, there is little research causally linking injuries and opioid overdoses. I measure the elasticity of injuries on opioid overdoses, using mass-layoff events exogenously-timed shocks to rates of work-related injury, exploiting layoffs in more injury-prone industries as the main source of treatment variation. The resulting elasticity of injury rates on opioid overdoses is small but significant, implying that doubling the rate of on-the-job injuries results in a 2-6% increase in the rate of opioid overdoses. Results imply that workplace injuries play a very minor role in the overall magnitude of the opioid crisis, and measures taken to improve workplace safety will have limited power to prevent adverse health outcomes caused by opioid use.

Cannabis Legalization: A Demand Shock to Pharmaceutical Markets

PRESENTER: **Jacqueline Doremus**, California State Polytechnic University, San Luis Obispo

Cannabis legalization has been shown to reduce prescription and over-the-counter medication use across drug classes. We estimate the effects of cannabis legalization on pharmaceutical markets using stock market valuations of publicly traded drug makers. Borrowing tools from finance, we use an event study of cumulative abnormal returns (CARs) around the time of cannabis legalization to assess the expected demand shock resulting from cannabis legalization on publicly traded pharmaceutical firms overall and across generic and branded drug markets. We find that market valuations for pharmaceutical firms overall decrease in response to cannabis legalization, but there are opposing effects for the expected profitability of generic versus branded drugs. Consistent with the evolving literature on generic entry, the market valuation of generic drug makers declines while the market valuation of branded drug makers increases. The average economic impact of a legalization event on the generic market reaches between $15 billion and $20 billion. Investors in major publicly traded pharmaceutical companies appear to recognize the potential impact of cannabis sales on their profits before the first gram of legal cannabis is sold. We then test whether changes in investors' expectations are reflected in changes in Medicaid prescribing using data from 2006-2017. We find little change in the quantity of prescriptions while generic drug prices fall. These effects are similar to generic drug entry and are consistent with investors' expectations.

The Effect of Medical Cannabis Dispensaries on Opioid and Heroin Overdose Mortality

PRESENTER: **Rhet A Smith**, University of Arkansas at Little Rock

Opioid overdose is the most common cause of accidental death in the United States and no policy response has been able to contain this epidemic to date. While studies have found early medical cannabis laws to be associated with significant declines in opioid mortality, recent work critiques the state-level analyses and argues this association has reversed in recent years. Using a novel dataset of dispensary locations, this paper exploits within-state variation in access to cannabis to re-examine the relationship between medical cannabis legalization and opioid-related mortalities. This more granular approach overcomes concerns of confounded state-level estimates and allows us to isolate the impact of a cannabis dispensary on opioid overdose deaths at the county level. We find opioid-related deaths increase following medical cannabis legalization. These effects, however, are mitigated by the presence of dispensaries. The negative effect of dispensaries on opioid deaths are strongest among women and those in their forties.

8:15 PM –9:15 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

Cost-Effectiveness of Acute Care

MODERATOR: **Shehzad Ali**, Western University

Acute Care Costs of Pediatric Sports-Related Head Injuries in Australia: The Australasian Paediatric Head Injury Study (APHIRST)

PRESENTER: **Sonia Singh**, The University of Melbourne

AUTHORS: Stephen J.C. Hearps, Kim Dalziel, John A. Cheek, Vicki Anderson, Jeffrey S. Hoch, Franz E. Babl

Objective: Sports-related head trauma is one of the most common mechanisms of injury in children. The annual cost of admissions for all sports-related injuries for children aged ≤16 years in Australia is approximately $40 million. We aimed to compare the acute care costs for emergency department (ED) presentations of pediatric head injuries across the common sports.

Methods: This was a cost analysis of a multi-center prospective observational study of 17,841 Australian children <18 years-old with head trauma. In children 5 to 17 years, sports-related head injuries were identified using the International Classification of Diseases 10th revision-Australian Modification (ICD-10-AM) activity codes U50-U71. High-speed sports were characterized to include bike riding, scooter, skateboarding, horse riding, snow sports, ice skating, rollerblading, roller skating, and skating (unspecified). Contact sports included rugby, Australian football league (AFL), football-unspecified, martial arts, and boxing. We stratified child-age in years into two groups (younger: 5 to 11) and (older: 12 to 17). Traumatic brain injury (TBI) severity was dichotomized as mild and moderate/severe. Mild TBI was defined as Glasgow Coma Scale scores 13-15, no neurologic deficits, and negative neuroimaging. Taking a public-sector healthcare perspective, we applied costs from a single pediatric site to patient-level data and estimated acute care costs for ED visits and hospital admissions. All costs were inflated to 2018 Australian dollars ($).

Results: The acute care costs were $2.7 million for 2,812 children with an average cost per episode of $954, 95% confidence interval (CI): $832-$1084. The younger age-group accounted for 44% of children and 38% of acute care costs ($1 million). The acute admissions in 33% of the cohort accounted for 76% of acute care costs ($2.0 million), with average cost $2,187, 95% CI: $1,806-$2,568. High-speed sports in 33% of the cohort, the most common head injury mechanisms were associated with 58% of acute care costs ($1.6 million) and 68% of the admissions cost ($1.4 million). The sport with the highest acute care costs in younger children was bike riding ($355,000) with average cost per episode $1,522, 95% CI: $1,036-$2,008, and skateboarding for older children ($430,000) with average cost per episode $3,797, 95% CI: $1,082-$6,512. Mild TBI occurred in 94% of children and was associated with 69% of acute care costs ($1.8 million). Horse riding was associated with the most moderate/severe TBI in both age groups. Contact sports in 32% of the cohort were the most common mechanisms of head injury in older children, accounting for 21% of acute care costs ($568,000), with AFL in 11% of the total cohort associated with the most ED discharges, and 7% of acute care costs ($186,000) with the average cost per episode $608, 95% CI: $502-$713.

Conclusion: Sports-related head trauma is associated with substantial acute care costs. Injury prevention strategies should focus on targeted age-related mechanisms to reduce TBI in children. Laws enforcing helmet use for skateboarding similar to bike riding could significantly impact head injuries in older children. This study provides evidence to support the development of a national sports injury prevention strategy for children in Australia.

Mitigating Hospital Capacity Concerns: A Cost-Utility Analysis of Remote Pulse-Oximeter Monitoring of COVID-19 Patients

PRESENTER: **Marcella A Kelley**
AUTHORS: Bryson H Choy, Samuel Crawford, Marlea A Miano, Riley Grosso, Peter Pronovost, William V Padula

OBJECTIVES: As of November 2020, COVID19 has infected over 11 million people in the US and killed over 250,000. Each infection surge leads to increased emergency department (ED) utilization and subsequent critical care admission for patients with acute respiratory distress syndrome. While many individuals fall ill with serious symptoms, not all COVID19 patients necessitate a ventilator, and therefore can remain safely at home to minimize the spread of infection and manage hospital capacity concerns. Remote Bluetooth-enabled pulse-oximeter monitoring of most moderate-to-severely ill COVID19 patients can be used to closely monitor escalations in symptoms and trigger visits to the hospital if necessary. Our objective was to analyze the cost-effectiveness of remote pulse-oximeter monitoring to reduce facility burden and health system expenditures.

METHODS: We analyzed the cost-utility of home-monitoring with pulse-oximetry using a Markov model over a 3-week time horizon in daily cycles from a US health sector perspective. Cost and outcome measures were derived from real-world evidence of pulse-oximetry monitoring in the Cleveland community through University Hospitals. Pulse-oximetry monitoring was implemented for patients presenting at the ED with respiratory symptoms but not necessitating immediate critical care. Patients were then remotely monitored by trained experts for up to 4-days until recovery or a second ED visit. Additional parameters were extracted from published literature. Costs (2020 U.S. dollars) and quality-adjusted life years (QALYs) were used to determine the incremental cost-effectiveness ratio (ICER) and incremental net monetary benefit at a cost-effectiveness threshold of $100,000/QALY. Model uncertainty was assessed using univariate one-way and probabilistic sensitivity analyses.

RESULTS: Model results demonstrated that remote pulse-oximetry monitoring dominated current standard care for COVID19 patients based on reduced costs and increased QALYs. Fewer patients were admitted to the hospital, were admitted to the intensive care unit, or died in the cohort with access to remote pulse-oximetry monitoring compared to the cohort without. Individuals with access to remote pulse-oximetry monitoring averaged $49,176 and 0.03 QALYs, whereas standard care increased average costs to $113,792 and decreased QALYs to 0.02 over the 3-week time horizon. The resulting incremental net monetary benefit was $65,557. The resulting ICER was not sensitive to uncertainty ranges in the model.

CONCLUSIONS: Remote pulse-oximetry monitoring of symptomatic COVID19 patients increases the specificity of those requiring immediate medical follow-up. We recommend adoption of this technology across health systems to cost-effectively manage COVID19 volume surges, maintain patients' comfort, reduce spread of infection in the community, and carefully monitor the needs of multiple individuals from one location by trained experts.

Value in Discovering Unruptured Intracranial Aneurysms (VIDUA) Study: A UK-Based Cost-Effectiveness Analysis

PRESENTER: **Yael Rodriguez-Guadarrama**, Maple Health Group, LLC
AUTHORS: Asfand Mirza, Fouzi Bala, Ahilan Kailaya-Vasan, Thomas Booth, Mark Pennington

Background

Technological advancements and the expansion of radiological imaging has increased considerably the number of incidental findings of unruptured intracranial aneurysms (UIAs). The majority of UIAs do not require emergency action and may not rupture in a lifetime. Nonetheless, a rupture carries a significant mortality or cognitive impairment risk. Considerable debate remains on the appropriate management of UIA. Furthermore, the benefit to patients of discovering UIAs versus a scenario of no discovery has not been established.

Methods

We devised a probabilistic Markov decision-analytic model to compare cost and consequences of current management of UIAs at King's College Hospital against two hypothetical scenarios where a) no further treatment is offered and b) discovery never occurred. Risk engines from the International Study of Unruptured Intracranial Aneurysms (ISUIA) provided the risk of rupture in the base case. We used retrospective data on 353 and 814 patients with UIAs and ruptured intracranial aneurysms (RIAs), respectively, to estimate transition probabilities and health care resource use. We valued resource use from a health and social care perspective. Outcomes were measured as quality adjusted life-years (QALYs) and health state utility tariffs were sourced from the literature. Costs and outcomes were discounted at 3.5% per year. We used these data to simulate cerebrovascular health states of a hypothetical 1000-patient cohort of 60-year-old males and females with UIAs over 30 years. Cost-effectiveness is presented as incremental cost-effectiveness ratios (ICERs) at accepted cost-effectiveness thresholds (CETs) in the UK. Cost-effectiveness acceptability curves (CEACs) were constructed to reflect parameter uncertainty. Structural sensitivity analysis was conducted using the PHASES risk prediction model.

Results

In the base case, current management is costlier and more effective than no discovery in men and women. The incremental costs amount to £3,401 in men and £3,244 in women, while the additional life years (LYs) and QALYs total 1.13 and 0.25 in men; and 1.1 and 0.31 in women. The ICERs for current management against no treatment are £13,558 and £10,627 (per QALY) for men and women, respectively. Costs and LYs differences remain the same when current management is compared to no discovery, while QALY gains are slightly reduced (0.19 and 0.25 for men and women). ICERs for current management versus no discovery are £17,405 and £13,221, for males and females respectively. The CEACs indicate that the probability of current management being cost-effective at a £20,000/QALY CET is above 70% compared to no treatment in men and women. When compared to no discovery, the probability of current management being cost-effective is around 60% for men and 70% for women at a £20,000/QALY CET. Results are sensitive to the choice of rupture risk estimates; current management is not cost-effective when PHASES risk model is applied.

Conclusions

The relatively conservative management strategy for UIAs practised in the UK is cost-effective. The findings support the approach to management of UIAs in the UK, relative to no action post diagnosis. They also provide some indication for the implementation of a potential cost-effective screening programme.

8:15 PM –9:15 PM MONDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: The Full Societal Benefits of Vaccination

SESSION CHAIR: **Daniel Cadarette**, Harvard T.H. Chan School of Public Health

DISCUSSANT: **Saad Omer**, ; **Hannes Schwandt**,

Economic Evaluation of Infant Vaccination Using a Social Welfare Function Approach

PRESENTER: **Maddalena Ferranna**, Harvard T. H. Chan School of Public Health

AUTHORS: Daniel Cadarette, JP Sevilla

An increasing amount of evidence points to the broad health, social and economic benefits of vaccination. However, standard cost-effectiveness analysis is not well-suited to deal with such a complexity because it neglects the complex interactions between health and other aspects of life on individuals' well-being. Practically, it is not clear how to trade-off health and non-health benefits in a cost-effectiveness approach.

The paper develops a framework based on social welfare analysis to assess the full impacts of vaccination and to express them in a single value-for-money metric. The methodology comprises two steps. First, we measure the joint health, social and economic impact of vaccination on the individual well-being accounting for individuals' preferences and trade-offs between health and non-health attributes. Second, we aggregate individuals' well-being gains and losses to determine the overall value of vaccination, where the choice of the aggregation method reflects distributional considerations.

The method is close in spirit to benefit-cost analysis since we use the individual willingness to pay for vaccination as a measure of the full vaccination impact at the individual level. However, the use of a social welfare function to aggregate individuals' well-being impacts allows us to reject the ethically objectionable implication of benefit-cost analysis that the interests of the wealthy matter more since they have a higher ability to pay, and, consequently, a higher willingness to pay for a given impact of vaccination.

In the paper we build a health-augmented life-cycle model that describes individuals' behavior throughout their lifetime (in terms of consumption, savings, education, occupation, etc.), and how lifetime well-being depends on these choices and on individuals' characteristics such as income, life expectancy, health status, etc. Vaccination will have a direct impact on individuals' characteristics (notably, the health status and life expectancy, but also labor productivity, medical expenditures, learning attitudes, etc.), and an indirect impact on individuals' behavior if changing those characteristics has a first-order effect on behavior. We theoretically derive a formula that expresses the hypothetical individual's willingness to pay for vaccination accounting for all the positive net impacts that vaccination has on individual well-being.

Using publicly available data on incidence and fatality rates of a set of diseases, as well as data on consumption, saving, and time use patterns in a set of industrialized and developing countries, we numerically estimate the individual willingness to pay for vaccination, and assess how it varies across countries and diseases.

Then, we aggregate the individuals' willingness to pay for vaccination through a concave social welfare function to derive the full social value of vaccination, and to investigate the importance of distributional considerations. We find that vaccines against diseases that affect mainly the poor are more valuable than what a standard cost-effectiveness approach would find.

The Effect of Childhood Vaccines in Reducing Antimicrobial Use in India

PRESENTER: **Emily Schueller**, The Center for Disease Dynamics, Economics & Policy

AUTHOR: Arindam Nandi

Antimicrobial resistance (AMR) is a global public health threat, but nowhere is it as stark as in India. India has among the highest antimicrobial resistance rates among bacteria that commonly cause infections in the community and in healthcare facilities. Resistance to the broad-spectrum antimicrobials fluoroquinolones and third-generation cephalosporins was more than 70% in *Acinetobacter baumannii, Escherichia coli,* and *Klebsiella pneumoniae*, and more than 50% in *Pseudomonas aeruginosa*. Resistance to last-resort antimicrobials was also high, with carbapenem resistance in 56.6% of *pneumoniae* isolates and more than 65% of *A. baumannii* isolates. Antimicrobial use is an important driver of antimicrobial resistance, and India was the world's leading consumer of antimicrobials in 2014. Vaccines are a key intervention that can prevent infections and lower the demand for therapeutic treatments, reducing use of antimicrobials and in turn slowing the rise of drug resistance. India has recently undertaken major steps towards modernizing its Universal Immunization Program (UIP) and expanding its vaccine portfolio. We use spatial and temporal variations in the introductions of the rotavirus vaccine (RVV), Hib-containing Pentavalent (Hib) vaccine and pneumococcal conjugate vaccine (PCV) to statistically estimate the impact of vaccine introduction on antimicrobial consumption. The core of our methodological approach is a well-validated, agent-based microsimulation model (ABM) called IndiaSim, which captures geographic and temporal variations in population, health services provision, socio-demographic characteristics, immunization status, and antimicrobial consumption in India. We use data obtained from vaccine rollouts to parameterize IndiaSim and simulate various policy scenarios. The benefits are measured in terms of reducing the burden of respiratory and diarrheal diseases, and antimicrobial use. We measure the number of incident cases, deaths, disability-adjusted life years (DALYs), out-of-pocket treatment expenditure, and use of antimicrobials and associated costs that would be averted by scale-up of the vaccines.

The Impact of Full and Timely Vaccination on Cognition and Educational Attainment in Children: A Pilot Study in India

PRESENTER: **Anita Shet**, Johns Hopkins School of Public Health

AUTHORS: Baldeep K Dhaliwal, Riti Chandrashekhar, Ananya Rattani, Himani Khanna, Daniel Cadarette, Rajeev Seth

Complete and timely immunization of children is an investment in human capital. Immunization results in children free from vaccine-preventable illnesses who are able to attain their full cognitive potential, leading to a productive society that achieves higher economic returns. We hypothesize that full immunization in early childhood (1-2 years of age) contributes towards improvements in early cognitive development and educational attainment. To assess feasibility, we conducted a pilot study to evaluate enrolment of young children, retention administration of relevant tests. Using a mixed-methods approach we aimed to understand perceptions of children's caregivers and community stakeholders on the benefits and value of vaccines.

The pilot study was conducted in Mewat District in Haryana, India, an area with extremely low vaccination coverage. Between November 2019 and November 2020, we enrolled 60 adults and 50 children in the age group of 18 months to 8 years (20 children aged 18-35 months; 10 children aged 36-71 months and 20 children aged 6-8 years). The following assessments were performed on enrolled children: socio-demographic and clinical assessment, nutritional and environmental care assessments, and age-appropriate culturally adapted cognitive function tests, (Bayley Scales of Infant Development-III, Stanford Binet test, and the Wechsler Intelligence Scale for Children-IV). Our findings showed that documented vaccination information was difficult to obtain for many children because of lack of home-based records. Labor-intensive strategies such searching village vaccination registries were often needed. Skipping of school was common, even in pre-lockdown days. We saw limited engagement with children by caregivers both before the national lockdown and at present. Overcoming these challenges and inclusion of more diverse sites would be important for the larger hypothesis-driven study.

We conducted six focus group discussions with 60 participants in the following categories: fathers of children under-5 years old, expectant mothers, mothers-in-law, community health workers, and community influencers such as locally elected officials and religious leaders. Our results highlighted four themes that influence vaccine uptake. While caregivers associated vaccinations with reductions in specific diseases, they noted that vaccination services also brought broad health gains, including nutrition, antenatal guidance, and social support. Second, community health workers played a critical role in influencing, positively or negatively, caregivers' vaccination perceptions. Third, community health workers faced gaps in their

education such as limited training on vaccine side-effects, which placed them at a disadvantage when dealing with families. Finally, we found that mothers-in-law, fathers, and religious leaders wielded decision-making power and influence over perceptions of vaccinations. These results indicate that communication of the broader benefits of vaccinations and vaccination services by community health workers, and community stakeholders, using a 'bottom-up' approach could be impactful in increasing vaccine acceptance. We anticipate that the results of the main study will likely increase public confidence in vaccines, and spur policy and action towards maintaining a healthy and productive society.

The Effect of a Prospective Vaccine Against Group a Streptococcus on Global Antibiotic Consumption for Sore Throat

PRESENTER: **Mr. Jeffrey Cannon**, Telethon Kids Institute

AUTHORS: Kate Miller, Daniel Cadarette, Daniel Cadarette, Chris Van Beneden, Jonathan Carapetis

INTRODUCTION: Sore throat is a primary reason for self-prescribed antibiotic consumption in many countries where antibiotics are sold without prescription, and many people who visit a physician with a sore throat expect to be prescribed antibiotics in regulated countries. Sore throats are often caused by a viral or bacterial infection, but antibiotics are only effective in treating bacterial infections. Group A *Streptococcus* (Strep A) is the predominant bacterial pathogen responsible for sore throats ('strep throat') and is also the cause of acute rheumatic fever and rheumatic heart disease (RHD); RHD was estimated to cause more than 300,000 deaths globally in 2015.

A vaccine that prevents Strep A would plausibly reduce not only appropriate antibiotic consumption for strep throat, but also inappropriate consumption for sore throats caused by viruses. The objectives of this study were to estimate the global rate of antibiotic consumption for sore throat and the expected reduction in consumption due to an effective Strep A vaccine.

METHODS: We conducted a systematic literature review for studies on the rate of antimicrobial consumption for sore throat, including pharyngitis and tonsillitis. We included studies published since 2000 for any country. We excluded studies on attitudes towards antibiotic consumption, consumption among medical students, and self-prescribed consumption among people recruited from pharmacies. The main measures were the proportion of people who consume antibiotics among those with a sore throat and the annual rates of antibiotic consumption for sore throat among the general population.

Three meta-analyses of the annual rates of antibiotic consumption for sore throat were conducted to estimate the rate at a global level. The first was an analysis of consumption for all-cause sore throat. The second was an analysis of consumption for confirmed (through point-of-care or laboratory testing) strep throat. The last was an analysis of consumption for the number of sore throats expected to be caused by Strep A, where the number of Strep A sore throats was estimated for each reviewed study based on data from a systematic review of the proportion of sore throats attributable to Strep A globally.

RESULTS: Preliminary findings indicate that, among primary care patients, antibiotics were prescribed to more than half of sore throat patients of any age, except for older adults (≥65 years-old). Antibiotics were prescribed to almost all patients with a positive point-of-care test, but antibiotics were also prescribed to a large proportion of patients (>30%) with negative test results. Data analyzed from the U.S. and Japan suggested that the rate of antibiotic consumption for sore throat was driven by high rates of sore throat among children and high rates of antibiotic prescription among adults conditional on having sore throat. Data from countries in which antibiotics are sold without prescription confirmed that sore throat is often the top reason for self-medication. We expect our final results will demonstrate that global antibiotic consumption for sore throat occurs at a rate in excess of 78 million courses per year, or more than one course per 100 persons per year.

8:15 PM –9:15 PM MONDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ECONOMICS OF OBESITY SIG SESSION: Food Prices, Consumption and Welfare

MODERATOR: **Andres Vecino-Ortiz**, Johns Hopkins University Bloomberg School of Public Health

Declining Food Prices Can Increase Welfare Despite Increasing Obesity: Evidence from the North American Free Trade Agreement (NAFTA) in Mexico

PRESENTER: **Tara Templin**, Stanford University

AUTHORS: Prof. Grant Miller, Enrique Seira, Jay Bhattacharya

In wealthy and poor countries alike, obesity and related chronic disease prevalence rates are rising. Although the rise of obesity is unambiguously bad for population health, in this paper we propose that from an economic perspective, it may not be unambiguously bad for social welfare if declining real food prices play an important role. To make this issue concrete, we study the North American Free Trade Agreement (NAFTA) and food prices in Mexico. Exploiting the staggered implementation of NAFTA provisions across different food types of foods (and using NAFTA-related food tariff repeals as instruments), we find that repeals decreased food prices by 15-30%, increased consumption of unhealthy foods – and that food price reductions in Mexico explain about 30% of type-2 diabetes incidence and 20% of obesity incidence. Importantly, however, estimating a demand model that directly incorporates how consumers value future health via hedonic prices, we find that consumer welfare gains due to falling per food prices outweigh the adverse health consequences of rising bodyweight.

Estimating Food Price Elasticities for Policy Interventions: Analyzing Food Demand in a Virtual Supermarket Under Expert Priors from Observational Studies

PRESENTER: **Dr. Liana Jacobi**, The University of Melbourne

Diet-related risk factors (e.g., obesity, low fruit and vegetable intake, and high salt intake) now form the most important risk factor set for the global burden of disease, with poor diets estimated to be responsible for 9.6% of the global burden of disease. Several countries have already introduced different types of food taxes and subsidies with the aim to improve dietary and health outcomes. While the number of studies on food taxes and subsidies is growing rapidly given their increasing popularity, concerns regarding the quality of the evidence remains.

Food price elasticities (PE) are essential for evaluating impacts of food pricing interventions used to improve dietary and health outcomes. However, PE estimations and in particular cross PEs are often poor, being based on single observational data sets without much variation in prices and lacking precision information. In this paper we provide an innovative demand analysis of a virtual supermarket experiment to improve the estimation of a comprehensive set of food price elasticities (PE) across all major food groups, an essential input for the assessment and design of health policies. We propose the analysis under a Linear Almost Ideal Demand System (AIDS) that incorporates PE results from observational data studies via prior assumptions within a Bayesian estimation framework. An expert prior that combines published PE estimates and expert judgement is introduced within the multi-stage demand framework to obtain PE estimates, including precision, for a total of 23 food groups.

Our approach combines the strength of the experimental setting, such as exogenous price variation and control over food group design, and observational studies, based on larger sample sizes, to improve the identification and precision of price response estimates. Our estimation framework exploits key features of the Bayesian approach to incorporate estimates from available and suitable observational studies as prior information within a multi-stage demand framework, often used in demand analysis across food groups. Further, crucial precision information for PE estimates is readily available under the simulation-based inference with standard Markov chain Monte Carlo methods.

Under expert-based weights of the prior PE information, we find oPEs ranging from -0.3 to -2.6, half of them indicating elastic goods with moderate complement and substitute effects. Incorporating prior knowledge, oPE estimates change on average by 0.31 in absolute terms, which amounts to an average change by 59 percent. Our analysis identifies a substantial improvement in the precision of the PE estimates (standard deviations on average 10% lower for oPEs and 29% lower for cPEs) when including prior information. Magnitudes of the estimated oPEs effects on average change by 59, and for cPEs on average by 83 percent, yielding stronger price responses and complementarity across foods, with some implications on magnitudes and precision of demand change predictions under commonly considered policy scenarios. We also illustrate how our empirical PE estimates of 23 food groups, can be used for policy analysis such as soft drinks taxes and show impacts on magnitudes of nutrition choices from policy interventions as well as improvements in the precision the predicted choices.

An Extended Estimation of Sugar-Sweetened Beverages and Alcoholic Drinks Demand in Colombia (2016-2017)

PRESENTER: **William Garcia**, PROESA/ Universidad ICESI

AUTHOR: Norman Maldonado

Background. Non-Communicable Diseases (NCDs) are unhealthy- diet and alcohol related. Sugar-Sweetened Beverages (SSB) over-consumption is a major driver of unhealthy diets. Alcoholic Drinks (AD) consumption in excess is also a public health concern. SSB and AD demand analysis are valuable for highlighting gaps in dietary/alcohol surveillance and determining SSB/AD reduction targeted policies.

Purpose. To estimate total consumption and joint demand elasticities for SSB/AD in Colombia using national representative data. These are key parameters for predicting a potential reduction in SSB demand caused by a possible implementation of SSB/AD consumption taxes, and for monitoring NCDs control policies.

Methods. We analyze purchases data from the Colombia Household Survey of Income and Expenses 2016-2017 (ENPH). The objective is to make inferences about population consumption and expenses in SSB/AD using sample survey analysis. We complement the analysis with public data on manufacturing and international trade.

The survey codifies household purchases in SSB and AD using the standard COICOP classification. Nevertheless, it does not correctly codify SSB purchases for out-of-household consumption (restaurants, pubs, cafes, etc.). We apply text analysis to identify SSB/AD purchases in survey respondents' description to re-codify purchases un-codified with COICOP. Thus, we can estimate total consumption and expenses in SSB/AD as the sum of codified and re-codified purchases.

We estimate a Quadratic Almost Ideal Demand System (QAIDS) using codified and re-codified purchases. QUAIDS includes SSB, AD, and other drinks to derive SSB/AD price, cross-price, and income elasticities. We use mean "unit values" as a proxy for prices, and expenses to compute budget shares.

Results. We estimate that 82% of 14.3 million Colombian households purchase SSB and 27% purchase AD. Estimated total consumption of SSB is 40 liters per capita (lPC) for SSB and 9.2 lPC for AD. These values are lower than apparent consumption estimated with supply data: 95.4 lPC in SSB and 55.4 lPC for AD.

Own-price SSB elasticity estimated using total consumption is -0.80, while if we only model home/codified consumption, price elasticity is -1.14. This result suggests that price elasticities in the literature that only considers home/codified purchases could be over-estimated. Similar findings were detected in AD analysis. We also find that SSB consumption is complementary rather than a substitute for AD. This result means that public health interventions to reduce SSB demand can also diminish AD consumption. Finally, we show that a 30% excise tax on SSB could be effective in reducing SSB demand by 24% and could generate revenues of about 4% of the Colombian Health System budget.

Contribution. Survey data allow us to estimate and characterize the joint demand for SSB and AD. Paper contributions are: 1) It corrects survey data and quantifies the bias in price elasticities introduced by usual survey encoding limitations. 2) It jointly analyzes SSB/AD demand, which is useful from a public health perspective. 3) It contributes to the literature that estimates SSB/AD elasticities in Latin America countries. The main limitation is that SSB/AD aggregate demand underestimation remains despite imputation and re-encoding. Further market analysis must be completed with additional information sources.

8:15 PM –9:15 PM MONDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Inequalities in Health and Health Care Use

MODERATOR: **Marcia Weaver**, University of Washington

Inequalities in Health between Non-Indigenous and First Nation Populations Living Off-Reserve in Canada: A Decomposition Analysis

PRESENTER: **Min Hu**, Dalhousie University

AUTHORS: Yukiko Asada, Amy Bombay, Dr. Mohammad Hajizadeh

First Nations populations have been experiencing considerably lower health outcomes in Canada. Using the adult subsamples (aged 18 and above) of First Nations peoples from the 2017 Aboriginal Peoples' Surveys (APS) and non-Indigenous populations from the 2017 Canadian Community Health Surveys (CCHS) we examined inequalities in health between registered and non-registered First Nations peoples (RFN and NRF, respectively) living off-reserve and the non-Indigenous population in Canada. We employed the Blinder-Oaxaca (BO) decomposition approach to decompose inequalities in five measure of health outcomes (self-reported poor/fair general and mental health status, prevalence of obesity, diabetes and asthma) into two parts: a part due to deferential distribution of the determinants of health between the two population (explained part), and a part due to the difference in the effect of these determinants and unobserved factors (unexplained part). Results showed worse health status of First Nations peoples compared to the non-Indigenous population in all five measures of health outcomes: self-perceived poor/fair general health (RFN 22.3%, NFN 23.3% and non-Indigenous 9.12%) and poor/fair mental health (RFN 16.2%, NFN 18.2%, and non-Indigenous 8.08%), prevalence of obesity (RFN 39.5%, NFN 36.5% and non-Indigenous 29.5%), diabetes (RFN 10.8%, NFN 9.2%, and non-Indigenous 4.8%), and asthma (RFN 13.4%, NFN 17.2%, and non-Indigenous 8.8%). We found that deferential distribution of the determinants explained 30% to 50% of the gap in self-perceived poor/fair mental health, obesity and diabetes between First Nations peoples and non-Indigenous populations. The differential distribution of socioeconomic status between First Nation peoples and non-Indigenous population explained a significant proportion of the differences in self-perceived poor/fair mental health, obesity and diabetes. Improving socioeconomic status of First Nations peoples through policies such as income equalization may reduce inequalities in health outcomes between First Nations and non-Indigenous populations in Canada.

Income-Related Inequities in Healthcare Utilization in Canada: 2000-2014

PRESENTER: **Laura Hirello**

AUTHORS: Mohammad Habibullah Pulok, Dr. Mohammad Hajizadeh

The Canada Health Act (CHA, 1984) recognizes the need for "universality" and "accessibility" in healthcare. Although the CHA eliminates direct financial barriers to physician and hospital services by making them free at the point of service provision, inequities (unfair inequalities) in healthcare utilization remain a major challenge in the Canadian healthcare system. This study, for the first time, sought to assess trends in income-related inequities in healthcare utilization within the Canadian healthcare system. Using ten cycles of the Statistics Canada Canadian Community Health Survey (CCHS, 2000–2014) we measured income-related inequities in the utilization of three measures of healthcare utilization *viz.*, general practitioner (GP), specialist physician and hospital admissions. The horizontal inequity (HI) index was used to quantify and assess trends in income-related inequities in healthcare utilization in Canada, urban and rural areas, as well as in all provinces from 2000 to 2014. The HI results suggested significant pro-rich inequities in the utilization of GP and specialist visits in all CCHS cycles in Canada as a whole. In contrast, the probability of hospital admission was found to be pro-poor over the study period. Stratified analyses by province and urban and rural areas also suggested similar findings. Pro-rich inequity in GP visits was found to be present at magnitudes similar to pro-rich inequity of specialist visits. This finding was consistent in all cycles and geographical areas. Trend analysis demonstrates inequity of GP use became more pro-poor in New Brunswick, but more pro-rich in Prince Edward Island and Quebec. This study demonstrated persistent income-related inequities in healthcare utilization in Canada. As the services examined in this study are free at the point of use, income-related inequities in the utilization of these healthcare services indicates the presence of non-financial barriers. The large magnitude of pro-rich inequity in GP utilization is of particular concern in Canada because not only GP services are key entry point into the healthcare system, but also most of these services are preventative in nature.

Effect of Medicaid Dental Coverage on Dental Care Utilization Among Low-Income Adults

PRESENTER: **Mr. Yifan Zhu**, University of Delaware

AUTHORS: Charles R Link, Simon Condliffe

Income-based disparities in dental health have long been an issue in the United States. Despite the importance of maintaining good oral health, many low-income adults remained uninsured for dental care. Medicaid serves as the primary source for many low-income adults who cannot obtain private dental insurance. Since states have the flexibility to determine dental benefits provided to Medicaid enrollees, it is no surprise that benefits vary widely from state to state. Adult Medicaid dental benefits have four different tiers ranging from comprehensive to no coverage. We apply a difference-in-difference approach and a synthetic control approach to examine Medicaid's multivalued treatment effects on dental utilization by low-income adults' over the period 2002 through 2016. This period is especially noteworthy since it encompasses the Great Recession and the implementation of the PPACA, and the expansion of Medicaid. These events brought about both state-to-state and year-over-year changes in the level of adult Medicaid dental coverage and Medicaid eligibility. Using the Medical Expenditure Panel Survey data (MEPS) and other supplementary datasets, our results show that an increase in the comprehensiveness of the state Medicaid dental benefits leads to an increase in the probability that a low-income non-elderly adult visited a dentist in the previous year. The more generous the coverage, the stronger the effect. We also examined the effect of the Medicaid Expansion on dental coverage and dental care use among low-income adults. Our results indicate that Medicaid expansion has increased the dental coverage in states that expanded Medicaid, but there is no significant improvement in dental care utilization from low-income adults. Other barriers might prevent Medicaid patients from accessing dental care. In addition to expanding Medicaid eligibility, increasing the level of dental coverage benefits could have a more direct impact on improving dental care use among low-income adults. Our results may shed light on how we can alleviate the gap between low-income and other income groups regarding dental care access.

Keywords: Medicaid, dental care, health inequalities, panel data, causal inference, difference-in-difference, synthetic control

JEL codes: I13, I14, I18, I38

Educational Attainment and Hospital Admissions: An Instrumental Variable Approach with Lasso Regression

PRESENTER: **Dr. Dahai Yue**, University of Maryland, College Park

Research Objective: Education is one of the most significant correlates of health. However, the extent to which this relationship is causal is yet to be established. Additionally, there is a dearth of studies investigating the effect of education on health care utilization. The study aims to examine the association between education and hospitalizations based on a pre-set conceptual model and determine the causal effect of education on hospitalizations.

Methods: The primary data source was the U.S. Health and Retirement Study (HRS) with restricted files, including state-identifiers from 1992 to 2016. This database was further merged with state-level compulsory schooling laws and the quality of schooling measures. We constructed weights to account for attrition bias in the relationship between education and hospitalizations using the inverse probability weighting approach. To determine the causal effects of education on hospitalizations, we used compulsory schooling laws as instruments for years of completed education. A Post-Double-Selection method based on the Least Absolute Shrinkage and Selection Operator (LASSO) regressions was used to select optimal instruments and a parsimonious set of controls, which yields efficient but still consistent instrumental variable (IV) estimators.

Population Studied: The study population included eligible respondents and their spouses in the HRS survey from 1992 to 2016. Aim 1 focused on those born in the United States. Aim 2 further restricted the study population to white respondents who had high school or lower educational attainment and were born in the 48 contiguous states and the District of Columbia between 1905 and 1959.

Results: On average, compared to individuals with less than a high school education, individuals with a high school education or some college had a 3.37 percentage point (pp) (95% CI, -3.93 pp to -2.80 pp) lower likelihood of being hospitalized, and individuals with a college degree or above had an 8.39 pp (95% CI, -9.10 pp to -7.67 pp) lower likelihood of hospitalization over the past two years, controlling for demographics, childhood socioeconomic conditions, childhood health status, state-of-birth fixed effects, year-of-birth fixed effects, state-specific linear time trends, and accounting for attrition bias. The preferred IV estimator (LASSO-IV estimator) implies that a one year increase in schooling lowered the probability of two-year hospitalization by 6.5 pp (95% CI: - 9.1 pp to -3.9 pp), which is much larger than that of the OLS estimator (-1.1 pp, 95% CI: -1.4 pp to -0.7 pp) without correcting for the endogeneity of education. Empirical tests suggest the assumptions for our instruments hold and the preferred set of instruments were not weak.

Implications for Research and Policy: Our main finding that educational attainment has a large effect on hospitalizations contributes to the growing literature on the social determinants of health. Results from this study should inform policymakers and suggest that providing more health care resources to the low-education group might be an effective means for reducing health disparities. In a broader context, it suggests that investing in the educational system could be a more cost-effective way to reduce intensive health care use and health care costs.

8:15 PM –9:15 PM MONDAY [Demand And Utilization Of Health Services]

ORGANIZED SESSION: Measurement of Children Mental Health Needs: Unmet Needs, Diagnosis, Treatment and Long-Term Economic Impacts

SESSION CHAIR: **Kathleen C Thomas**, University of North Carolina at Chapel Hill

DISCUSSANT: **John Cullinan**, NUI Galway; **David Johnston**, Monash University

Is Subjective Unmet Need for Mental Health Care a Valid Measure Compared to a More 'objective' Metric?

PRESENTER: **Jemimah Ride**, University of Melbourne
AUTHORS: Claire de Oliveira, Rowena Jacobs, Nicole Black

Objectives

Reducing unmet need for mental health care is a policy goal in many health systems, since most people with mental disorders receive less than adequate or no care. However, the measurement of mental health care needs is complex, with different normative and empirical implications from alternative approaches. Clinical interview or validated symptom measures may be the most ‘objective’ measure of whether a mental disorder is present, but variation in levels of care required for a given disorder make it difficult to determine whether someone’s needs have been met. Asking the patient to report unmet need prioritises the patient perspective but may be subject to reporting biases. The diagnostic approach may reflect a more deterministic definition of need, while self-reporting allows for differing preferences for health and health care. Self-reported unmet need for health care in adults predicts later deterioration in physical health, but this has not been examined for mental health, nor in children, where the reporter is usually the parent. To investigate the validity of each approach, we explore how well they predict later outcomes, since the principle reason to address unmet needs is to reduce health burden.

Methods

This study uses survey data (N=5,121) from the nationally representative Longitudinal Study of Australian Children, a panel followed from birth to 12-13 years or from 4-5 to 16-17 years, surveyed every two years. We compare parent-reported (subjective) unmet need for mental health care with measured unmet need in terms of mental health symptoms (from the Strengths and Difficulties Questionnaire) paired with mental health service utilisation from claims data. We use an individual fixed effects model of quality of life controlling for baseline quality of life and health, mental health symptoms of the reporting parent, and family demographics and socioeconomic status.

Results

Measured unmet needs predict worse later quality of life, but subjective unmet needs are not a statistically significant predictor of later quality of life. Subjective unmet need is less prevalent but shows higher relative income inequality. The two measures of unmet need show different pictures of inequality when we examine differences in inequality across regions of Australia, with measured unmet need showing different levels of inequality between regions while subjective unmet need shows similar levels of inequality between regions.

Discussion

These results suggest that measured unmet needs for children's mental health care predict health outcomes while parent-reported subjective unmet needs are not predictive of future health. Measuring unmet needs in this way is more laborious for national surveys, but may be more useful in assessing the performance of the healthcare system at acting on unmet needs that are important to long-term health. However, subjective unmet needs may be important to capture patient experience of care. In Australia, access to most community-based mental health services requires out-of-pocket payments even if publicly subsidised, which may contribute to income gradients in unmet need. Differences in inequality between self-reported and measured unmet need could reflect a socioeconomic gradient in reporting bias or could represent an important recognition of differences in experience.

Mis(sed) Diagnosis: Physician Decision Making and ADHD

PRESENTER: **Ms. Kelli Marquardt**, University of Arizona

While the presence of disparities in healthcare is well documented, the mechanisms of such disparities are less understood, particularly in relation to mental health. This paper develops and estimates a structural model of diagnosis for the most prevalent child mental health condition, Attention Deficit Hyperactivity Disorder (ADHD). The model incorporates both patient and physician influences, highlighting four key mechanisms of mental health diagnosis: true underlying prevalence, patient stigma, diagnostic uncertainty, and physician costs from type I and type II diagnostic errors. I estimate sex-specific structural model parameters using novel electronic health record data on doctors' notes together with machine learning and natural language processing techniques. In raw comparisons, males are 2.3 times more likely to be diagnosed with ADHD than females. Counterfactual simulations using model estimates show that less than one-half of this disparity can be explained by true differences in underlying ADHD prevalence, very little explained by patient preferences, and about 50% attributed to differences in physician decision-making. I show that physicians view *missed diagnosis* to be costlier than *misdiagnosis*, especially for their male patients. Back of the envelope calculations estimate the national economic impact of ADHD diagnostic errors to be $60-$117 billion US dollars, suggesting a need for public and/or medical policy responses aimed at increasing diagnostic accuracy and reducing disparities in mental health care.

Use of Psychoactive Polypharmacy By High Need Children and Young Adults: The Role of Clinical and Neighborhood Characteristics

PRESENTER: **Ms. Kathleen C Thomas**, University of North Carolina at Chapel Hill
AUTHORS: Izabela E Annis, Robert B Christian, Scott A Davis, Neal A de Jong

Background

Use of psychoactive medication among children has been growing over time. Recent evidence raises concerns that parent characteristics are associated with their children's use of psychoactive medication. While electronic health records provide detailed clinical information together with neighborhood context, to date, these issues have not been explored.

Objective

To examine factors associated with psychoactive polypharmacy among a broad cohort of high need children and young adults, taking into account clinical, insurance and neighborhood factors.

Methods

Electronic health record data 2014-2019 from a large healthcare system were used to examine psychoactive polypharmacy in two groups of geocoded patients: children aged 2-17 years (N=4,017) and young adults aged 18-27 years (N=2,736). Inclusion criteria were diagnosis with intellectual and developmental disability (IDD), psychiatric conditions, or a complex medical condition with at least 1 contact annually over the study period. Polypharmacy was defined as use of more than one drug class concurrently for 60 days or more. Neighborhood health, wealth and education were measured with the Child Opportunity Index. Logistic regression models assessed the association of predisposing, enabling, need and context factors with polypharmacy consistent with the Behavioral Model of Healthcare Use.

Findings

Among children, older age 13-17 (OR=3.7,p<.0001) and having no health insurance (OR=5.5,p<.007) were associated with greater odds of polypharmacy. Black race compared to White (OR=.52,p<.0001) and Hispanic ethnicity (OR=.40,p<.0002) were associated with lower odds of polypharmacy. Having IDD, psychiatric conditions, problem behavior diagnosis, sleep disorders or a psychiatric hospitalization were all associated with over twice the odds of polypharmacy. Low versus moderate child opportunity was associated with lower odds of polypharmacy (OR=.59,p<.006). Among young adults, Black race compared to White (OR=.42,p<.0001) and Hispanic ethnicity (OR=.52,p<.02) were associated with lower odds of polypharmacy. Having IDD, psychiatric conditions, sleep disorders or a psychiatric hospitalization were all associated with over twice the odds of polypharmacy. Having a complex medical condition was associated with lower odds of polypharmacy. Among young adults, the opportunity index was not associated with polypharmacy.

Conclusions

Among a broadly defined group of children and young adults with high needs in data with detailed clinical information on diagnoses and service use, clinical issues explain much of the variation in psychoactive polypharmacy. Nonetheless, race, ethnicity and low child opportunity are associated with lower odds of polypharmacy. Young adults have similar factors associated with polypharmacy, although health insurance and child opportunity index were not significant in this group.

Implications for Policy and Practice

Among high need children and young adults, problem behaviors and sleep disorders are significant drivers of multi-class psychoactive polypharmacy. Lack of health insurance, a significant factor for children, may reflect pent up demand and unmet need. Effective shared decision-making among clinicians and parents together with valid measures of it have the potential to elucidate treatment choices that support the child and family. Research must move beyond using a measure of race and ethnicity to control for latent factors that are not understood. The significance of race, ethnicity and opportunity underscore concerns about structural racism that must be addressed.

Diagnostic Errors in Child Mental Health: Assessing Treatment Selection and Its Long-Term Consequences

PRESENTER: **Jill Furzer**, University of Toronto
AUTHORS: Maripier Isabelle, Boriana Miloucheva, Audrey Laporte

Importance: Mental illness in childhood is a growing issue, but treatment consistency and adherence remain a challenge. Understanding the role of insurance programs on pharmaceutical treatment usage is vital for informing health care priorities to improve mental health care access.

Objective: To assess risk-specific changes in the use of drug products to treat ADHD, anxiety, and depression following the implementation of a public pharmaceutical insurance plan in Quebec, Canada.

Design, Setting, and Participants: This quasi-experimental study relied on 104,530 person-year observations from the Canadian National Longitudinal Survey of Child and Youth. Individuals aged 0-11 in 1994 were followed over 15 years, until 2008. An ensemble machine learning model was used to predict a measure of general adverse mental health risk. Risk-specific treatment uptake was estimated in a difference-in-differences framework. Non-random treatment assignment was determined based on a child living in Quebec after the policy was implemented. Data were analyzed from June 2020 to January 2021.

Exposures: Access to no-cost pharmaceutical treatment through the Public Prescription Drug Insurance Plan from the Régie de l'Assurance Maladie du Québec from 1997 onwards for children residing in Quebec.

Main Outcomes and Measures: Change in parent-reported diagnosis of ADHD, anxiety or depression by a medical professional and prescription for broadly defined stimulant and tranquillizer medications. Heterogenous treatment effects were measured based on a child's rank-ordered predicted mental illness risk, estimated via a gradient boosted tree model. Comparator treatments included inhaler products.

Results: The Public Prescription Drug Insurance Plan implementation in Quebec increased drug treatment for mental health disorders by 3.38 (CI: 2.16 to 4.40) percentage points (pp) overall. Treatment use increased 7.10pp (CI: 2.42 to 11.84) for children in the top decile of risk and 2.35pp (CI: -0.02 to 4.72) for children in the bottom decile. Stimulants drove increased prescription drug use for predicted high-risk children (11.63pp, CI: 6.06 to 17.20). Increased use of tranquillizers (2.75pp, CI: -0.58 to 6.08) and comparator inhaler products (6.44p, CI: 0.90 to 11.97) were comparably smaller.

Conclusions: These findings suggest that treatment decisions for child mental health issues, specifically ADHD, are highly responsive to out-of-pocket costs. Decreasing cost increased drug treatment use for more high-risk children from lower-income families. There is little evidence that reducing out-of-pocket costs increased treatment use by patients predicted to see little treatment benefit. Policies to reduce out-of-pocket costs have the potential to increase mental health treatment access for high-risk children and lower-income families with inadequate private insurance coverage, without leading to low-benefit care among lower-risk individuals.

8:15 PM –9:15 PM MONDAY [Supply Of Health Services]

ORGANIZED SESSION: New Research on Drug Rebates

SESSION CHAIR: **Zeid El-Kilani**, Carnegie Mellon University

ORGANIZER: **Steven C Hill**, US Agency for Healthcare Research and Quality

DISCUSSANT: **Andrew Mulcahy**, RAND; **Josh Feng**, University of Utah - Eccles School of Business

Branded Price Variation in the U.S. Drug Market, 2010-2019

PRESENTER: **Joseph Levy**, Johns Hopkins Bloomberg School of Public Health

AUTHOR: Benedic N Ippolito

Branded drug prices command considerable attention in the US yet defining a drug's price is not straightforward because they vary substantially across settings. We link branded drug prices across a host of publicly available data sources to document price levels and trends from 2010-2019. Our sample is broad, representing $1.67 trillion in net revenues to drug makers and includes a number of payers across both the pharmacy-dispensed and physician-administered markets. We find substantial pricing variation between payers and observe that list is an increasingly poor proxy to represent net prices; this has implications for economic evaluations and drug pricing debates.

Rebates for New Drugs

PRESENTER: **Steven C Hill**, US Agency for Healthcare Research and Quality

AUTHORS: Zeid El-Kilani, Dr. G. Edward Miller

Drug manufacturer rebates are an increasingly important factor in spending on pharmaceuticals. In 2019, U.S. prices net of rebates, off-invoice discounts, 340B discounts, coupons, and other price concessions were 30% less than invoice prices (IQVIA 2019). Laws setting minimum rebates to Medicaid programs account for some of this reduction. We focus on rebates outside of Medicaid, which are at the core of many current debates about pharmaceutical pricing.

We quantify the competition and regulatory factors related to manufacturers' rebates for single-source brand name drugs licensed or manufactured by publicly listed companies and primarily dispensed by retail pharmacies. Our outcome measure is one minus net revenue per unit as a fraction of list price, specifically wholesale acquisition cost. For simplicity we label this fraction "discounts," although it combines rebates, discounts, and coupons. Our primary data are drug by quarter discounts for 2012-2019, from SSR Health, which uses information on gross sales and net revenues reported in filings with the U.S. Securities and Exchange Commission to estimate discounts for brand name drugs.

Just as economic theory predicts higher prices for monopolists, we expect low, if any, discounts for drugs with exclusivity and no substitutes. We expect that discounts will increase, all else being equal, as the number of substitutes rises. We use Cerner Multum's therapeutic classification to determine the number of manufacturers of drugs that are substitutes. This allows us to separately include the number of drugs in the specific subclass as well as broader classes.

Two provisions of the Medicaid rebate program are hypothesized to have opposing effects on non-Medicaid rebates as Medicaid market share rises. The best price provision gives Medicaid access to the best price (not including rebates) offered to private purchasers. When offering discounts to private payers that are larger than the Medicaid statutory rebate, therefore, the incentive to use rebates, rather than wholesale price discounts, increases as the Medicaid market share rises. The inflation penalty increases Medicaid rebates when manufacturers' prices increase more rapidly than general inflation. The disincentive to raise real prices increases as Medicaid market share increases. If a manufacturer does not raise real prices, then non-Medicaid purchasers can receive a lower net price with a smaller rebate. This leads to the prediction that rebates will decrease as Medicaid market share rises.

Statutory provisions for other public payers could account for some of the non-Medicaid discounts, so we include market shares for federal facilities (such as the VA) and Medicare. We measure quarterly market shares for Medicaid, Medicare and federal facilities using data from IQVIA.

While we do not directly study gross and net prices, we control for many factors that may affect these prices, including years since Food and Drug Administration (FDA) approval, dosage form, biologics, and orphan drug status. We include year fixed effects to account for time trends and consolidation among PBMs, which may increase market power to obtain greater rebates, as well as the growing number of facilities covered by the 340B program, another source of discounts unrelated to rebates.

The Impact of Sharing Drug Rebates at the Point of Sale on Out-of-Pocket Payments for Enrollees in Employer-Sponsored Insurance

PRESENTER: **Yao Ding**, AHRQ

AUTHOR: Dr. G. Edward Miller

Pharmaceutical manufacturers pay drug rebates to pharmacy benefit managers (PBMs) to obtain preferred formulary placements for their drugs. Rebates potentially benefit manufacturers by increasing the market share of their products. Rebates also benefit PBMs, because most current PBM contracts for employer-sponsored insurance (ESI) allow PBMs to retain a percentage of the rebate in addition to other administrative or service fees. There is an ongoing debate on the role of rebates in creating incentives in favor of higher list prices, which, in turn, lead to higher retail prices and expose consumers to higher out-of-pocket costs. One solution that has been proposed to improve drug price transparency and lower out-of-pocket drug costs would be to require PBMs to share rebates with consumers at the point of sale.

This study investigates the potential implications of rebates for out-of-pocket spending by ESI enrollees in a stylized scenario where we reduce the retail price of each fill of a given drug by the average rebate rate for the drug at the time of the fill. Enrollees who pay 100% of the retail price of a prescription fill – because they have not yet met their deductible – receive 100% of the rebate for that fill. Enrollees who paid a portion of the retail price for a fill, determined by a coinsurance rate, receive a corresponding percentage of the rebate. We assume copayments would not decrease. The primary data sources for this study are SSR Health rebates data and 2018 MarketScan commercial claims data. For brand name drugs covered by payers other than Medicaid, SSR Health estimates discount rates (which are primarily comprised of rebates but also include other price concessions) for each drug based on the ratio of net revenues reported in filings with the Securities and Exchange Commission to the product of the Wholesale Acquisition Cost and total units sold, adjusted for statutory rebates paid to Medicaid. We apply these discount rates to the spending on each brand name fill, allocate the reduction to out-of-pocket spending based on cost sharing provisions, and aggregate each individual's out-of-

pocket spending across fills. We assume that generic drugs have no rebates for ESI. We assess the impact of moving rebates to the point of sale on out-of-pocket spending overall. We also assess variation in impacts across subgroups defined by their health conditions.

In our preliminary analysis, we found that sharing drug rebates at the point of sale would reduce annual out-of-pocket spending by $53 per person, on average, among 2018 MarketScan enrollees with positive total drug spending. Among the 6,892,237 individuals with at least one branded drug fill, 28.3% would see a reduction in out-of-pocket spending, 10.1% would see annual out-of-pocket savings of more than $100, nearly 3% would see annual out-of-pocket savings of more than $500, and 1% would see annual out-of-pocket savings of more than $1,000.

8:15 PM–9:15 PM MONDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Predicting Future Health Expenditures and Its Determinants in Latin America and Caribbean Countries

SESSION CHAIR: **Krishna Rao**, Johns Hopkins Bloomberg School of Public Health

DISCUSSANT: **Midori de Habich**, ; **William Savedoff**, Inter-American Development Bank; **Andres Vecino**, Johns Hopkins University

Health Expenditure Trends in the Latin America and the Caribbean Region and Its Determinants: A Model for Predicting the Future

PRESENTER: **Krishna Rao**, Johns Hopkins Bloomberg School of Public Health

Economic growth in Latin American and Caribbean (LAC) countries is expected to increase health expenditures. In addition, population aging, and the aspiration for universal health coverage will also influence national health spending. This study investigates the relationship between economic growth, demographic changes, and healthcare expenditure in a group of 21 LAC countries between 2001 to 2018. We assess the relationship between per capita health expenditures, per capita GDP and population aging using a fixed-effects regression model with time trends. Additional explanatory variables are introduced to test the robustness of our regression results. Using growth accounting methods we decompose the growth in health expenditures in terms of income, population aging, and a "residual" that captures the effect of technology, health sector wage increases, and other factors. Our preliminary results indicate that health expenditures grew annually on average at 2.8% between 2001-2018, which was higher than economic growth (1.6%). We find a positive income elasticity of 0.91 for the LAC region, which is similar to those of OECD countries. There are notable variation in the elasticity estimates across LAC countries and time periods. The growth in health expenditures between 2001-2018 had the following contributions - economic growth 1.6%, population ageing 0.74%, and a "residual", which captures the contribution of technology, and relative prices, 0.44%. The study findings confirm the importance of economic growth on health expenditures in the LAC region, though other factors such as changes in technology have a larger contribution to health expenditure increases.

What Factors Determine Future Health Expenditures in the Latin America and Caribbean Region

PRESENTER: **Timothy Roberton**, Johns Hopkins University Bloomberg School of Public Health

With the ongoing demographic and epidemiological transitions, and with developments in medical technology, health expenditure is likely to remain a considerable share of government spending in in the LAC region. Understanding how health spending will change, and the drivers of this change, will help decision makers to develop appropriate policies for the future. To this end, we modeled future health spending in Latin America and the Caribbean for 2020 to 2050. We developed a growth model for each country based on three underlying factors: changes in prevalence of diseases, population growth, and increasing health care costs due to medical inflation. For prevalence of diseases, we took data from the Global Burden of Disease (GBD). We mapped GBD diseases to ICD10 chapters and used a linear model to project prevalence trends to 2050. For population growth, we used age-disaggregated UN estimates from the World Population Prospects 2019. For medical inflation, we developed country-specific estimates based on a fixed-effects regression analysis of historical expenditure in the region. For each country, we combined the three growth factors and applied them to baseline medical expenditures (from 2018 or 2019, depending on the country). The final analysis gave us estimates of future health spending, for each country, disease category, and age category, for the years 2020 to 2050. Our preliminary results suggest that health expenditure will increase by as much as 8 times in certain countries, with trends driven largely by population growth in older age categories, and by medical inflation. Although disease prevalence is not a major driver in our analysis, we recognize the limitations of existing prevalence data and our forecasting methodology, and we offer alternative approaches that future studies might consider.

Costa Rica – Future Health Spending and Its Determinants

PRESENTER: **Claudio Mora**, INCAE

AUTHOR: Andrea Prado

Costa Rica is among the best performing Latin American countries in health. However, the country is facing substantial increases in the prevalence of chronic non-communicable diseases, including cancer. Further, Costa Rica's population is progressively aging. These changes, which are expected to increase further in future decades, will affect healthcare expenditures and can threaten the sustainability of national health systems. Of interest is to understand: (a) how health expenditures in Costa Rica will change over the next 30 years; (b) what will be the main drivers of this change, and (c) what policies might help constrain future health expenditures. Costa Rica has multiple sources of health care financing; the most important in terms of coverage (80% of population) is the Costa Rican Social Security (CCSS) system. Data for baseline (2018) health expenditures was sourced from CCSS and supplemented with information on expenditures from other sources (e.g. out-of-pocket payments). We applied a econometric model to forecast future health expenditures that incorporated changes in demography, epidemiology, population aging, and medical inflation due to economic growth and other residual factors. We estimate that per capita health expenditures in Costa Rica will triple from $655 PPP in 2018 to $1,848 PPP in 2050. By disease condition, the greatest growth in expenditures is due to neoplasms; endocrine, nutritional, and metabolic diseases; diseases of the circulatory and respiratory system; and diseases of the genitourinary system. By age-group, the highest growth in health expenditures will be in individuals older than 60 years of age, with the largest contribution coming from those 75 years or older. Overall, the main contributor to the growth in health expenditures between 2018 and 2050 will be medical inflation, and population growth. Changing epidemiology is a relatively less important factor for future health expenditure growth. These findings indicate that to control the growth in health expenditures, Costa Rica will need to invest in health system that can provide health services to aging populations outside of hospitals. Further, an emphasis on prevention initiatives, particularly for the prevention of cardiovascular disease, and neoplasms, can help reduce the growth in health expenditures.

Brazil – Impact of the COVID-19 Epidemic on Health Expenditures and Implications for the Future.

PRESENTER: **Carla Machado**, Universidade Federal de Minas Gerais

AUTHORS: Claudia Pereira, Andres Vecino

Objectives: The main questions of the present study were: (i) is there evidence of a change in health care expenditures during the COVID-19 pandemic? (ii) would Brazilian health expenditures' projections be affected? Given that, the present study compares, for government health expenditures: (i) January to April as an aggregate (2020 with 2019; 2021 with 2019) for inpatient/hospital and outpatient/ambulatory data; (ii) the full year of 2019 and 2020 for inpatient and outpatient data. (iii) the trend in health care expenditures from January 2019 to April 2021 (28 months) using an integer time variable (month).

Methods: Data on health expenditures were described using US$ PPP. Generalized linear model regressions – with the log link and considering the gamma distribution assumption – to model inpatient and outpatient expenditures were used. Control variables included month of the year (seasonal use of care) and clustering on types of care within inpatient and outpatient health care. All analyses were carried out using Stata/SE 12.0 for Mac.

Results: The total government inpatient health expenditures in 2019 and 2020, respectively, were US$ 16.53 Billions PPP and US$ 14.99 Billions PPP. For outpatient health expenditures, the figures for 2019 and 2020 were, respectively, US$ 9.5 Billions PPP and US$ 7.8 Billions PPP and, for inpatient, the figures for 2019 and 2020 were, respectively, US$ 7.0 Billions PPP and US$ 7.2 Billions PPP. The comparison of first four months of 2019, 2020, and 2021 indicated a rebound in overall and in inpatient health expenditures, but not in outpatient expenditures. The regression models indicated no evidence of change in overall government health care expenditures in Brazil due to COVID-19 pandemic (2020 as compared to 2019; 2021 as compared to 2019; all models); evidence of a decrease in health care outpatient expenditures 2020 and 2021 (all models); weak evidence of decrease in health care expenditures 2020 as compared to 2019 for inpatient (evidence of only one model).

Conclusion: the COVID-19 pandemic has impacted government health care expenditures in Brazil, but only for outpatient care. Further, the COVID-19 pandemic may not impact national health expenditures over the long term. Similar studies in other Latin America countries are needed and could yield more evidence in order to improve health projections.

8:15 PM –9:15 PM MONDAY [Cross-Cutting Themes And Other Issues]

Political Economy

MODERATOR: **Jakub Kakietek**, The World Bank

Political Economy of Health Reform in India – Unpacking the "World's Largest" Health Insurance Program

PRESENTER: **Anuska Kalita**, Harvard T.H. Chan School of Public Health

Background

The Indian government announced its flagship health insurance program - the Pradhan Mantri Jan Arogya Yojana (PMJAY) in August 2018. A government-sponsored health insurance scheme, PMJAY aims to cover more than 500 million people, making it, theoretically, the world's largest health insurance program. Although India has had several health reforms before this, the distinction of the PMJAY has been the high media attention, political and electoral interest that it has received, including being an issue in national elections. In a country where health and health insurance have been historically absent from political agendas and public discourse, the interest in the PMJAY is thought-provoking.

This study analyzes the political economy of the agenda-setting process for the PMJAY and examines how it has sustained public and political interest.

Data and Methods

The study uses a unique set of data from three categories of material: (i) media articles published between 2014-19 in leading national dailies, (ii) election manifestos of the two main contesting political parties (the Bharatiya Janata Party or BJP and the Indian National Congress) during the two legislative elections in 2014 and 2019, and (iii) the debates and questions in the Indian parliament (the two legislative houses) between 1999 and 2017 on topics of health, health insurance, and the PMJAY. The study uses content analysis and applies Kingdon's Multiple Streams Framework to examine the data.

Results

Our analysis shows how Kingdon's separate streams of problems, politics and policies came together at a critical time in India, leading to the announcement of the PMJAY and sustained it as a politically salient issue. The *problem stream* had two sets of problems – one, the issues of corruption and policy-paralysis (associated with the pre-2014 Congress rule), and two, high out-of-pocket expenditures faced by a majority of the Indian population. The *political stream* included the change in the status quo, with the BJP coming to power in 2014 after decades of Congress-rule. The absolute majority won by the BJP in 2014, and 2019 reduced the role of legislative veto-players to either question or oppose the PMJAY. Together with policy entrepreneurs, political leaders acted in the *policy stream* to design and roll-out the PMJAY with unprecedented speed and newly set-up unconventional institutions. The choice of its name and branding of the program contributed to the sustained public and political interest in the PMJAY.

Conclusion

Research on the political economy of health reforms in India is scarce. Most research has focused on either description of health policies or their evaluation. Studies on the political economy of a program of the size and scale of PMJAY are even scarcer. This study attempts to address this gap in the literature. The paper throws light on the importance of the role of political economy factors in health reforms. It underscores the importance of conducting such analyses to inform better policy design as well as increase the chances of better policy-adoption by political leaders.

The Economic Impact of COVID-19 Non-Pharmaceutical Interventions and the Influence of Poverty and Inequality

PRESENTER: **Carlos Pineda**, National Institute of Public Health

AUTHORS: Alejandra Rodriguez, Diego Cerecero, Arantxa Colchero, Prof. Sergio Bautista-Arredondo

Introduction: COVID-19 has spread rapidly across the world, resulting in tremendous economic damage. Forecasts estimate a 4.9 percent contraction of the global economy because of the implementation of Non-Pharmaceutical Interventions (NPI) aimed to mitigate the spread of SARS-CoV-2. The adverse economic effects of COVID-19 may vary by the stringency of the NPIs, their length of implementation, and the degree of compliance. Robust evidence on how COVID-19 impacted the global economy is needed to inform decision making. This work aims to estimate the variation on quarter Gross Domestic Product (GDP) and its association with the stringency of NPI.

Methods: For 34 countries members of the Organization for Economic Co-operation and Development (OECD), we gathered information on quarterly growth rates of real GDP from the OECD databases. We also estimated maximums of NPI stringency and Mobility reduction observed in the three first 2020 quarters, using data published from the Oxford Covid-19 Government Response Tracker and Google's Community Mobility Reports, respectively. Demographic and economic indicators used for controlling the econometric models were obtained from the World Bank. We used a panel data model with random effects to identify the effect of the NPIs stringency attained over the GDP.

Results: Our estimations suggest that containment measures have had, on average, a negative impact on the economic activity—reduction on average of about 5 percent in the GDP over three quarters observed. We find that there was a variation in the negative impact among the NPIs; restrictions on workplaces show the largest impact. Finally, other factors such as inequality -GINI index- and extreme poverty also influence GDP, while mobility reduction showed to be an adequate modulator of NPI adoption.

Conclusion: Like prior studies, our findings suggest that NPIs implemented in early 2020 substantially showed an economic impact. We also show that public compliance was fundamental to NPI effectiveness. Although it is widely documented that workplaces and lockdown restrictions are highly effective in decreasing infections, they are associated with the highest economic costs for countries.

Health Economics in the Post-COVID-19 Era: Going Beyond the Opposition between Extra-Welfarism and the Rule of Rescue

PRESENTER: **Mr. Brayan V. Seixas**, UCLA Fielding School of Public Health

Background: Are the Covid-19 curbing measures worth the health consequences attributable to social isolation, unemployment, and recession? This is a legitimate question that mainstream health economists would address through a utilitarian lens. Nonetheless, health authorities and epidemiologists have favored the ethical imperative to save individual endangered lives, a position known as "the rule of rescue". Regardless which stance one takes, the "global coordinated rule of rescue" practiced in response to Covid-19 reveals vital elements about the health economics field and its implicit assumptions.

Methods: This work reflects on how the Covid-19 pandemic defied the paradigmatic status of the extra-welfarist model in health economics/policy. Assuming that resources must be allocated in ways that maximize population health (usually operationalized through QALYs), extra-welfarism concerns about an instrumentalized and narrow idea of societal welfare, not necessarily providing available treatments to people in need.

Results: First, the inadvertent reliance on the extra-welfarist position takes for granted the status quo of resource level and distribution, rendering invisible the political economy behind it. Second, the shutdown of entire economic sectors revealed that a humanistic epistemology that privileges people's lives over utilitarian views of resources is possible when there is political will.

Conclusions: The health economics' research agenda needs to include the upstream social factors that determine the observed scenarios of resource allocation. Furthermore, the opposition between extra-welfarism and the rule of rescue could be reconciled through a broader paradigm of health economics that combines the pursuit of efficiency within health systems with a solidary underpinning political economy.

Tuesday

6:00 AM –7:15 AM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

Equity and Efficiency Evaluation of Policy and Programs Poster Session

MODERATOR: **Virginia Wiseman**, London School of Hygiene & Tropical Medicine

The Impact of Indonesia's Social Health Insurance on Out-of-Pocket Health Expenditures: Financial Risk Protection, and Its Potential for Stimulating Macroeconomic Growth

PRESENTER: **Prastuti Soewondo**, Ministry of Health, Indonesia

AUTHORS: Nirwan Maulana, Nadhila Adani, MSc, Dr. Anooj Pattnaik, Paulina Limasalle SM

Introduction

Since the single payer national health insurance scheme in Indonesia (JKN) rolled out in 2014, the proportion of out-of-pocket (OOP) health expenditure in Indonesia has steadily decreased over time. The OOP health expenditure at the national level was 32% of Total Health Expenditure (THE) in 2018, a substantial decrease from 47% in 2013, prior to JKN. Public spending became the largest component of national health expenditure from 2018 onwards (54%). To better understand the root causes and characteristics of OOP at the household level, this study estimates the effect of JKN towards reducing OOP spending and how this effect changes by key sociodemographic (e.g. poverty level) and provider (e.g. type, service) characteristics.

Method

The study employs a pooled regression analysis of Indonesia's 2018 and 2019 National Socioeconomic Survey (Susenas) dataset. A two-part regression Model (2PM) is employed, using logit specification in the initial part, subsequently followed by Generalized Linear Model (GLM) with gamma distribution and log-link function.

Result

Results show that households with JKN membership are significantly more likely to access health services without incurring OOP expenditure. Moreover, households that have JKN coverage incur lower OOP expenditure than households without insurance, by 38% in 2018 and 39% in 2019. The middle income (Q3 and Q4) benefitted the most with a 41% reduction of OOP, potentially leading to reallocation of resources to other non-health consumption that could potentially contribute to the economy's multiplier effects. Meanwhile, poor JKN households (Q1) have the highest probability to not incur OOP, although the reduction magnitude is lower than the middle-income group. The JKN households experience a more substantial decrease in OOP payments for inpatient care compared to outpatient care, and the reduction effect is larger at public hospitals than private hospitals (partly due to lack of JKN coverage at private hospitals). The JKN households also have the highest probability to access health services without incurring OOP expenditure at Public Primary Health Centers (PHCs).

Conclusion

The JKN coverage program has significantly reduced the financial risk associated with sudden, unpredictable OOP health expenditure across wealth quintiles. Households that benefit from this are not only healthier in financial terms and have a higher sense of security, but can reduce the anxiety to save for future health events, allowing a larger disposable income, which can boost consumer spending and contribute to overall macroeconomic growth, and contribute to higher GDP. This suggests that JKN should not merely seen as a traditional "consumption" program of government finances, but an investment initiative as it reduces OOP health expenditures. This might be an especially important link as the COVID-19 pandemic has led to inevitable economic downturn and fiscal shock in the last year. Going forward, the JKN will need to prioritize coverage to the remainder 15% of the population not currently covered, and promote sustainability by improving healthcare access particularly to the PHCs as the more cost-effective "front line" in providing health services for the poor and vulnerable groups.

The Impact of Free Maternity Policies in Kenya: An Interrupted Time Series Analysis

PRESENTER: **Stacey Orangi**, Kemri-Wellcome Trust Research Programme

AUTHORS: Angela Kairu, Lucas Malla, Joanne Ondera, Boniface Mbuthia, Nirmala Ravishankar, Edwine Barasa

Background: User fees have been reported to limit access to services and increase inequities. As a result, Kenya introduced a free maternity policy in all public facilities in 2013. Subsequently in 2017, the policy was revised to the Linda Mama program to expand access to private sector, expand the benefit package, and change its management.

Methods: An interrupted time series analysis on facility deliveries, antenatal care(ANC) and postnatal care(PNC) visits data between 2012-2019 was used to determine the effect of the two free maternity policies. This data was from 5,419 public and 305 private and faith-based facilities across all counties, with data sourced from the health information system. A segmented negative binomial regression with seasonality accounted for, was used to determine the level(immediate) effect and trend (month-on-month) effect of the policies.

Results: The 2013 free-maternity policy led to a 19.6% and 28.9% level increase in normal deliveries and caesarean sections respectively in public facilities. There was also a 1.4% trend decrease in caesarean sections in public facilities. A level decrease followed by a trend increase in PNC visits was reported in public facilities. For private and faith-based facilities, there was a level decrease in caesarean sections followed by a trend increase in the same following the 2013 policy.

Further, the 2017 Linda Mama program showed a level decrease then a trend increase in PNC visits and a 1.1% trend decrease in caesarean sections in public facilities. In private and faith-based facilities, there was a reported level decrease in normal deliveries and caesarean sections and a trend increase in caesarean sections.

Conclusion: The free maternity policies show mixed effects in increasing access to maternal health services. Emphasis on other accessibility barriers and service delivery challenges alongside user fee removal policies should be addressed to realize maximum benefits in maternal health utilization.

Is Leaving No One Behind Affordable? The Case of Delivering Free Primary Healthcare Services to the Exempted Ultra-Poor in Burkina Faso

PRESENTER: **Ms. Yvonne Beaugé**, Institute of Public Health, Heidelberg University, Germany

Background: In the era of leaving no one behind, governments in low- and middle-income countries are challenged to provide primary healthcare services for those who live in extreme poverty. To achieve this objective, countries are implementing various strategies, including targeting and user fee exemptions for ultra-poor people. To translate a policy decision into tangible public health action, policy-makers and donors need to know the cost of providing care. Pertinent evidence, however, is extremely limited. We addressed this knowledge gap and estimated the average recurrent cost of first-level curative consultations provided specifically to the ultra-poor. Based on these estimates, we modelled the impact on the Burkinabè health budget of delivering primary care free of charge to the ultra-poor nationwide.

Method: As basis for our analysis, we conducted a micro-costing study. We extracted resource consumption data from the medical records of 1386 ultra-poor patients having used care in 15 CSPS and 1 district hospital in 2016. We extracted unit costs from official price list and pharmacy registries. To derive the average cost per first-level curative consultation, we multiplied the quantity of the resources consumed by its unit costs. We limited our analysis to ultra-poor above 5 years of age, since children under 5 are the target of a different exemption mechanism. Using the derived cost per consultation, we computed the budget for delivering primary care free of charge to the ultra-poor nationwide, considering different thresholds of health service utilization and population coverage.

Results: The average recurrent cost of a single first-level curative consultation was estimated to be USD 2.21. Drug costs at 51% contributed to half of the costs, followed by costs for human resources with 31%. A nationwide delivery of primary healthcare to the bottom 20% of the population, assuming 0.25 healthcare contacts per year would result in an annual expense of USD 2,376,874. This annual expense represents 0.90 percent of the Burkinabè health budget. The expected annual expense, however, is very sensitive to changes in health service utilization and population coverage.

Conclusion: Budgeting the provision of primary healthcare services to the ultra-poor is essential when moving towards universal health coverage. The provision of primary healthcare services at no cost for the ultra-poor at the national level is likely to be affordable. To further advance towards leaving no one behind, Burkina Faso could consider piloting a capitation-based system to remunerate primary healthcare providers for treating the ultra-poor.

Keywords: Ultra-poor, universal health coverage, primary healthcare, user fee exemptions, cost, Burkina Faso, leaving no one behind

Equity in Health Service Utilisation and Children's Well-Being: Results from an Australian Longitudinal Population-Based Study

PRESENTER: **Ha N.D Le**, Deakin University
AUTHORS: Fiona Mensah, Yichao Chang, Susan Clifford, Katherine Lange, Ben Edwards, Kate Lycett, Melissa Wake, Lisa Gold

Background

Equity in access to and use of healthcare services is a national goal and a principal indicator of health system performance. Therefore, it is important to understand the association between socioeconomic position (SEP) and healthcare utilisation as well as children's well-being. However, literature that explores how SEP associates with children's health service utilisation and children's well-being is limited and these associations have not been fully quantified.

Aims: to explore (1) the association between children's health-related quality of life (HRQoL) and families' SEP from 2-13 years; (2) the association between healthcare costs and families' SEP from birth to 13 years and (3) broader socio-demographic factors associated with HRQoL and healthcare costs.

Methods

Data were from the Longitudinal Study of Australian Children (LSAC). Children's HRQoL was measured using the parent-reported Pediatric Quality of Life Inventory 4.0 from 2-13 years. We used government administrative data (Medicare) on the use of medical services and pharmaceuticals to estimate healthcare costs to government from birth to 13 years. SEP was measured using a composite of the education level, income and occupation of parents. Multivariable linear regression and mixed effect modelling were used to analyse the associations between families' SEP and children's HRQoL/healthcare costs between 2 and 13 years, including the effects of child age and sex, child special healthcare needs and remoteness of the family's area of residence.

Results

There is evidence of inequalities in health care utilisation (both medical and pharmaceutical use) in the first year of life ($p=0.02$). Results from the mixed effect model showed that between 2-13 years, children from higher SEP families had better HRQoL ($p<0.001$) and potentially lower healthcare costs ($p=0.07$). Child special healthcare needs and parental stress were associated with lower children's HRQoL and higher healthcare costs whereas more siblings, partnered families and living in inner regional areas were associated with better children's HRQoL and lower healthcare costs.

Conclusion

The associations between SEP and children's HRQoL and healthcare costs found in this study highlight the inequity in health service utilisation and children's well-being up to 13 years of age. These findings have important implications for public health policy decision-makers in efficiently planning and allocating resources.

Measuring Inequity in the Utilisation of Assisted Reproductive Technology in Australia

PRESENTER: **Aarushi Dhingra**

Background and aim: This study quantifies inequity in the utilisation of assisted reproductive technologies (ART) using Australian Longitudinal study of Women's Health (ALSWH) and linked Medicare Benefits Schedule (MBS) claims data for the year 2006, 2009 and 2012. One in every 6 Australian couples of reproductive ages suffer from infertility and this is projected to increase. The Medicare system provides rebates for expenditure on ART items. In 2010, the government introduced a monetary benefit cap on ART items, increasing the out-of-pocket costs. One of the main aims of the Australian health system is to have equitable access to health care services. However, there lacks evidence on the inequity in the use of ART services and the impact of the 2010 policy change on inequity.

Contribution and methods: We add to the literature by quantifying if there is inequity of access and then quantify the income related inequality associated with this inequity, in the use of ART services. Furthermore, we evaluate if the inequity changes over time, especially after the policy change. We use concentration and horizontal inequity indices to measure inequity in health care use. This enables us to focus on the extent to which utilisation of ART services are distributed according to need factors, irrespective of socioeconomics factors such as income.

Results: Our results indicate that there is small but pro-rich inequity in the utilisation of ART services. In other words, in Australia, after controlling for need variation, women with higher income are significantly more likely to use ART services compared to their counterparts with lower income. The coefficient on inequity increases from in 2006 to in 2009 and slightly decreases to in 2012. These result are significant at significance level. They are also robust to choice of need variables.

Discussion: Financial barriers are a significant obstacle to equitable access to ART services. There is a need to readdress this inequity faced by women who use such services. Additionally, policymakers need be aware about the implications such reforms have on inequity.

The Impact on Health Equity of Socioeconomic Inequalities in Diagnosis and Control of Diabetes and Hypertension in Sri Lanka's Mixed Public-Private Health System

PRESENTER: **Ravindra Rannan-Eliya**, Institute for Health Policy
AUTHORS: Nilmini Wijemunige, Owen O'Donnell, Nishani Gunawardena, Chathurani Sigera, Jürgen Maurer

Background

Diabetes and hypertension are often under-diagnosed and under-treated. Inequalities in diagnosis and treatment lead to significant pro-rich, socioeconomic inequities in access to care and overall outcomes in most developing countries. In Sri Lanka's dual public-private health system, where utilization of the public sector is heavily pro-poor and the private sector is pro-rich, there may be scope for inequalities in diagnosis and treatment. We measured the prevalence of diabetes and hypertension, along with the diagnosis and control of each condition, by socioeconomic group, and assessed contributions of differential use of public and private healthcare.

Methods

We used data from the Sri Lanka Health and Ageing Study, a nationally representative survey of 6,600 adults completed in 2019. We identified people who have diabetes and hypertension, and determined who had been diagnosed and who had achieved control, by wealth index quintile group.

Diagnosis was self-reported or inferred from taking antidiabetics or antihypertensives in the previous 2 weeks. A person was identified as having diabetes or hypertension if they reported a diagnosis, or if their measured blood sugar or blood pressure was above standard thresholds. Control was defined by a blood sugar or blood pressure below appropriate benchmarks. We used the concentration index (CI) to measure socioeconomic inequality in prevalence of diabetes and hypertension, and used the horizontal inequity index (HI) to measure inequality in diagnosis and control.

Results

Prevalence of diabetes was somewhat higher among the better off (CI=0.08), and diagnosis was positively associated with wealth (CI=0.13). However, control in people with a diagnosis was equally distributed (CI=0.01). This translates to a somewhat pro-rich distribution of diagnosis (HI=0.05) and pro-poor distribution of control (HI=-0.14).

There was little or no inequality in hypertension (CI=0.01). Diagnosis of hypertension was higher among the rich (CI-=0.04), while hypertension control was higher among the poor (CI=-0.09). This translates to slightly pro-rich inequity in diagnosis (HI=0.03) and pro-poor inequity in control (HI=-0.11). Public outpatient visits were heavily pro-poor for people with diabetes and hypertension, and pro-rich for private outpatient visits.

Discussion

The control of diabetes and hypertension is better in poorer Sri Lankans, who also make greater use of public sector clinics. Furthermore, diagnosis is equitable for hypertension, although there is a slight underdiagnosis of diabetes in poorer quintiles. The mainstay of control of both conditions is treatment with cheap medications, and diagnosis for hypertension is less resource-intensive than diagnosis of diabetes, which relies on a fasting blood-glucose. These findings are consistent with previous research which found the public sector provided better quality for less resource-intensive conditions, and suggests that for these two conditions Sri Lanka's mixed system promotes overall health equity.

Assessing Geographic Healthcare Equity in a Mixed Public-Private Health System – Noval Approach Using Kakwani and Concentration Indices

PRESENTER: **Saw Chien Gan**, University of Malaya
AUTHOR: Chiu-Wan Ng

Introduction

Distribution of healthcare resources across geographic areas is an important aspect in equity because healthcare services are mainly delivered at static healthcare facilities for people reside in the area. Geographic healthcare equity is important for a mixed private-public health system such as Malaysia where public healthcare resources are allocated according to geographic administrative areas and out-of-pocket payment funded private healthcare resources are concentrated at affluent areas.

This study adopted the position that there should be horizontal geographic equity in provision of healthcare, where overall healthcare resources should be made available to the people in a geographic area proportionately to the healthcare needs of the area. At the same time, there should be vertical geographic equity in financing of healthcare, where highly subsidised public healthcare resources should be concentrated in areas where people have less ability-to-pay for healthcare.

Method

This study proposed to assess horizontal geographic equity of provision of healthcare by using Kakwani Index (KI). KI measured the difference between concentration curve (CC) of healthcare provision and Lorenz Curve (CC) of healthcare needs when population are ranked by healthcare needs of geographic groups. It was also proposed to assess vertical geographic equity of financing by using "Different Index" (DI). DI is a novel approach of quantifying the difference between CC public healthcare resources and CC of healthcare needs when population are ranked by ability-to-pay of geographic groups.

The method was applied for the assessment of distribution of acute hospital beds and hospital and primary care recurrent financial expenditure in Peninsular Malaysia in 1997 and 2012. Geographic healthcare needs were also estimated based on the area population demography and further adjusted for differential healthcare needs beyond demographic factors.

Results

It was shown that the distributions of above three resources were in line with the principle of horizontal geographic equity. It was also found that the distribution of primary care financial resources was in line with the principle of vertical geographic equity. For the distribution of hospital care resources, the same could only be claimed for the distribution of acute hospital beds in 2012.

Conclusion

The study demonstrated that the approaches adopted can illustrate the progress of geographic equity in a mixed public-private system. These approaches also generated specific guides on the geographic areas and amount of healthcare resources that should be allocated to ensure both horizontal and vertical geographic equity.

Does the Reform of Public Hospitals' Compensation System Change the Compensation Structure of Health Workers? Evidence from a Nationwide Longitudinal Study in China

PRESENTER: **Dr. Yaxin Zhao**, Xi'an Jiaotong University
AUTHORS: Zhongliang Zhou, Ms. Dan Cao, Dr. Dantong Zhao

Background: Many low and middle-income countries struggle to improve the physician payment system, ensure physician motivation and make sure physicians to be retained. The physician payment system offers challenges in reasonable salary structure and poor remuneration in developing countries. Chinese government piloted the "Two Permissions" and the physician remuneration system reform at public hospitals in 2017 to enhance the public welfare of public hospitals and to mobilize health workers' enthusiasm. There is little evidence about the impact of the reform on physician salary structure and salary level.

Methods: We conducted a quasi-experimental design by using longitudinal data from waves 1 and 2 of the China Physician Remuneration Reform Survey at Public Hospitals in 15 provinces. In this cohort, 110,782 hospital staff were included in the tertiary hospitals and secondary hospitals. We assessed salary structure change and salary levels following the physician payment system reform in public hospitals by using the difference-in-difference analysis with propensity score matching.

Results: Compared with the control group, the percentage of base salary increased by 0.47, and the percentage of merit salary declined by 1.38 in the pilot group following the policy. We found that annual salary, annual base salary , and annual merit salary increased by 8%, 10%, and 8%. The reform is also effective for increasing the salary of junior doctors. The salary of hospital staff was significantly associated with the average social salary, the hospital's type, and their educational status, nature of employment, qualification, position, job type, and departments. Salary in establishment staff was significantly higher than non-establishment staff.

Conclusion: This study suggests that policymakers should further promote salary reform and raise the proportion of fixed salaries. The salary distribution should promote "Equal pay for equal work."

Keywords: Physician remuneration system reform; Public hospitals; salary structure; annual salary; PSM-DID

Job Competition in Civil Servant Public Examinations and Sick Leave Behavior

PRESENTER: **Grace Armijos Bravo**, University of Barcelona
AUTHOR: Judit Vall Castello

In several countries the entry system to public service is the traditional public examination procedure. In general, this type of positions is very attractive as they offer a bunch of benefits that are not available in the private sector, in particular, long-term employment stability. To access a permanent position, candidates have to take several passing exams that usually require a huge load of material to study, and therefore time. Candidates preparing a public examination may change their behavior in order to gain more time to study, in this sense, one of the sources of time may be paid health-related work absence as they are a right established in most social security schemes. This change in sick leave behavior may constitute a negative externality of the public examination process.

Therefore, in this paper, we analyze whether public examinations have an impact on sick leave behavior in Spain in terms of increased sickness absences as a source to get more time to study. For this, we use unique administrative data on the universe of sickness absence and permanent civil servant positions offered in Spain from 2009 to 2015. We apply an event study design to identify any changes in sickness absences months before the examination date. Our results show that there is an increase in health-related absence months before the examination date. In particular, when we examine calls with a large number of positions under competition the effect is even stronger. We also exploit differences across economic sectors and find that the education sector suffers from more sickness absences several months before the exams. In addition, we find evidence suggesting that female employees might be taking more sick leave. Finally, we also explore the type of diseases that may be driving our results.

Results from this paper are of relevance in terms of unintended consequences that the public examination system may be generating in terms of days lost that we measured through sickness related absence rates. Our findings are also of important policy implications for countries in which this recruitment scheme is used.

More Health per Rupee: Efficiency of Public Spending and Governance Quality

PRESENTER: **Dr. Dweepobotee Brahma**, National Institute of Public Finance and Policy
AUTHOR: Dr. Mita Choudhury

Health systems in low and middle-income countries are plagued by inefficiencies across the spectrum of heath service delivery. The presence of inefficiencies causes diminished overall health system performance in a country and poor health outcome through wastage of resources, incorrect allocation and inadequate utilization of existing resources.We study the case of India – the second most populous country that bears a sixth of the world's population. In India's federal system of government, decisions related to public health are made primarily at the state level. Hence inefficiencies in public spending start at the state level.

Several factors including inappropriate/counterfeit medicines, unmotivated healthcare workers contribute to inefficiency in the healthcare sector. A salient factor in India is the overall state capacity and quality of state governance. Good governance increases overall transparency and accountability and reduces the incidences of fraud and leakage. In this paper, we first estimate the technical efficiency in public spending in health across different states in India. We identify the most and least technically efficient states. We investigate the relationship between technical efficiency and the quality of governance in the states and discuss several ways of improving efficiency and overall health system performance.

We use administrative data on public spending on health from government budgets across the states for 2016 to 2020. We focus on direct outputs of the healthcare system and use data on total inpatients and outpatients served in public health centers from Health Management Information System. The total physical infrastructure is incorporated as the total primary health care centers, community health centers, sub-centers, district hospitals and sub-divisional hospitals in the state. We use panel data stochastic frontier models to assess the technical efficiency of public spending of funds across the states. States are ranked according to their technical efficiency and the most and least efficient states are identified. We also conduct a sub-group analysis to account for the differences in public spending in populous states versus small and hilly states. Our results hold up to a battery of robustness checks.

Capturing the quality of governance is a challenging task. There are different aspects to governance relevant to health service delivery. Moreover there are two way linkages between the quality of governance and economic development in a state. To account for these issues, we use two governance indices from Mundle et al. (2016) that measures the quality of governance for service delivery – the Governance Performance Index and Development Adjusted Governance Performance Index.

Overall, technical efficiency in public spending is positively related to the level of governance in the state. The most efficient states are the ones who possess the highest level of governance quality and vice-versa. Additionally we identify two groups of states – one with moderate levels of efficiency yet relatively low governance, and another group with low technical efficiency despite moderate governance quality. This is important for policy-making since these states require other focused interventions to improve their efficiency of public spending in healthcare.

Advancing Universal Health Coverage in the COVID-19 Era: An Assessment of Public Health Sector Technical Efficiency and Applied Cost Allocation in Cambodia

PRESENTER: **Mr. Robert John Kolesar**, Abt Associates Inc.
AUTHORS: Peter Bogetoft, Guido Erreygers, Vanara Chea, Sambo Pheakdey, Wim Van Damme

1. Overview

COVID-19 is causing severe global economic disruption. Cambodia's economy is expected to contract by 4% in 2020 (Asian Development Bank, 2020). This has serious impacts on tax revenue and consequentially on government budgets in general, and the public health budget in particular (Thmey, 2020). At the same time, unemployment is increasing financial vulnerability to health shocks, as out-of-pocket health care expenditure comprises an excessive share of income (Kolesar, et al., 2020). Cambodia's high-level strategy and policy documents including the National Strategic Development Plan 2019-2023 call to advance Universal Health Coverage (UHC) by increasing population coverage of social health protection to 65% by 2023. This represents a substantial increase as population coverage is presently about 30% (Kolesar, et al., 2020).

This study will assess the technical, cost, and allocative efficiency of the Cambodian public health system to quantify the extent to which current health sector resources can accommodate social health protection expansion. The study will also assess factors that explain differences in performance among the provinces as well as pioneer the application of the Data Envelopment Analysis-Aumann-Shapley applied cost allocation approach to the health sector. This will estimate the unit costs for each of the social health insurance reimbursement categories.

2. Background

There is evidence suggesting that health system efficiency in Cambodia can be improved. However, these studies assessed technical efficiency by comparing countries or health facilities. Given the Cambodian government's current Decentralization and De-concentration (D&D) reform program, the unit of analysis for this study will be the provinces. In 2019, 39.7% of the total Ministry of Health budget (~USD $377 million) was allocated to the capital/provincial level.

3. Methods

First, Data Envelopment Analysis (DEA) will be applied to calculate bias-corrected efficiency scores for each province and Phnom Penh (Bogetoft P. , 2012). Inputs will include staff salaries, pharmaceuticals and commodities, social health insurance reimbursements, user-fees collected, and performance-based service delivery grants. Centrally allocated resources will be monetized and assigned to provinces as inputs according the amounts received. Outputs will focus on the social health insurance reimbursement categories (e.g. out-patient services, in-patient services, cervical cancer screening, family planning services, emergency services, surgeries, and delivery and post abortion care). The second stage analysis will

employ Tobit regression to assess explanatory factors relating to provincial-level technical efficiency such as mean distance to a public health provider, healthcare quality scores, number of private providers, number of stock-outs of essential medicines, hospital mortality rates, ID Poor household density, secondary education completion rates, distance to capital city from the provincial capital. Finally, this study will estimate the unit cost for each of the insurance reimbursement categories. This will be done by using the DEA-Aumann-Shapley applied cost allocation approach. The Aumann–Shapley prices associated with a given output vector are estimated by weighting the sum of gradients of the linear facets of the estimated cost function along a radial contraction path of the observed output vector (Bogetoft, Hougaard, & Smilgins, 2016). The results will be compared with the current reimbursement rates and other costing studies.

6:00 AM –7:15 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Economic Evaluation Methodological Issues Poster Session

MODERATOR: **Tessa Peasgood**, University of Melbourne

A Sensitivity Analysis Framework for Health Economic Evaluation in Middle Income Countries: Appropriately Incorporating a Comprehensive Approach

PRESENTER: **Joshua Soboil**, IQVIA

AUTHORS: Lucy Cunnama, Tommy Wilkinson

When constructing a health economic decision model it is critical to select a sensitivity analysis approach that is appropriate for the decision context. This point is particularly salient to Middle-Income Countries (MICs), where there is relatively heightened resource scarcity and increased opportunity-cost. MICs face acute shortages of accessible as well as high-quality evidence, resulting in frequent imputing of data from external jurisdictions. Conversely, there are shortages in skills and research capacity, creating a strong complementary need to consider the contextual feasibility of applying resource demanding methodologies. Given the above, it is critical to establish when the technical benefits of more complex and resource demanding sensitivity analysis methods result in real-world value. We apply a comparative case study using a comprehensive approach to decision-modelling, implemented in the R and JAGS languages. The case study replicates a deterministic model originally used to inform the cost-effectiveness of adding a bivalent Human Papilloma Virus (HPV) vaccine to South Africa's public health care cervical cancer screening programme. Crucially, the case study provides critical insight into the potential pros and cons of implementing more complex sensitivity analysis techniques within MIC climates. Our findings indicate that the benefits of more advanced sensitivity analysis methods are nuanced; are contextually beneficial according to a case-by-case basis; and, moreover, that choosing a sensitivity analysis method should be guided by a conceptual 'fruitfulness' (i.e., a bang-for-buck). To aid analysts in the process of selecting an appropriate approach to achieving a sensitivity analysis output, using the insight gained from the comparative case study, we provide a general framework containing three core conceptual areas, namely: Decision-Maker Preferences (Investment, Decision Power, and Risk Aversion), Analytical Considerations (Available resources and Indirect Evidence) and Policy Context (Knowledge of Topic and Technical Expertise). The framework intends to encourage a judicious selection of sensitivity analysis methods, reduce the methodological variation apparent in MIC settings, and provide health care decision-makers with greater methodological transparency.

Economic Evaluation Guidelines in Low- and Middle-Income Countries: A Systematic Review.

PRESENTER: **Caroline Daccache**

AUTHORS: Rana Rizk, Jalal Dahham, Silvia Evers, Mickael Hiligsmann Sr., Rita Karam Sr.

Objective: To systematically identify the latest versions of official economic evaluation guidelines (EEGs) in low- and middle-income countries (LMICs) and explore similarities and differences in their content.

Methods: We conducted a systematic search in MEDLINE (Ovid), PubMed, EconLit, Embase (Ovid), the Cochrane Library, and the grey literature. Using a predefined checklist, economic evaluation key features and general characteristics of EEGs were extracted. A comparative analysis was conducted including a summary of similarities and differences across EEGs.

Results: Thirteen EEGs were identified, three pertaining to lower-middle-income countries (Bhutan, Egypt, and Indonesia), nine to upper-middle-income countries (Brazil, China, Columbia, Cuba, Malaysia, Mexico, Russian Federation, South Africa, and Thailand), in addition to Mercosur, and none to low-income countries. The majority (n=12) considered cost-utility analysis and health-related quality of life outcome. Half of the EEGs recommended the societal perspective, while the other half recommended the healthcare perspective. Equity issue was required in ten EEGs. Most EEGs (n=11) thoroughly required the incremental cost-effectiveness ratio and recommended sensitivity analysis, as well as the presentation of a budget impact analysis (n=10). Seven of the identified EEGs were mandatory for pharmacoeconomics submission. Methodological gaps, contradictions, and heterogeneity in terminologies used were identified within the guidelines.

Conclusion: As the importance of health technology assessment is increasing in LMICs, this systematic review could help researchers explore key aspects of existing EEGs in LMICs and explore differences amongst them. It also supports international organizations in guiding LMICs to develop their own EEGs and improve the methodological framework of existing ones.

Keywords: Economic evaluation, Economics pharmaceutical, Guidelines, Technology Assessment, Low- and middle-income countries.

Adherence to Country-Specific Guidelines Among Economic Evaluations Undertaken in Three High-Income and Middle-Income Countries: A Systematic Review

PRESENTER: **Dr. Deepshikha Sharma**, Post Graduate Institute of Medical Education & Research

Background: The world has witnessed a recent upsurge in the publication of economic evaluations of health interventions; however, the methodological quality of economic evaluation is essential if they are to usefully inform health policy decision making. To address this issue, several countries have formulated specific guidelines to standardize the principles of economic evaluation. We undertook a systematic review to assess the adherence of published economic evaluations to the recommendations on the principles of economic evaluation as stated in the country-specific guidelines for three countries across different income groups namely Canada, South Africa and Egypt.

Methodology: A systematic search was carried out in PubMed, Embase and York Centre for Reviews and Dissemination (CRD) databases to identify health economic evaluations conducted in the context of three selected countries from one year after the publication of the guideline to December 2018. The methodological specifications and reporting standards listed in the country-specific guidelines were converted into discrete binary variables: 0 (non-adherence) and 1 (adherence) to calculate mean adherence scores. Quality appraisal was done using Drummond's checklist. Correlation between adherence scores and quality appraisal scores was assessed. Stratified analysis by countries were undertaken to identify independent variables affecting adherence.

Results: We identified a total of 44, 79 and 16 economic evaluations for Canada, South Africa and Egypt, respectively. The mean adherence score was highest for Canada (71%), followed by South Africa (65%) and Egypt (60%). Quality appraisal score was also highest for Canada (82%), followed by South Africa (78%) and Egypt (55%). Adherence to guidelines was positively correlated with quality of studies (based on the checklist). Further, mean adherence score was significantly higher for studies using a cost-utility analysis design (72%), those with a local/national funding aid (72%), undertaken by a health economist (71%) and for pharmacoeconomic evaluations (70%).

Conclusion: Adherence to country-specific guidelines results in better quality economic evaluations. Countries should aim development of context-specific guidelines, however, the approach to enforcement of methodological adherence is critical, as it is unclear whether methods guidance in isolation directly improved quality in our sample or whether published economic evaluations simply aligned with the good practice as promulgated in the methods guides. Additionally, emphasis should be laid to set-up country-level institutional frameworks for funding Health Technology Assessments (HTA) and development of local researchers' HTA capacity.

What Is the Contribution of Health Technology Assessment to the Health System Objectives after over Ten Years of Implementation in Middle-Income Countries?

PRESENTER: **Sarah Saragih**, R4D Institute

AUTHORS: Nader Ahmad Fasseh, Zoltán Kaló

Background: Several middle-income countries (MICs) focus on the implementation of Universal Health Coverage (UHC). As those countries have limited public health care funds, they need to allocate their scarce resources efficiently. For that purpose, many would opt for using health technology assessment (HTA) to improve the evidence base of health policy decisions. Our aim was to assess the HTA impact on health system objectives in MICs in the transition towards UHC.

Methods: A systematic literature review was conducted by two independent researchers based on PRISMA guidelines to explore the impact of HTA across countries, specifically in MICs. A literature search using keywords "health technology assessment" or "HTA" and several keywords referring to impact ("benefit*" or" consequence*" or "impact*" or "effect*" or "influence*") with proximity "W/15", was performed on 18th February 2018 in Scopus databases. Reviewers conducted title and abstract screening, in which excluded article which is duplicated, which is a book chapter, without an English abstract, and which does not contain topic criteria. Afterwards, full-text review and data extraction was carried out to find information about the country, methodology used in data collection, type of HTA, purposes of undertaking HTA, the impact of HTA, and the relation between the impact and health system objectives.

Results: Out of 1293 articles, 17 studies met the inclusion criteria, where only five studies explored the impact of HTA in MICs (Romania, Bulgaria, Argentina, Malaysia, Thailand, China, Brazil, and India). Four out of five studies using literature review methodology, while remaining studies did not mention the methodology. Out of five articles, two articles explored the HTA impact performed by the institutionalized body, while two of them were not institutionalized yet (Romania and India), one studies did not mention this information. The most common purpose of undertaking HTA was health product pricing (3 out of 5 studies), which following with the use of HTA in reimbursement decision and clinical practice guideline. HTA in MICs was associated with the majority of health system objectives, but mostly related to equity in health and sustainable financing. The reimbursement decision based on HTA could facilitate patient access to effective and efficient health technologies, which contributes to sustainability of health care financing. However, if HTA contributes to price reduction in middle countries, its implementation may encourage parallel export of pharmaceuticals. No direct evidence supported the hypothesis that HTA can induce systemic cost-savings in underfinanced health systems of MICs.

Conclusion: There was a lack of studies that examine the impact of HTA in MICs until 2018. Based on experiences in high income countries, the use of HTA for pricing and reimbursement decisions and clinical practice guideline development could support the country to achieve health system objectives. Future research should explore whether findings from higher income countries are transferable to countries with lower economic status and eventually conclude on the impact of HTA in MICs.

Cultural and Linguistic Adaptation of the Multi-Dimensional OxCAP-MH for Outcome Measurement in Mental Health Among People Living with HIV/AIDS in Uganda: The Luganda Version

PRESENTER: **Kenneth Roger Katumba**, MRC/UVRI & LSHTM Uganda Research Unit

AUTHORS: Yoko V Laurence, Patrick Tenywa, Joshua Ssebunnya, Agata Laszewska, Judit Simon, Eugene Kinyanda, Giulia Greco

Background: It is rare to find HIV/AIDS care providers in sub-Saharan Africa routinely providing mental health services, yet 8-30% of the people living with HIV have depression. In an ongoing trial to assess integration of collaborative care of depression into routine HIV services in Uganda, we will assess quality of life using the standard EQ-5D-5L, and the capability-based OxCAP-MH which has never been adapted nor used in a low-income setting. We present the results of the translation and validation process for cultural and linguistic appropriateness of the OxCAP-MH tool for people living with HIV/AIDS and depression in Uganda.

Methods: The translation process used the Concept Elaboration document, the source English version of OxCAP-MH, and the Back-Translation Review template as provided during the user registration process of the OxCAP-MH, and adhered to the Translation and Linguistic Validation process of the OxCAP-MH, which was developed following the international principles of good practice for translation as per the International Society for Pharmacoeconomics and Outcomes Research's standards.

Results: The final official Luganda version of the OxCAP-MH was obtained following a systematic iterative process, and is equivalent to the English version in content, but key concepts were translated to ensure cultural acceptability, feasibility and comprehension by Luganda-speaking people.

Conclusion: The newly developed Luganda version of the OxCAP-MH can be used both as an alternative or as an addition to health-related quality of life patient-reported outcome measures in research about people living with HIV with comorbid depression, as well as more broadly for mental health research.

Measurement of Health-Related Quality of Life in People with Relapse Onset and Progressive Onset Multiple Sclerosis Using the Assessment of Quality of Life-8-Dimension (AQoL-8D) Multi-Attribute Utility Instrument

PRESENTER: **Hasnat Ahmad**, Menzies Institute for Medical Research, University of Tasmania

AUTHORS: Ingrid van der Mei, Bruce Taylor, Ting Zhao Miss, Qing Xia, Andrew J Palmer

Background: The evaluation of onset-type differences in health-related quality of life (HRQoL) (in the forms of health state utility values [HSUVs] and health dimension scores) of people with multiple sclerosis (MS) using a detailed preferentially sensitive multi-attribute utility instrument (MAUI) has not been performed. We aim to examine if HSUVs and dimensional scores differ significantly between MS onset types, in which health dimensions the differences are most pronounced, and whether these differences remain when HSUVs and dimensional scores are stratified by disability severity.

Methods: We estimated HSUVs and the unique composite 'super-dimension' and 'individual dimension' scores (crude, age, sex, disease duration and disease modifying therapies usage status adjusted; and stratified by onset-type and disability severity) for an updated sample of 1,577 participants of Australian MS Longitudinal Study, using the Assessment of Quality of Life (AQoL)-8D. Disability was assessed with the patient determined disease steps (PDDS) and mapped against the gold-standard Expanded Disability Status Scale (EDSS), and classified as no disability (EDSS level: 0), mild disability (EDSS levels: 1–3.5), moderate disability (EDSS levels: 4–6) and severe disability (EDSS levels: 6.5–9.5).

Results: Adjusted mean overall HSUV of progressive-onset participants was 0.55, which was 0.07 units lower than that of relapse-onset participants. Adjusted mean physical and psychosocial super-dimension scores for progressive-onset participants were 0.51 and 0.28, which were 0.07 and 0.06 units lower than for relapse onset participants, respectively. For the individual health dimensions, the largest statistically significant difference in mean scores between two onset groups was seen in independent living (0.12 units), followed by relationships (0.07 units), self-worth (0.07 units), coping (0.04), happiness (0.03) and mental health (0.02). HSUVs and dimensional scores were negatively associated with increasing disability severity in both onset types. However, when we stratified HRQoL estimates by disability severity, the differences between MS-onset types disappear.

Conclusions: Overall HRQoL estimates are worse for progressive-onset MS than relapse-onset MS. And MS-related disability negatively impacts HRQoL, irrespective of the MS onset type. However, the HRQoL estimates do not vary between the two onset types when stratified by disability severity, suggesting that we do not need to develop separate disability severity specific HSUV inputs for multi-state health economic evaluation models of each MS onset type.

Health-Related Quality of Life Among Patients with Chronic Hepatitis C Virus Infection: A Cross-Sectional Study in Tianjin, China

PRESENTER: **Xia Wei**, Peking university

AUTHORS: Mr. Yuxuan Feng, Li Yang

Background

The incidence of Hepatitis C virus (HCV) infection in China has increased sharply in the last decade, reaching at 16.02 per 100,000 people in 2019, and there are around 7.6 million patients currently in China. If the patients enter the stage of hepatocellular carcinoma, the average hospitalization expenses can reach 14,425 RMB each visit. Therefore, patients with chronic HCV infection always live with an impaired health-related quality of life (HRQoL) due to the large health and economic burdens. Although the arise of direct-acting antivirals (DAAs) has dramatically improved the efficacy, the access to and compliance with those treatments are still unsatisfactory in China, which has a further impact on HRQoL of patients with chronic HCV infection.

Objectives

Our aim was to assess HRQoL in Chinese patients with Chronic HCV infection using EuroQoL-5 dimensions with both 3-level (EQ-5D-3L) and 5-level (EQ-5D-5L), and to compare the differences between EQ-5D-3L and EQ-5D-5L in the field of chronic liver disease. we also aimed at identifying the significant factors associated with the impairment of HRQoL in these patients of China.

Methods

A cross-sectional observation study was conducted from November to December 2018 in Tianjin, China. EQ-5D-3L, EQ-5D-5L and EuroQoL visual analogue scale (EQ-VAS) were adopted to investigate the HRQoL of adult patients with chronic HCV infection. Utility values were calculated basing on the value sets specific to China. Results were reported in descriptive analysis to capture the sociodemographic characteristics, clinical patterns and utility values. EQ-5D-3L and EQ-5D-5L index were further compared, and a Tobit regression analysis was applied to investigate the associations of these variables with HRQoL.

Results

A total of 277 patients were enrolled in the study [median age 55 (45, 63); male 47.29%]. Mean EQ-5D-3L and EQ-5D-5L index were 0.90±0.17 and 0.87±0.21, respectively, while the mean EQ-VAS score was 78.01±16.21. The ceiling was reduced from 59.93% (3L) to 38.99% (5L). Tobit regression analysis demonstrated that age (45–65 years old, β=−0.18; >65 years old, β=−0.26), employment status (retirement, β=−0.15; unemployment, β=−0.19), and treatment regimen (DAAs, β=−0.12) were negatively associated with EQ-5D-3L index significantly, while age (45–65 years old, β=−0.13; >65 years old, β=−0.24) and employment status (unemployment, β=−0.12) were the significant negative factors with EQ-5D-5L index. Whereas, none of the above factors were significant with EQ-VAS score. The presence of liver cirrhosis or hepatocellular carcinoma was negatively correlated with HRQoL, but this effect was not significant in our analysis.

Conclusion and policy implications

HRQoL was impaired among Chinese chronic HCV infection patients, and more careful attention should be paid to the elderly and the unemployment subgroup. In addition, EQ-5D-5L appears to be a valid extension of the 3-level system to improve measurement properties and discriminatory power in the field of chronic liver disease.

Quantifying the Health-Related Quality of Life Burden of Scabies

PRESENTER: **Susanna Lake**, Murdoch Children's Research Institute
AUTHORS: Daniel Engelman, Oliver Sokana, Titus Nasi, Dickson Boara, Michael Marks, Margot Whitfeld, Lucia Romani, John M Kaldor, Andrew Steer, Natalie Carvalho

Background

Scabies is caused by a mite that burrows into the skin causing intense itch and skin lesions. The lesions can become infected and may lead to serious immune-mediated disease. Limited studies have shown that scabies impacts health-related quality of life (HRQoL), however no studies have been conducted in the Pacific region, an area with a high burden of scabies.

The aim of this study is to assess the impact of scabies on HRQoL in a high prevalence setting using the Children's Dermatology Life Quality Index (CDLQI) and Dermatology Life Quality Index (DLQI). We also assessed the validity of these tools in a Pacific island population.

Methods

The study was conducted in Western Province, Solomon Islands where 15% of the population have active scabies cases. We went to 20 villages and examined the whole population for scabies. We conducted Dermatology Life Quality Index and Children's Dermatology Life Quality Index questionnaires on participants both with and without scabies.

Results

We surveyed 1051 adults and 604 children, 91 and 103 with scabies, respectively. Scabies had a small impact on HRQoL with an average DLQI score of 3.1 (95%CI 2.4-3.8) and CDLQI score of 2.8 (2.3-3.4) (out of 30) in participants with scabies. Scores increased linearly with the severity of scabies with an average DLQI score of 7.8 (4.2-11.4) and CDLQI score of 4.8 (3.0-6.7) in participants with severe scabies indicating moderate impact on quality of life in adults and a small impact in children. The greatest impact on quality of life was due to the symptoms, impact on school and work, and sleep. Participants without skin disease had an average DLQI score of 0.2 (0.1-0.3) and CDLQI score of 0.4 (0.2-0.5).

Conclusions

Our study demonstrates that scabies has a small, but measurable, impact on HRQoL in Solomon Islands. We observed impacts on school, work and gardening which, in this setting, impact an individual's future and ability to support their family. In a setting where population prevalence of scabies is 15% this accounts for a large impact on the community. There is scope to develop a modified DLQI and CDLQI for scabies that is more culturally appropriate for Pacific Island countries and may better measure the true impact of this disease. The DLQI and CDLQI scores were able to discriminate between the skin-related quality of life of patients with scabies and the control group without skin disease. This study established a construct validity for the use of these questionnaires in Pacific Island populations indicating that these are appropriate tools to measure skin-related quality of life. The results of this study provide further evidence of the need for elimination of scabies as a public health problem in Solomon Islands and other settings where the disease is endemic.

Construct Validity and Responsiveness of EPIC-26, AQoL-6D and SF-6D Following Treatment for Prostate Cancer

PRESENTER: **Norma Brenda Bulamu**, Flinders University
AUTHORS: Christine Mpundu-Kaambwa, Michael O'Callaghan, Billingsley Kaambwa

Purpose

This study assesses the construct validity (convergent and discriminant validity) of two generic preference-based measures, the Short-Form Six-Dimension (SF-6D) and the Assessment of Quality of Life - 6 Dimensions (AQoL-6D) relative to the prostate cancer-specific Expanded Prostate Cancer Index Composite Instrument (EPIC-26) in patients with prostate cancer.

Methods

This study was conducted retrospectively using data obtained from a longitudinal population-based prostate cancer cohort, the South Australian Prostate Cancer Clinical Outcomes Collaborative (SA-PCCOC). Patient reported quality of life was assessed at baseline, 1 year, 2 years and 5 years. Patients were treated under three different modalities 1) active surveillance 2) radical prostatectomy and 3) non-surgical treatment (radiation therapy or chemotherapy). To assess convergent validity, correlations between EPIC-26 domain scores and utility scores were examined using Spearman's correlation coefficient, the intra-class correlation coefficient (ICC) and Modified Bland-Altman plots to further study the limits of

agreement. Discriminant validity was assessed using the Kruskal Wallis test. Effect Size (ES) and Standardized Response Mean (SRM) were calculated to assess responsiveness between baseline and 1 year.

Results

2,358 patients were included in this study. Correlation between the measures were significant but weak to moderate. The AQoL-6D (r = 0.531, p <0.001) and the SF-6D (r = 0.520, p <0.001) were strongly correlated with EPIC-26 hormonal domain but both had weak to moderate correlations with the other EPIC-26 domains. AQoL-6D discriminated between age-groups (*p=0.025*) but neither utility measures could discriminate between tumour stage. All EPIC domains except the hormonal domain discriminated between age groups while urinary irritation/obstruction (*p=0.006*), bowel (*p=0.05*) and hormonal domains (*p=0.04*) discriminated between tumour stage. When assessed between treatments at each timepoint post treatment, AQoL-6D discriminated between different treatments at 1-year (*p=0.0001*) and 2 years (*p=0.0003*) while SF-6D discriminated at 2 years (*p=0.03*) and 5 years (*p=0.03*). All EPIC domains discriminated between treatments (p<0.05) at all timepoints except the sexual domain which did not discriminate in outcomes at 5 years. When change in outcomes at the different timepoints was assessed for patients receiving the same treatment, none of the measures or EPIC domains discriminated in outcomes for patients under active surveillance. AQoL-6D did not discriminate in outcomes for all three treatments but SF-6D discriminated in outcomes for patients undergoing radical prostatectomy (*p=0.008*). All EPIC domains (except bowel domain) discriminated in outcomes for patients undergoing radical prostatectomy and non-surgical treatments.

The mean change for both utility measures was neither statistically significant nor responsive to change. The mean change in all EPIC domains was statistically and clinically significant except for the bowel and hormonal domains respectively. Urinary incontinence and sexual domain were responsive to change with ES=0.74 and ES=0.91.

Conclusions

The generic utility measures were comparable to EPIC-26 domains in discriminating between general characteristics such as age, however, EPIC-26 was able to discriminate between treatments and post-treatment outcomes over time. We therefore recommend the EPIC-26 be used within an economic evaluation for measuring subgroup differences in studies where generic preference-based measures are routinely used. However, it should be used in combination with a preference-based measure.

Correcting for Discounting and Loss Aversion in Composite Time Trade-Off Health State Valuation

PRESENTER: **Stefan Lipman**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam
AUTHORS: Dr. Arthur Attema, Matthijs M. Versteegh

Background: Time trade-off (TTO) is a commonly used method for health state valuation. It is typically applied assuming linear utility of life duration, i.e. respondents are assumed to value each year of life equally. Earlier work has suggested that this assumption, which imposes restrictions on individual's' preferences for health, is descriptively invalid. In particular, many individuals discount future life years and are loss averse for health, which may yield bias in the utilities derived from TTO. Applying a 'corrective approach', i.e. measuring individuals' discounting function and loss aversion and correcting TTO utilities for these individual characteristics, may provide a solution.

Aim: In this study, earlier work on the corrective approach was extended to make it suitable for use in practice (e.g. for use in EQ-5D valuation). This extension involved the development of methods for measuring discounting and loss aversion in the general public and deriving a corrective approach for health states worse than dead (i.e. for lead-time TTO).

Methods: The extended corrective approach was applied in an experiment for which 150 individuals of the general public were recruited for personal interviews with a trained interviewer. Lockdown measures related to COVID-19 required shifting data collection to digital interviews (facilitated with videotelephony) after 36 interviews were completed. All respondents completed TTO tasks for six health states, following the protocol typically used for valuation of EQ-5D health states, and afterwards loss aversion and discounting were measured with the non-parametric method and direct method respectively. Each respondent was also asked to provide feedback on the implications of their stated preferences in TTO.

Results: Digital interviewers yielded data that was similar to that obtained in personal interviews. We find that respondents are loss averse for life duration, and we find large heterogeneity in discounting (i.e. both positive and negative discounting of life duration). Generally, the estimates of loss aversion and discounting are in accordance with earlier work. We applied two different approaches, which differed in terms of the assumptions made about the reference-point for lead-time TTO. As a result, we find no difference between corrected cTTO utilities between the two approaches for relatively mild health states (as lead-time TTO is unlikely to be required in these cases). As in earlier work, after correcting for loss aversion and discounting, TTO utilities are lower. Interestingly, corrected utilities were generally lower than confirmed utilities. When respondents were asked if their TTO utilities should be adjusted, they were more likely to indicate downwards rather than upwards adjustment was needed. The adjustments made by respondents themselves were not as pronounced as would occur when applying a corrective approach.

Conclusions: The extended corrective approach developed here enables its' use in practice. Correction yields lower TTO utilities, but it remains unclear how to best represent individuals' judgments about the value of impaired relative to perfect health.

Lifetime Cost of HIV Management in Australia: A Modelling Study

PRESENTER: **Megumi Hui Ai Lim**, University of Melbourne
AUTHORS: Angela Devine, Richard Gray, Amy Kwon, Jolie Hutchinson, Jason Ong

Background: Changes in the efficacy of antiretroviral therapy (ART) have significantly reduced morbidity and mortality. Persons living with HIV (PLHIV) are now living longer and with much fewer complications than before and the costs of providing care and treatment over their lifetime are likely substantial. A recent systematic review identified that the best practice for estimating lifetime costs globally is through Markov modelling. However, there has not been one conducted in Australia to date. It is important to provide reliable estimates to prevent over- and undervaluing of HIV prevention strategies or under-estimating healthcare budgeting based on outdated data by policymakers. The aim of this study is to provide an updated estimate of the lifetime cost of HIV care in Australia, from the healthcare provider perspective.

Methods: A Markov cohort model was built to simulate disease progression for persons living with HIV (PLHIV) based on their CD4 counts (>500 cells/μL; 351–500 cells/μL; 201–350 cells/μL; 50-200 cells/μL; <50 cells/μL) and line of ART (first, second, and third line). The model was parameterized using data from the Australian HIV Observational Database, Australian refined diagnosis-related groups, Medicare Benefits Schedule, Pharmaceutical Benefits Scheme, and other published sources of literature. All costs were calculated in 2019 Australian dollars (A$), at a 3.5% discount rate per annum. One-way and probabilistic sensitivity analyses were conducted to explore the impact of input costs, transition probabilities, discount rates and proportion of PLHIV on ART on lifetime cost estimates.

Results: The average discounted lifetime cost of managing PLHIV was A$282,093 [95% CrI: A$194,648 - 429,076]. The lifetime cost estimate, multiplied by the estimated number of PLHIV in Australia, could cost the government A$7,949,380,740 [5,485,180,640 - 12,091,361,680]. ART drugs take up the largest proportion (92%) of the estimated lifetime cost. Lifetime cost was most sensitive to the costs of ART drugs and the failure of third-line ART. Replacing patented ART drugs with currently available generic equivalents for all patients reduced the lifetime cost to A$141,345.

Conclusions: This study is an update to previous national estimates of lifetime management cost of PLHIV in Australia, many of which have been reported sporadically and crudely estimated. The relatively high lifetime costs for managing HIV in Australia supports the urgent need to invest in HIV prevention strategies to avert new infections. Additional research is needed to explore the lifetime cost in specific population groups (such as men who have sex with men, people who injected drugs, people ineligible for Medicare, and members of the culturally and linguistically diverse community).

BRCA Mutations, Families and Economic Modelling – a Scoping Review

PRESENTER: **Mr. Jason Zischke**, QIMR Berghofer Medical Research Institute

Background: Women with mutations in *BRCA1* and *BRCA2* genes have an increased lifetime risk of developing breast or ovarian cancer. The hereditary nature of these mutations also means that there are relatives who may also be at a higher risk of developing these diseases. Family history of disease is a common clinical indicator for disease risk and criteria for genetic screening of women. Unfortunately, there are many women who do not know that they are at a potentially higher risk, with up to 50% of women with *BRCA* mutations having no known family history of disease. Through familial outreach and cascade testing, the TRACEBACK program aims to identify those women and their families who are unknowingly at-risk and provide them the opportunity to undergo genetic testing. The identification of at-risk women and families through the TRACEBACK program may lead to family members across potentially several generations being offered genetic testing, which poses some issues for economic modelling. There are no modelling guidelines on how to include multiple generations through cascade testing or how to identify how many individuals to include.

Methods: To identify how cascade testing has been incorporated into economic evaluations of genetic or genomic technologies, we conducted a scoping review. Articles were sourced from published academic literature, Health Technology Assessments and grey literature with the aim of answering three distinct questions: 1) how has genetic cascade screening been incorporated into health economic evaluations, 2) what modelling methods have been adopted to deal with multiple generations of patients and, 3) what rules or assumptions were used to identify how many relatives would receive testing. Articles were eligible for inclusion if they were full economic evaluations of genetic or genomic testing for any disease in a family, with multiple degrees of relatedness (at least first and second-degree relatives) and in English language.

Results: We assessed 14 eligible papers, across a range of diseases, where cascade genetic testing of relatives is routinely carried out. Authors used a wide range of methods to include cascade genetic screening across multiple generations, with no 'standard' or 'best practice' methodology observed. In many cases standard economic modelling methods were used but overlooked the complex nature of the decision problem. Multiple studies failed to describe how many generations of a family were tested. Several approaches were used to estimate the number of relatives that would undergo cascade genetic screening, but many were vague in their methods. There was also little evidence of a systematic method to accurately identify the number of individuals that may benefit from genetic screening.

Conclusions: Accurately identifying the number of individuals who would benefit from cascade genetic screening is a key cost driver in determining the cost-effectiveness of genetic and genomic testing programs such as TRACEBACK. A systematic approach to identify these individuals is required to improve the accuracy of modelling parameters and provide the best evidence for health care decision makers.

It's All the in the Family: Microsimulation Modelling of Genetic Testing

PRESENTER: **Lara Petelin**, The University of Melbourne
AUTHORS: Michelle Cunich Dr, Pietro Procopio, Carolyn Nickson, Ian Campbell, Alison H Trainer

Background

Around 20-25% of ovarian cancers and 5-10% of breast cancers are due to an inherited predisposition. Identifying at-risk women, such as those who carry a pathogenic variant in the *BRCA1* or *BRCA2* genes, can help reduce cancer incidence and morbidity by targeting them for early detection and preventive interventions. Current clinical models generally rely on first identifying a pathogenic variant in a woman who is already affected by cancer, with eligibility for testing determined by tumor subtype and whether there is an existing family history of cancer. The primary clinical and economic benefit of hereditary breast and ovarian cancer (HBOC) testing is obtained from preventing cancers in unaffected relatives who come forward for predictive testing for a known pathogenic variant in the family. Thus, the current approach is estimated to miss at least 50% of high-risk women. Population-based testing for HBOC as an alternative to current practice has been gaining momentum in recent years, as it enables identification of high-risk women before they develop cancer. Existing evaluations of population-based testing mostly rely on heavily simplified comparators, and are based on selected point estimates for probabilities of identification of relatives and uptake of cascade testing. This is likely to overestimate the benefit of population-based testing.

Methods

We have developed a novel microsimulation model for evaluating HBOC genetic testing that includes individuals linked within family structures (and thus a more sophisticated cascade testing component). The family unit is centered around an index (a woman aged 50-54 years) and is comprised of all first- and second-degree relatives. The number of relatives is modelled using parity estimates and birth intervals based on an analysis of 1173 pedigrees from an Australian genetics clinic. The genetic component includes Mendelian inheritance of single high- and moderate-risk gene variants in *BRCA1, BRCA2, PALB2, ATM, CHEK2*, *BRIP1*, *RAD51C* and *RAD51D*. HBOC risk associated with common genomic variants (single nucleotide polymorphisms) was incorporated through polygenic risk scores. Life histories for all individuals are generated, taking into account their gender, genetic risk, and current age.

Results

This microsimulation model, called NEEMO, more accurately reflects what is occurring in current practice using a simulated family-based approach. It has been validated for gene-specific cancer incidence, mortality, pathology, and uptake of cancer risk management. It has also been validated for genetic testing referral rates, and uptake of predictive genetic testing in relatives. Results regarding validation will be presented at the Conference.

Conclusions

Modelling genetic testing presents challenges due to the nature of inheritance and interaction between individuals. Clinical genetics and genetic testing are complex and highly specialized, with a commonly cited barrier to testing being a lack of awareness or understanding in non-genetics specialists around eligibility and management. The model we have developed will be useful for evaluating changes in cancer risk assessment, target populations for genetic testing, as well as modifications to cancer prevention strategies for women at increased risk.

Opportunistic Screening for Cardiovascular and Metabolic Diseases in Outpatient Settings in Sri Lanka: Effectiveness, Cost and Distributional Impact

PRESENTER: **Nilmini Wijemunige**, Institute for Health Policy
AUTHORS: Ravindra Rannan-Eliya, Owen O'Donnell, Jürgen Maurer

Background

Effective screening for diabetes, hypertension and high risk of cardiovascular disease (CVD) is critical to reducing the burden of CVD and metabolic diseases, which are the number one cause of death worldwide. Whilst these three chronic conditions (CDs) can be diagnosed with quick clinical assessment and widely available blood tests, and controlled with cost-effective medicines, a large proportion of people remain undiagnosed and untreated.

While Sri Lanka has set up Healthy Lifestyle Centres (HLCs) to screen people over the age of 40 for these CDs, attendance is low, with only 1.3 - 17% of the target population screened in any year, and those attending are predominantly female (70%). However, 30% of the target population visit a general or specialist outpatient department (OPD) at least once per month. Such visits present opportunities for screening and diagnosis that are currently missed. We modelled the impact of opportunistic screening at OPDs.

Methods

We used data from the Sri Lanka Health and Ageing Study, a nationally representative survey of 6,600 adults completed in 2019. We modelled a program screening people aged 40 years for hypertension, diabetes or high risk of CVD. Diagnosis was self-reported or inferred from taking antihypertensives, anti-diabetics or statins during the past two weeks. A person was identified as having one of these conditions if they had a diagnosis, or if their blood pressure, blood sugar or total cholesterol was above a critical threshold, or if they had a 10-year risk of cardiovascular disease ≥ 20%.

We modelled an intensive 1-month screening program using data on the number of visits in the past 28 days to relevant OPDs. We set the probability of being screened on a single visit to 60% for a public OPD and 55% for a private OPD, and assume that 80% of those screened are followed-up. We also modelled the impact of a 12-month program where 62% of people with a CD had at least 1 OPD visit and the probability of screening per visit was lowered to 30% in the public sector and 28% in the private sector.

Results

Of the 2.4 million people aged 40 years and above without CVD, and an outpatient visit in the past month, 1.4 million (61%) would be screened by a one-month program, with 924,932 (40%) followed-up. Nearly one-fifth of those screened would be newly diagnosed with a CD. The program would diagnose 12% of previously undiagnosed people. A one-year program would identify 39% of previously undiagnosed people. The cost per person diagnosed in the 1-month program was USD 1.37 in the public sector and USD 21.53 in the private sector, and USD 1.46 and USD 18.67 for the 12-month program. In the public sector, the poor would be disproportionately represented among those newly diagnosed (Concentration Index = -0.03 $p<0.001$). Taking the public and private sectors together, new CD diagnoses would be neither pro-poor nor pro-rich.

Discussion

Screening for CDs at OPD clinics could be a cost-effective and equitable way to supplement low, female-heavy attendance for screening at HLCs.

A League Table of Cancer Control Interventions That Spans Primary Prevention to Palliation: QALYs, Impact on Inequalities, Costs and Cost-Effectiveness

PRESENTER: **Nick Wilson**

AUTHORS: Leah Grout, Jennifer Summers, Anja Mizdrak, Nhung Nghiem, Cristina Cleghorn

Background

Policy-makers need to know the best investments in cancer control from the perspectives of health gain, health inequities, cost and cost-effectiveness. We aimed to collate cancer-relevant interventions that have been evaluated by our research team using compatible data and with compatible modeling methods.

Methods

We extracted data from an online interactive league table that we have developed for Australian and New Zealand (NZ) health sector interventions (https://league-table.shinyapps.io/bode3/). We focused on a selection of NZ interventions published in the peer-reviewed literature that were relevant to different aspects of cancer control: primary prevention, screening, management/treatment and palliation. These were all methodologically comparable: modeled with a proportional multistate lifetable, health system perspective, lifetime time horizon, and discount rate (3%).

Results

The modeled primary prevention intervention with the largest gain in quality-adjusted life-years (QALYs) was the adoption of climate-friendly eating patterns that are more plant food-based (ie, 1.46 million QALYs gained [95%UI: 1.17 to 1.77]; 331 QALYs per 1000 people; US$15.0 billion costs saved). This model included the prevention of 13 different diet-related cancers (along with other benefits eg, preventing cardiovascular disease and diabetes). Most of the other interventions related to nutrition (eg, taxes on sugar, a fruit and vegetable subsidy, processed food reformulation) and physical activity (eg, increasing levels of active transport by switching car trips to walking and cycling) were also estimated to be cost-saving.

The most effective tobacco control intervention (preventing 16-tobacco related diseases, including 12 cancers) was the "sinking lid on tobacco supply" intervention. It was estimated to gain 282,000 QALYs (64 per 1000; US$4.1 billion costs saved). All of the other modeled tobacco control interventions (eg, tobacco tax, supply restrictions, Quitline promotion and apps for quitting) were also cost-saving and delivered higher per capita QALYs to Māori (Indigenous) compared to non-Māori. Other cost-effective primary prevention measures included alcohol tax increases and HPV vaccination programs (using a threshold of NZ$45,000 (US$32,900) per QALY gained, a rule of thumb of GDP per capita per QALY gained).

A colorectal cancer screening program was found to be cost-effective, as was a *Helicobacter pylori* fecal antigen and serology screening program to prevent stomach cancer (particularly for Māori and Pacific peoples in NZ). Low-dose CT screening for lung cancer was found to be of possible cost-effectiveness for Māori.

In terms of treatment, cancer care coordinators for assisting colorectal cancer and breast cancer patients were found to be cost-effective, as was targeted adjuvant trastuzumab (Herceptin) in HER2-positive early breast cancer by age and hormone receptor status.

Conclusions

We found the primary prevention interventions (eg, relating to diet and tobacco) gave the largest health gains and cost-savings. Researchers and policy-makers can use this online league table to identify the potential best next cancer control interventions to perform further research or implement. They can also use it to make comparisons with interventions in other health sector domains and between Australia and NZ.

6:00 AM –7:15 AM TUESDAY [Supply Of Health Services]

Supply of Health Services Poster Session 1

MODERATOR: **Tor Iversen**, Universitetet i Oslo

Indonesia: Setting a Path Towards a Three "E" (effective, efficient, and equal) Primary Health Care System

PRESENTER: **Mr. Aditia Nugroho**, Social Security Administering Agency (Health BPJS)

AUTHORS: Eko Arisyanto, Tuncay Serdaroglu

Government of Indonesia implemented a decentralization system since 1998. It is a submission of authority by the central government to the autonomous regions to organize and manage government affairs in the system of the Unitary State of the Republic Indonesia. Along with the submissions of authority, the Central Government formulated a financing system among different levels of government. However, decentralization has not yet provided satisfactory results. Local governments are still financially dependent on the central government. Transfer funds from central government account for more than half of local government revenues as of 2016, the locally- generated revenue only accounted for 22%. Transfer funds consist of general purpose grants and specific purpose grants. General purpose grants serve for supporting local government autonomy, while Specific Purpose Grants (SPG) are funds allocated to specific areas and specific activities which are utilized for regional affairs in accordance with national priorities. SPG for health are aimed to improve access and quality of basic health services. One of the utilization areas of SPG funds in basic health services is to develop a first-tier level basic health infrastructure called *Puskesmas* (Primary Health Center). *Puskesmas* are basic health care facilities at the district level and associated sub-district levels. Management of *Puskesmas* is within the authority of local governments particularly at the district and sub-district levels. One of the *Puskesmas* essential roles is to provide immunization services within its coverage area. However, decentralization of the health system which gives local government authority to manage fiscal allocation from central government does not associate with the improvement of immunization status in children.

In this paper, we examine the socioeconomic and regional disparities of the utilization and the provision of primary health care in Indonesia with a particular emphasis on the operational framework of decentralization. Then, we will provide a set of alternative policy options to address poor outcome of the primary health care system in the country. Among them, the most relevant policy options are determined as the recommendations to the Ministry of Finance and Ministry of Health according to the results of our Criteria Alternative Matrix analyses.

First identified causal determinant related to the problem is that total government health spending in Indonesia remains low both in national and local level. The second causal determinant is the weak operational framework of governance within the decentralized health system. The third causal determinant is inequality in the distribution of *Puskesmas* and physicians among region in Indonesia.

We recommend three final policy recommendations. First recommendation is to increase the proportion for Public Health Service budget in the Specific Purpose Grants that has a specific purpose to increase the number of public primary care centers (*Puskesmas)*. Second recommendation is to improve public financial governance capacity among different levels. The last recommendation is to revitalize community involvement through education and empowerment at Integrated Health Service Points (*Posyandu*) as the *Puskesmas's* extension.

Closing a Policy Loophole: The Impact on Australian Government Health Expenditure and Primary Health Consultations in the After-Hours

PRESENTER: **Barbara de Graaff**, University of Tasmania

AUTHOR: Mark Nelson

Background: The Australian Government subsidises access to primary care through the Medicare Benefits Scheme. In 2010, a new business model emerged, largely employing non-vocationally registered General Practitioners (NVR-GP), and provided fully subsidised, after-hours home visiting medical services. In 2017 we showed[1,2] that since establishment of these businesses, the increase in Medicare claims/rebates for after-hours GP and NVR-GP services ranged between 208%-1,270% in most jurisdictions, with no corresponding decrease in presentations to hospital Emergency Departments (ED) (single jurisdictional case-study).

Much of this growth was related to urgent after-hours consultations, which attracted a higher rebate than non-urgent services (e.g $129.80 versus $74.95). In response, new rules regarding eligibility for GPs and NVR-GPs to claim rebates were introduced on 01/03/2018. The aim of this study was to assess the impact of these changes on Medicare claims and expenditure.

Methods: Retrospective analysis of Medicare claims data for all after-hours GP and NVR-GP services from the Medicare Statistics website. Annual and monthly data were extracted from 01/01/2010-31/12/2019. Results include national numbers of claims for after-hours services and Medicare expenditure (Australian dollars (AUD)).

Results: Total annual claims for after-hours (urgent and non-urgent) consultations increased from 872,326 to 2,294,247 between 2010-2017. Over the subsequent two years, this decreased to 1,343,961 claims. Across all years, the most common item claimed was for item 597/585, the more highly rebated item for urgent after-hours consultation. Between 2010-2017, the annual number of claims for this item increased from 544,280 to 1,403,679. Evaluation of monthly data illustrated that claims for this item began to decline in late 2017, associated with publication of our previous study and subsequent media coverage. As of 01/03/2018, when only GPs were eligible to claim this item, a further dramatic decrease in claims was observed: with just 344,406 in 2019. In contrast, the number of claims for item 591 (urgent after-hours consultation by a NV-GP) increased from ~40,000 claims annually to 328,188 in 2019, and claims for non-urgent items have all increased moderately since 2018.

In turn, between 2010 and 2017 annual expenditure across all after-hours items increased from AUD98.5 million to AUD269.3 million. This subsequently decreased to AUD150.2 million in 2019. Annual Medicare expenditure on item 597/585 (urgent after-hours) decreased from AUD182.1 million to AUD46.4 million between 2017-2019. Increases in expenditure on non-urgent items and urgent NVR-GP consultations have increased moderately since 2018.

Discussion: The supply-induced demand that was largely driven by widespread advertising by these new business models has largely been addressed by a combination of adverse publicity, and both the mooted and actual changes to the rules for claiming Medicare rebates in the after-hours. Whilst no corresponding reduction in ED presentations was observed during the growth in claims for the after-hours period[1], data for EDs over the 2018/19 period will not be released until mid-December 2020. It will be important to review presentation rates in the context of the results of this study.

Distance to Provider Delays Initiation of Specialist Care: Evidence from Public Renal Units in Queensland, Australia

PRESENTER: **Marcin Sowa**, The University of Queensland

AUTHOR: Luke Connelly

Timely initiation of specialist care is essential for managing the burden of chronic disease. This is especially true in chronic kidney disease (CKD) where progressing to end stage results in renal replacement therapy: transplantation or continuing renal dialysis. In Queensland, people who experience loss of renal function sustained for over 3 months qualify to receive renal specialist care. We set out to test whether geographic distance to provider influences the timing of specialist care initiation.

We retrospectively analysed data collected in the CKD.QLD Registry, a Queensland disease surveillance program, which gathered information from 3,469 consenting individuals who entered one of the eight public renal specialty units between 4 July 2011 and 30 June 2016. We approximated the distance to specialist using geographic coordinates of the individual's suburb and the provider's location. We used ordered logit and multilevel mixed-effects ordered probit to estimate the impact of distance on disease stage at the time of presentation. We used linear models to confirm the robustness of results and to inspect the behaviour of interaction terms. The models were specified to control for demographic and socio-economic factors, comorbidities, site effects, and year of presentation.

Median distance to specialist was 23 km, and for 95.4% of patients it was less than 200 km. 59.2% of patients presented with early CKD (stages 1-3), and 40.8% with advanced CKD (stage 4 or 5). Greater distance to provider was associated with more advanced disease at the time of specialist care initiation, and the effect was pronounced in indigenous patients. In the fixed effects model, for patients of median characteristics, a 100 km distance to specialist corresponded to a 1.1 (non-indigenous) and 6.7 (indigenous) percentage point increase in the probability of presenting with advanced CKD. The respective values from the random effects model were 1.0 and 5.4. Findings were consistent across linear and non-linear models.

The healthcare system's capacity to manage CKD is not evenly distributed. To the extent that specialist care offers effective secondary prevention, this outcome may be suboptimal. Initiating specialist care has two requirements: a timely diagnosis and a successful referral. Determining the relative contributions of both steps, and finding effective responses, will be instrumental for reducing the gap. Access to primary care and costs of travel are likely to be important factors.

Impacts from a Novel Outcomes Based Commissioning Approach to Treat Chronic Disease

PRESENTER: **Henry Cutler**, Macquarie University Centre for the Health Economy

AUTHORS: Dr. Yuanyuan Gu, Francesco Longo, Joanne Epp, Rachel Sheather-Reid, Peter Lewis, Michael Bishop, Anthony Critchley

Many governments are managing people with chronic conditions using integrated care, to improve health outcomes, improve patient experience, and reduce hospital costs. In 2017, one Australian local health district introduced a novel outcomes based commissioning (OBC) program to keep vulnerable older people healthy and at home.

Two providers were commissioned to deliver care coordination for one year. Provider payments were based on how much they reduced unplanned public hospital bed days relative to predictions for their allocated patient cohort without OBC, regardless of whether their cohort enrolled into their care coordination program.

This study estimated the effect of OBC on emergency department (ED) attendances, unplanned hospital admissions, and length of stay (LOS) on the intervention group consisting of enrolled and not enrolled patients, and the enrolled group consisting of only enrolled patients.

We used hospital administration data for the intervention group (N=411) and a control group (N=332) meeting the same program selection criteria but receiving usual care. Controls included patient demographics and health status. We used difference in differences (DiD) analysis with entropy

balancing to promote parallel trends and account for potential selection bias.

The intervention, enrolled and control groups all experienced a reduction in ED visits, unplanned public hospitalisations, and LoS over the trial period, suggesting regression towards the mean. Reductions were less for the intervention and enrolled groups compared to the control group. OBC significantly increased ED attendances but did not significantly impact unplanned hospital admissions or LOS.

OBC may have improved health literacy and encouraged people to seek emergency care when their health was in doubt, but this did not translate into reduced unplanned hospitalisation costs. Impacts on health outcomes and public hospital utilisation may occur beyond one year but were not measured in this study.

The Impact of Structural and Strategic Competition on Hospital Quality

PRESENTER: **Christiane Wuckel**, RWI – Leibniz-Institut für Wirtschaftsforschung

Many health care systems aim to enhance quality of hospital treatments by encouraging competition. For example, the German hospital market has undergone a series of reforms that aimed to introduce and increase competition among hospitals. One of the most significant changes was the shift from a payment system that is based on the length of stay to the introduction of the Diagnosis-Related Group payment scheme. There is evidence that this reform increased competition between hospitals significantly (e.g. Herwartz and Strumann (2012)).

However, the relationship between competition is less clear. Theoretical analysis predicts a positive relationship between competition and quality in case of a market with regulated prices (e.g. Karlsson (2007)). However, empirical analyses find evidence for a positive as well as a negative relationship. Other studies find no impact at all.

My contribution to this literature is two-fold. The ambiguous empirical results suggest that the relationship depends crucially on the specific setting of the analyzed hospital market. Analyzing the relationship between competition and quality for the German hospital market can give valuable insights about the nature of the relationship in a market with regulated prices that is characterized by a high number or hospitals and a diverse ownership structure.

While most studies look at competition as market structure, I aim to distinguish effects of market structure from effects of strategic behavior by using a twofold analysis.

First, I examine the effects of market structures on quality using the Hirschman-Herfindahl-Index. Second, I apply a spatial approach to analyze if hospitals adapt their quality in response to quality changes in neighboring hospitals. My analysis is based on several essential quality measures including patient satisfaction, mortality, hospital complications. I use a factor analysis to extract latent quality indicators from those measures. Moreover, investigating the years 2014 to 2017 enables me to estimate cross sectional and panel data models.

I find evidence for a significant, non-linear relationship between market structure and quality. Hospitals in mildly competitive environments appear to offer better quality than monopolists as well as hospitals in highly competitive environments. Additionally, I find evidence for strategic behavior. Neighbors of high-quality hospitals are more likely to offer higher quality themselves.

In conclusion, hospitals appear to be impacted by market structure as well as strategic behavior. Quality enhancing policies might therefore be likely to show positive spill-over effects.

Patient-Centered Communication and Quality of Health Care: Evidence from a Standardized Patient Study

PRESENTER: **Min Su**

AUTHORS: Zhongliang Zhou, Yafei Si

Background

Effective patient-physician communication has been considered a central clinical function and core value of health care for physicians. Currently, there are no studies directly evaluating the status quo of patient-centered communication (PCC) and its association with the primary care quality in China. This study aims to measure the status quo of the PCC of primary care in urban China and investigating the association between PCC and the primary care quality.

Methods

The standardized patients were used to measure PCC and the quality of health care. We recruited 12 standardized patients from local communities presenting fixed cases (unstable angina and asthma), including 492 interactions between physicians and standardized patients across 63 CHCs in Xi'an, China. PCC was scored on three dismissions: exploring disease and illness experience, understanding the whole person and finding common ground. We measured the quality of the primary care by considering six criteria: (1) accuracy of diagnosis, (2) consultation time, (3) appropriateness of treatment, (4) unnecessary exams; (5) unnecessary drugs, and (6) medical expenditure. Ordinary least-squares regression models with fixed effects were used for the continuous variables and logistic regression models with fixed effects were used for the categorical variables.

Findings

The average score of dimension 1, dimension 2, and dimension 3 of PCC was 12.24±4.04 (out of 64), 0.79±0.64 (out of 3), and 10.19±3.60 (out of 17), respectively. The average total score of PCC was 23.22±6.24 (out of 84). We found 44.11% of the visits (217 out of 492) having correct diagnosis, and 24.19% of the visits (119 out of 492) having correct treatment. The average number of unnecessary exams and drugs was 0.91±1.05, and 0.45±0.82, respectively. The average exam cost, drug cost and total cost was 19.09±29.04 CNY, 15.21±29.26 CNY, and 35.00±41.26 CNY, respectively. After controlling for the potential confounding factors and fixed effects, the correct diagnosis, and correct treatment, consultation time, number of unnecessary drugs, and medical expenditure increased in a statistically significant manner, by 0.111% ($P<0.01$), 0.114% ($P<0.01$), 0.140 ($P<0.01$), 0.036 ($P<0.01$), and 1.428 ($P<0.01$).

Interpretation

This study revealed poor communication between primary care providers and patients, as well as the poor quality of the primary care. The PCC model has not been achieved, which could be one source of the intensified physician-patient relationship. We also found significantly positive associations between PCC and correct diagnosis, correct treatment, and consultation time. The results suggest that efforts on improving PCC not only reward PCC per se but also have significant gains in quality of health care, which will ultimately improve population health. However, our study also showed that negative associations between PCC and the number of unnecessary drugs, and medical expenditure. To improve PCC, the clinical capacity and communication skills of primary care providers needs to be strengthened. Also, strategies on reforming the pay structure to better reflect the value of physicians' value and providing a stronger motivation for performance improvement are urgently needed.

The Impact of Online Doctor Reviews on Offline Provider Behaviors: Evidence from Orthopedic Inpatient Care in China

PRESENTER: **Dr. Mengcen Qian**, Fudan University

Online physician review websites have gained their popularity worldwide. Such websites provide a platform for patients to share their personal experiences by publicly commenting and rating the performance of their doctors. Although these ratings are subjective, they are specific to individual physician, straightforward to understand, and rich in evaluation domains, which potentially provides new information to the market relative to an official report card and may affect both the demand and supply of offline services.

Previous literature has examined the reliability of online ratings as a performance measure and the impact of these ratings on patient demand in various settings. However, few studies have explored how the rating information may affect provider behaviors. This study aims to fill up the gap

by investigating the impact of online review volumes and average ratings on traditional quality indicators of orthopedic providers in China.

We used two data sources. The first is the discharge data of a prefectural city in China from 2016-2019. Each discharge record provides information about the diagnosis, procedures, total expenditures, admission and discharge dates, hospital name, names of attending providers, and an anonymous patient identifier. We calculated indicators of 7-day readmission, 30-day readmission, in-hospital mortality, Charlson comorbidity index above 0 and postoperative infections and pains incidence for each record. The second is the scrapes of historical online doctor comments of a leading online physician review website in China (haodf.com, which is the earliest found website of this kind). Each piece of review provides us the hospital name, name of the reviewed doctor, a general rating, a written comment, and the post date. We calculated average ratings and review volumes on monthly basis for each doctor. We linked lagged rating information to the discharge data based on the name of the hospitals and the doctors.

Considering that doctors who always received higher ratings may be inherently different from those who always received lower ratings, our results may suffer endogeneity issues. We used two approach to address this empirical challenge. First, we used a physician fixed effects to control for time-invariant unobserved heterogeneity across providers. That is, we exploit temporal variations in rating information for a given individual to identify the effects. Then, we identified the date that each doctor received his first online review and employed a dynamic difference-in-differences approach to compare changes in behaviors of doctors before and after their reviews were available in the market among those who received their first reviews earlier relative to those who received them later.

We find that rates of readmission and postoperative infections and pains decreased as rating volumes in the recent month increased. Providers with intermediate titles who provided services in more competitive areas were more responsive to online rating information. Our results suggest that online physician review websites may have served as a form of public surveillance which induced quality consciousness of the providers. Attempts to enhance the sensitivity of the ratings and comments to actual performance by redesigning or regulating such websites may improve social welfare.

Effects of Fee-for-Service, DRGs and Mixed Payment Systems on Physicians' Medical Service Provision: Experimental Evidence

PRESENTER: **Ms. LI Xing**, Captital Medical University

AUTHORS: Yue Zhang, Xinyuan Zhang, Youli Han

Background How to keep a balance between controlling health expenditure and guaranteeing medical quality is an important issue that all countries are concerned about in healthcare reform. Because of the imperfect of pure payment systems, healthcare reforms in many countries, including China, demonstrate a movement towards the mixed payment systems. However, as to how to design better mixed payment systems, and how the implementation of mixed payment systems affects the health benefits of patients, these problems have not been well solved, especially about Mix-more-DRGs systems. This research supplements the relative laboratory experimental literature.

Objective To conduct a laboratory experiment to explore how FFS, DRGs and mixed payment systems affect physicians' medical service provision.

Methods We designed a laboratory experiment to investigate how physicians responded to FFS, DRGs and mixed payment systems. 210 medical students in the role of physicians, as subjects, were randomly divided into 7 groups, a, b, c, d, e, f, g. Each subject in the same group participated in the experiment consisting of two parts. In part I, subjects decided under a pure payment system, FFS or DRGs. In part II, they decided under a mixed payment system. Mixed payment systems of a, b, c, d, e groups were 96%DRGs+4%FFS, 84%DRGs+16%FFS, 64%DRGs+36%FFS, 80%FFS +20%DRGs, 60%FFS+40%DRGs, respectively. The f, g groups were designed to investigate the effect of presentation of payment systems. There were 5 rounds of each group of experiments, and each subject made 18 decisions per round. The quantity of medical services provided by subjects were collected. And relevant statistics were computed and analyzed by Nonparametric tests.

Results Our results showed that physicians were likely to provide more (less) medical service than optimal quantity under FFS (DRGs). The higher the severity of the disease, the greater the difference between the quantity of medical services provided and the optimal quantity under DRGs, while the difference is lower under FFS. Mixed payment systems could improve the overprovision (underprovision) caused by FFS (DRGs) and provided higher patients' health benefit than the respective pure payment system. And we found that the health conditions of patients had an effect on the degree of the loss of patients' health benefit under different mixed payment systems. The loss of patients' health benefit reduced for patients in intermediate and bad health with the weight on DRGs decreased under Mix-more-DRGs systems. The loss of patients' health benefit reduced for patients in good and intermediate health but increased for patients in bad health with the weight on FFS decreased under Mix-more-FFS systems. In addition, the presentation of pure incentives or mixed incentives did not significantly affect physicians' medical service behavior.

Conclusions Mixed payment systems are a better way to balance physicians' profit and patients' health benefit. The weight placed FFS or DRGs in mixed payment systems should be adjusted according to the patient's health conditions. The 84%DRGs+16%FFS and 64%DRGs+36%FFS payment systems are more suitable for patients in good and intermediate health, respectively. While for patients in bad health, 64%DRGs+36%FFS and 80%FFS +20%DRGs payment systems are better.

The Effect of Diagnostic Related Groups As an Internal Resource Allocation Mechanism for Public Inpatient Care: Evidence from Hong Kong Public Hospital System

PRESENTER: **Ms. Yushan WU**, JC School of Public Health and Primary Care, The Chinese University of Hong Kong

AUTHORS: Eng-kiong Yeoh, Hong Fung, Ka-Chun Chong

Importance: Hong Kong introduced diagnosis-related groups (DRGs)–based internal resource allocation scheme for all public hospitals in 2009. The scheme was subsequently discontinued in 2012 and replaced by a global budget system. Changes associated with the discontinuation of a DRG system in inpatient care have never been evaluated before.

Objective: To examine the association between DRGs' introduction and discontinuation and changes in volume of care, length of stay, in-hospital mortality rates, and emergency readmission rates among the entire acute inpatient population and stratified by age group and across 5 medical conditions.

Design: We used an interrupted time series model to quantify the level and slope changes in outcome variables before the DRG scheme was introduced (April 2006–March 2009), during its implementation (April 2009–March 2012), and after its discontinuation (April 2012–December 2014).

Setting: The acute care setting of all public hospitals in Hong Kong

Participants: Patients aged 45 years and above hospitalized in acute care settings

Main outcomes and measures: Patient-level length of stay, in-hospital mortality rate, and one-month emergency readmission rate; population-level number of admissions

Results: Our study included 7 604 390 patient episodes in total (mean patient age = 68.97 [SD = 13.20]; 52.17% male). We estimated that the introduction of DRGs was associated with a 1.82% decrease in average length of stay (95% CI, 1.72% to 2.13%), a 2.90% increase in the number of patients admitted (95% CI, 2.52% to 3.28%), a 4.12% reduction in in-hospital mortality (95% CI, 1.89% to 6.35%), and a 2.37% decrease in unplanned readmissions (95% CI, 1.28% to 3.46%). Following the discontinuation of the DRG scheme, there was a 0.79% increase in average length of stay (95% CI, 0.58% to 0.99%) and a 1.82% reduction in the number of patients treated (95% CI, 2.17% to 1.47%) after adjusting for covariates; no statistically significant change was observed in in-hospital mortality and emergency readmission rates.

Conclusion and relevance: DRGs' introduction was associated with shorter lengths of stay and increased hospital volume; these trends reversed following DRGs' discontinuation. In-hospital mortality and emergency readmission rates did not significantly change with DRGs' discontinuation.

The Long Run Impact of Changing the Healthcare Production Mix on Expenditure

PRESENTER: **Mendel Grobler**

Introduction

Excess growth in healthcare expenditure is of high concern for many countries and has been for almost a century. There is broad consensus in the literature that the introduction and use of new technologies are the likely cause of the excess growth as a proportion of GDP. However, it is possible that this view is premature.

Methods

A simulation model was developed to test the cost impact of varying the healthcare production mix over time in meeting healthcare demand. The model was constructed for a 170 year period commencing in 1900, and simulated healthcare demand assuming exponential temporal growth in demand per person and a price elasticity of zero. Healthcare production to satisfy simulated demand consisted of two factors of production: services and goods (medical technologies). Services were limited in labour productivity whereas goods were allowed to increase unit output when new goods were introduced. The mix of production was varied simply by varying the rate of uptake of new goods. All service unit prices increased at a rate 0.4% higher than GDP growth. GDP growth followed historic trend growth with an average of 3.9% across the period. New goods had a 2.0% incremental improvement in output for each new good compared to existing goods, with a 4.4% incremental increase in unit price. No price reduction was allowed for new goods at any time. The only other costs considered were infrastructure costs, assumed not to be a production factor but dependent on the volume of service consumption and increasing in unit price in line with GDP growth.

Results

In 1900, production of healthcare was dominated by services at 95% by volume and 49% by cost. Goods comprised 5% of volume and 21% by cost. Infrastructure comprised 30% of total healthcare cost. When rate of uptake of new goods was set at zero, healthcare costs had an exponential growth trajectory relative to GDP through to 2070. When the rate of uptake of new goods was set to 2.5% per year, the healthcare costs as a proportion of GDP curve showed a marked reduction in growth and assumed a linear shape after the year 2000. When the rate of uptake of new goods was set at 3%, the rate of growth showed a decline in healthcare costs relative to GDP from about 2050. Uptake values between 2.5% and 3% showed healthcare costs as a proportion of GDP having a roughly sigmoidal shape over time.

Discussion

This model indicates that when goods displace services in the production mix of healthcare, costs ameliorate. This is despite new goods declining in efficiency while improving in output, and hence appears counter-intuitive. However, the reduction in costs comes from the displacement of future expensive services that also decline in efficiency and are a larger proportion of the production mix.

A Hard Look at Soft Cost-Control Measures in Healthcare: The Case of Preferred Statins Prescription Quotas in Germany

PRESENTER: **Katharina Blankart**, University Duisburg-Essen

AUTHOR: Daniel Avdic

We study the efficacy of preferred drug policies in altering physicians' prescribing behavior for the high volume drug class of HMG-CoA-reductase inhibitors (statins) within the German statutory health insurance system. Using a nationally representative panel of ambulatory care physicians between 2011 and 2014, we exploit the regional administrative structure of German healthcare policy to estimate treatment effects of changes in preferred drug policies across regions and time in a difference-in-differences / pooled synthetic control group empirical design. To identify relevant policy parameters we specify a physician agency model to describe the incentive for the physician to use preferred drugs compared to non-preferred drugs. In this approach we account that physicians face a risk of a recourse claim when non-compliant. We then empirically analyze how physicians adapt their prescribing behavior in face of a policy change (preferred drug level and range of drugs) in a situation where the current standard of care is contested by generic entry of atorvastatin, a blockbuster drug of similar efficacy-safety-cost profile. We find that changes in the preferred drug policy does not lead to higher levels of the preferred drugs prescribed, on average. However, this average effect conceals treatment effect heterogeneity by a physician's compliance status pre-/post-policy and across the statin drugs of the preferred drug regimen. The large number of physicians who always comply do not change their behavior as expected. It is non-compliant physicians at risk pre-policy and never compliers by sticking to simvastatin despite the rise of the now generic atorvastatin.

Procurement Institutions and Essential Drug Supply in Low- and Middle-Income Countries

PRESENTER: **Dr. Lucy Xiaolu Wang**, Max Planck Institute for Innovation and Competition

AUTHOR: Nahim Zahur

Ensuring essential drug supply in low and middle-income countries (LMIC) is a pressing global challenge, with complicated issues regarding supply chain management, local production capacity, and intellectual property (IP) rights. International procurement institutions have played important roles in reducing coordination failures in drug supply by centralizing procurement and delivery within and across regions. This paper studies price, delivery, and shipment time of essential drugs supplied in 106 LMIC during 2007-2017 across four therapeutic areas and five procurement institution types. We find that pooled procurement institutions generate significantly lower prices, particularly when pooling across countries. Pooling internationally is most effective at reducing prices when buyers are small and when markets are more concentrated, while pooling within-country is most effective with large buyers and less concentrated markets. Although pooling internationally with an integrated payment system reduces delivery delays, drugs have to be ordered earlier, resulting in a longer shipment time. Finally, pooled procurement institutions tend to purchase older generation drugs, complementing IP licensing institutions that focus on the diffusion of newer, patented drugs.

Exploring Human Resources in Health Underpinnings of Kerala's Public Health System: A Retrospective Data-View of Kerala's Story of Pandemic Containment

PRESENTER: **Althaf Shajahan**, National Institute of Technology Calicut

AUTHORS: Muneera Kuthirodath, Fawaz Kareem

State of Kerala, India was one of the first states which clearly forecasted another possible outbreak when they found three of its Covid positive University students seeking to come back home from the pandemic epicenter-Wuhan, China. Earlier in 2018, Kerala faced an outbreak of Nipah virus, another deadly pathogen spread from animals to people. Kerala was ripe for the spread of the virus, with its large urban population, many residents living abroad (and traveling back and forth), and high influx of migrant laborers. Yet with targeted testing, contact tracing, and isolation measures, the state government brought the number of daily new cases down to almost zero in the first few months, flattening the curve far better than the rest of India. As national lockdown measures eased, infections have risen again, but the state seems prepared to keep things from going out of control. Only 0.36% of confirmed cases have died, a mortality rate that is among the lowest in the world and reflects both Kerala's young population and high-quality health care (Chandrashekhar,(2020a, 2020b).The study goes beyond these political and personal factors and looks at the determinants of the system's coping abilities to respond to such crises and contain pandemics. Kerala's success in effectively responding to the COVID-19 is attributed to its experience and systematic investment in health systems strengthening along with measures such as surveillance, risk communication and community engagement, early detection and broad social support (WHO,2020).

We wish to take a retrospective view on the role of an understudied factor- the Human Resources in Health(HRH) underpinnings of Kerala's public health system and explain the resilient responses in pandemic containment. The focus of this research is to deconstruct the HRH story of Kerala's Public Health System resilience using available data. So we build on the existing empirical work to explore plausible spatial correlations (and attempt questions of causality) between the measures of Human Resources in Health (HRH) and health outcomes viz. health seeking behavior, health expenditure and public provider choice. For the data exercise, we use existing secondary data sources viz. economic census, NSS health surveys and data from Medical Council of India to build a panel database which helps us explore demand-supply imbalances of HRH in the health system and unveil underlying patterns. We employ panel regressions to explore the correlations and causal links and spatial heat mapping to visualize the geographical distributions. Seeking to understand the deeper patterns, we do investigate a related question on if investments in medical

education and training gets reflected as employment in the public and private health system. We compare the state of Kerala, the southern states, BIMARU(the lagging states) and other states of India to elucidate on this key role of investments in HRH for a resilient health system.

Regulating Medical Tourism: Evidence from Spain

PRESENTER: **Judit Vall Castello**, University of Barcelona

AUTHORS: Catalina Amuedo Dorantes, Noelia Rivera

Medical tourism, defined as those individuals travelling to another country to receive medical treatment or surgery, is increasing in several parts of the world. We analyze the effectiveness of a legislative measure adopted in one of the regions in Spain in January 2012 with the purpose of deterring and curtailing medical tourism. Using a comprehensive administrative dataset of all medical procedures performed in the country between 2008 and 2015, and a difference in difference approach that exploits the geographic and temporal variation in the implementation, we find a drastic drop in the number of hospitalizations, along with a reduction in its total cost of approximately 4.8 million euros per trimester. Furthermore, the reduction occurred uniformly across patients' gender, age, origin, as well as across medical procedures, without significant changes in their estimated consumption of resources, duration of treatment or mortality.

6:00 AM –7:15 AM TUESDAY [Cross-Cutting Themes And Other Issues]

Cross-Cutting Issues: COVID 19, Digital Health and Stated Preference Poster Session

MODERATOR: **Aviad Tur-Sinai**, Max Stern Yezreel Valley College

Why COVID-19 May Lead to an Increase in HIV/AIDS in Africa: Evidence from a Cohort Study of Female Sex Workers in Senegal.

PRESENTER: **Carole Treibich**, GAEL

AUTHORS: Wen Qiang (Wally) Toh, Sandie Szawlowski, Henry Cust, El Hadj Alioune Mbaye, Khady Gueye, Cheikh Tidiane Ndour, Aurelia Lepine

Background

The COVID-19 pandemic has the potential to be the most severe and long-lasting economic shock experienced by female sex workers (FSWs) globally due to the high and close contact nature of the profession. Given that there is a positive income premium attached to unprotected sex, FSWs may resort to adopting risky sexual behaviours as a means to cope with the decreased earnings resulting from COVID-19.

Methods

We used data from a cohort study of around 600 Senegalese FSWs in Dakar, Senegal. During the COVID-19 pandemic in June-July 2020, we elicited respondents' perceptions of how COVID-19 has affected them. We also compared FSWs' income and sexual behaviours in 2020 with that of previous survey waves in 2015 and 2017. For continuous variables, the mean, median, interquartile range (IQR), 10^{th} and 90^{th} percentiles were reported. A t-test was also carried out to test the differences between the means in 2017 and 2020. For categorical variables, bar charts were shown. Condom use was elicited via the list experiment method to overcome social desirability bias. Heterogeneity analyses were carried out to identify the channels through which COVID-19 affected condom use.

Findings

COVID-19 led to a 70·0% reduction in the number of clients seen in a week from 2017 levels. The steep fall in the number of clients led to a reduction in sex work earnings by 50·3%. Estimated condom use prevalence with the last client was similar in 2015 and 2017, but decreased by 13·1%-pts during the COVID-19 pandemic (p=0·014), corresponding to a drop of 16·8% compared to 2017. Condom use decline was concentrated amongst asset-poor FSWs (22·7%-pts drop (p=0·004); 27·0% reduction in condom use from 2017 levels). However, self-reported STI symptoms did not increase. Furthermore, a substantial proportion of FSWs reported that they have reduced visits to health facilities because of COVID-19, but there was no evidence that this was associated with decreased condom use. Mental health of FSWs has deteriorated, while experience of violence from clients or the police has remained largely unchanged.

Interpretation

Condom use has likely to have fallen to alleviate the economic shock brought about by COVID-19. While the plunge in the number of clients may have offset the transmission of HIV and other STIs for now, it remains to be seen whether condom use would resume once business improves, especially if the crisis were to be prolonged. Given the potential public health issue this may create, policies targeting FSWs to dampen the adverse economic impact of the COVID-19 crisis should urgently be considered as a strategy to prevent the transmission of HIV and other STIs.

Benefit-Cost Analysis of Oral Polio Vaccine to Stimulate Innate Immunity: Examples of COVID-19 and Child Mortality

PRESENTER: **Angela Y Chang**, Danish Institute for Advanced Study

AUTHORS: Dr. Stefano M Bertozzi, Dr. Dean T Jamison

Background: Recent reviews summarize evidence that some vaccines have heterologous or non-pathogen specific effects (NSE) against multiple pathogens. Numerous economic evaluations examine vaccines' pathogen-specific effects, but only two economic evaluations of NSE exist. This paper starts to fill this gap by conducting economic evaluations of the NSE of oral polio vaccine (OPV) against under-five mortality and COVID-19.

Methods: We conducted economic evaluations in two settings: (1) reducing child mortality in a high-mortality setting (Guinea-Bissau) and (2) preventing COVID-19 in India. In the former, the intervention involves three annual campaigns in which children receive OPV. In the latter, a susceptible-exposed-infectious-recovered model was developed to estimate the population benefits of two realistic vaccine scenarios, in which OPV would be co-administered alongside COVID-19 vaccines. Incremental cost-effectiveness and benefit-cost ratios were estimated for broad ranges of intervention effectiveness estimates to supplement the headline numbers and account for uncertainty.

Findings: For child mortality, headline cost-effectiveness was $650 per child death averted. For COVID-19, assuming OPV has 20% effectiveness, incremental cost per death averted was $23,000-65,000 when it was administered simultaneously with a COVID-19 vaccine less than 200 days into a wave of the epidemic. If OPV can be available earlier, the cost per averted death falls to $2600-6100, Estimated benefit-to-cost ratios vary but are consistently high.

Interpretation: Economic evaluation suggests large potential of LAVs, such as OPV, to reduce child mortality in high mortality environments. Likewise, within a broad range of assumed effect sizes LAVs could play an economically attractive role against COVID-19.

The Sub-National Pandemic Response in Malawi: Integrating COVID-19 into District Planning to Prioritize Financing Decisions for COVID-19 and Essential Health Services

PRESENTER: **Stephanie Heung**, Clinton Health Access Initiative (CHAI)

AUTHORS: Liberty Neba, Dalitso Laviwa, Ian Yoon, Jean Nyondo, Pakwanja Twea, Kenasi Kasinje, Leslie Berman, Saadiya Razzaq, Eoghan Brady, Gerald Manthalu, Bejoy Nambiar, Levison Nkhoma, Mihereteab Tehome Tebeje, David Matseketse, Mesfin Senbete, Tedla Damte, Andrews Gunda

Introduction

The Government of Malawi has prioritized an Essential Health Package (EHP) delivered free to all Malawians as a step towards UHC. EHP implementation is decentralised to District Health Management Teams (DHMTs), which develop annual District Implementation Plans (DIPs) as

tools for the planning and management of EHP services.

To coordinate the COVID-19 response, the Government of Malawi launched its National COVID-19 Plan in April 2020. In Malawi's decentralized context, sub-national coordination is critical to ensure that resources are effectively planned and utilized towards the National COVID-19 Plan while essential services are delivered without disruption.

In order to promote harmonized planning for routine EHP services and emergency COVID-19 activities, the MOH supported all districts to integrate COVID-19 activities into their DIPs, with technical assistance from the Clinton Health Access Initiative (CHAI) and co-financing from UNICEF. This analysis describes the methods through which COVID-19 was integrated into district planning and summarizes emerging trends for district financing towards COVID-19.

Methods

DHMTs from all 29 districts were supported to develop sub-national COVID-19 activities, in alignment with the National COVID-19 Plan, and to prioritize and integrate these activities into their DIPs together with government COVID-19 budget allocations. DHMTs additionally integrated data on available partner resources from the MOH's rapid COVID-19 Resource Mapping exercise. Finally, unfunded activities were prioritized for further resource mobilization.

Using DIP data, resources were categorised and analysed against the pillars of the National COVID-19 Plan, in order to inform district-level resource allocation towards the COVID-19 response and the EHP, to estimate and prioritize financial gaps, and to allow future tracking of expenditures against sub-national response plans.

Results

Each district planned an average of $508,231 in COVID-19 activities, representing 10% of the total DIP cost with the remaining 90% planned for EHP services. A much larger percentage of COVID-19 activities at district level was funded (75%) compared to the EHP (37%). Overall, district COVID-19 activities were 45% partner-funded, 30% government-funded and 25% unfunded.

There was large geographical variation in COVID-19 funding allocations. The average allocation was $0.49 per capita, ranging from $0.31 per capita in Mulanje to $6.04 per capita in Neno. Further research is required to understand the drivers of this variation.

When analysed against the pillars of the National COVID-19 Plan, the majority of district COVID-19 activity costs (62%) were aligned to HR Development, primarily for capacity-building of the health workforce in COVID-19. Several pillars were almost entirely partner-funded, including Laboratory and Diagnostics (95%). Other pillars were primarily unfunded, including Clinical Care (80%) and Infection Prevention (80%), with clear implications for protecting health workers and maintaining essential services. None of the pillars were predominantly government-funded.

Conclusion

The integration of COVID-19 into district planning, including quantification of district funding gaps, can promote efficient resource allocation for COVID-19 and EHP services and serve as a starting point to inform future pandemic preparedness. Further work is needed to understand the drivers of the observed funding variations, and to track government and partner expenditures against the budget commitments in the district plans.

An Economic Evaluation of COVID-19 Special Health Accomodation Quarantine and Caring for Residents Self-Isolating in the Community with the Royal Prince Alfred Virtual Hospital (RPAVIRTUAL): The First Phase

PRESENTER: **Michelle Cunich Dr**

AUTHORS: Brendan Bott, Teresa Anderson, Miranda Shaw, Emma McBryde, Ross Sinclair, Michael Byrom, Gregory Fox, Leena Gupta, Emma Quinn, Dianna Jagers, Rajip Thapa, Hannah Storey, Elaine Pan

Background: The Sydney Local Health District's (SLHD) COVID-19 outbreak response was quick and centred on the use of crucial infrastructure established only a few months prior to the outbreak – the RPA Virtual Hospital (rpavirtual). This virtual hospital enabled the timely delivery of virtual multi-disciplinary care for returning travellers in Special Health Accommodation (SHA) quarantine and residents self-isolating in the community (S-I) (i.e., 'at-home care'). Early in the year, a few studies reported on the potential impacts of the pandemic on the NSW health system under non-mitigation and optimal mitigation strategies, including estimates of hospitalisations, ICU requirements and deaths at the peak of the pandemic. However, the economic evidence for these strategies is yet to be provided.

Aim: To evaluate the costs and benefits associated with the scenario where there is SLHD SHA quarantine with virtual hospital-type care and virtual care for residents S-I provided by rpavirtual, compared to the scenario where there is an unchecked pandemic (i.e. no mitigation strategies) from a societal perspective. By evaluating these outbreak scenarios, we can investigate whether or not the SLHD SHA quarantine and virtual care for residents S-I has been justified by being either life-saving, cost-saving or both.

Methods: We have developed a novel economic model to quantify the resources used (costs) and health outcomes associated with the SLHD's SHA quarantine with virtual hospital-type care and virtual care for residents S-I through rpavirtual, compared to the scenario where there is an unchecked pandemic (or only partial implementation of available strategies) during the period from 11 March 2020 to 30 June 2002. A range of data sources have been utilised to build the model, including information on healthcare resource usage (e.g. rpavirtual management, multi-disciplinary virtual care centre staff, multi-disciplinary personnel in SHA, COVID-19 screening staff, swabs, SHA vendors, client transfers and wearable devices for health monitoring) and health outcomes (hospitalisations, ICU stays, length of stay and deaths) from our Partner Sites, and complementary data from published literature and official websites. A bottom-up costing approach has been adopted, which involved identifying all activities associated with SLHD SHA quarantine and caring for residents S-I with rpavirtual, estimates of the resources used for these activities, identifying activities where there were dependencies, and accounting for these dependencies in calculations. We have utilised an established epidemiological (microsimulation) model to obtain estimates of the relevant health outcomes under the checked and unchecked scenarios. Net Savings from SLHD SHA quarantine and virtual care for residents S-I through rpavirtual are in the process of being calculated. Sensitivity analysis will be undertaken, especially in relation to how rates of infection impact on the magnitude of the health outcomes under the different scenarios (and relative success of quarantine).

Results: Total costs, total hospitalisations, total ICU stays under the different scenarios; averted hospitalisations and ICU stays; net savings be presented at the Conference.

Conclusions: Economic evaluations are critical as health administrators (and policymakers) assess the efficacy of quarantine in the event of another COVID-19 outbreak or controlling another highly infectious disease in the future.

Assessing Spatial Accessibility to Fever Clinics during the COVID-19 Epidemic in Beijing, China

PRESENTER: **Jiawei Zhang**, Peking University Health Science Center

AUTHORS: Peien Han, Li Yang

Background: In 2020,the COVID-19 pandemic threatens human lives and causes huge economic losses. The viral infection expanded internationally and WHO announced a Public Health Emergency of International Concern, placing severe pressure on national health systems. In China, fever clinics establish an important platform for the early detection, diagnosis and treatment of the epidemic. However, there is no study to measure fever clinics service spatial accessibility in Beijing using the enhanced two-step floating catchment area (E2SFCA) method.

Objectives: The study aimed to measure spatial accessibility of fever clinics during the COVID-19 epidemic in Beijing under different outbreak levels and to provide practical recommendations for optimizing the spatial distribution and enhancing the capacity of fever clinics.

Methods: The 2020 health statistics of fever clinics from Beijing Municipal Health Commission and the 2019 5km*5km population data from Tencent Location Data Services were collected. We obtained epidemiological indicators for COVID-19 as parameters for the improved-SEIR model. Firstly, we acquired fever clinics' name, address and numbers of health technicians. Secondly, we utilized the improved-SEIR model to predict the

maximum number of infections on a single day at different control levels. Thirdly, based on the ratio of the number of visits to fever clinics to actual number of infections in Beijing and the number of infections predicted by the model, we calculated the number of patients who would need to visit fever clinics at different outbreak levels. Finally, we used the enhanced two-step floating catchment area (E2SFCA) method under ArcGIS 10.5 environment to analyze spatial accessibility to fever clinics services for the patients in Beijing.

Results: The maximum number of infections per day for the three outbreak levels,which is severe,moderate and mild, simulated by the model was 68, 183 and 8514 respectively. At the severe level of the outbreak, 409 communities (69.91%) had poor accessibility to fever clinics, which means each physician need to care more than 100 patients per day. Only 17 communities (2.91%) had good accessibility to fever clinics, all in the central districts. When the outbreak is at a moderate level, there were notable disparity in spatial accessibility of fever clinics. When the outbreak was at a mild level, 559 communities (95.56%) had good access to the fever clinic and no population points had poor access. The supply of fever clinic services was adequate at this degree.

Conclusions: The results of the proposed model show that the spatial accessibility to fever clinics services shows a significant disparity, and the uneven distribution of general hospitals is the main cause. At severe levels of the outbreak, additional fever clinics or fever sentinel sites can be established in ecological conservation districts. In the case of a mild epidemic, it is necessary to consider the closure of fever clinics in urban areas to avoid cross-infection. Fever clinics should develop targeted recommendations for the dynamic opening of fever clinics, depending on the development of the epidemic and the level of control and prevention.

How Modifying Key-Performance Indicators for Primary Care Providers Affects Improvement in Healthcare Outcomes and Creates Economic Savings during COVID-19 Pandemic in Indonesia

PRESENTER: **Mr. Aditya Darmasurya**, BPJS Kesehatan

AUTHORS: Rahma Anindita, Mcandra ikhda Nurrohman

How Modifying Key-Performance Indicators for Primary Care Providers Affects Improvement in Healthcare Outcomes and Creates Economic Savings During COVID-19 Pandemic in Indonesia

Background:

Since March 2020, COVID-19 has affected primary care providers to deliver continuous healthcare in Indonesia despite the fact that they receive regular capitation payment. In order to not only improve health care quality but also maintain efficient payments for health facilities especially during the COVID-19 pandemic, Indonesia's Social Security Administering Body for Health Sector (BPJS Kesehatan) has applied Performance-Based Capitation (KBK) for primary care providers with modified key-performance indicators. The indicators are contact rate which includes virtual consultation, ratio of-Disease Management Program (DMP) members with controlled clinical outcomes and non-speciaized referral ratio. The former two indicate healthcare outcomes while the latter indicates cost-containment since referrals to hospital care will be paid by partial free-for-service payment through Case-Based Groups (CBGs) system. Previous indicators only emphasize on process aspect; therefore, a modification is essential. In the time of COVID-19, issues arose on how these indicators will improve health outcomes and will it create efficient capitation payment thus allowing economic savings?

Objectives:

To asssess the effectiveness of KBK indicator modification on healthcare outcomes and economic savings.

Method:

This study is a non-experimental big-data analysis by observational descriptive method. Quantitative data were obtained from BPJS Kesehatan national database generated from healthcare services recorded by 21.746 primary care providers through P-Care application program with 223.470.668 national health security program (JKN) members. Data series from April 2020 to September 2020 were then analyzed. These data include number of patient visits, number of virtual consultations, laboratory results for PROLANIS-DMP members and vital signs for each patient and number of patients referred to hospital.

Results:

A total electronic data of 123.260.813 primary care visits was analyzed. There had been an improvement in indicator target achievements. Contact rate increased from 77,42‰ in April 2020 to 90,48‰ in September 2020. Virtual consultation, included in contact rate, increased from 0,29% of total visits in April 2020 to 2,22% of total visits in September 2020. Contact rate and virtual consultation show how primary care providers act as first contacts to JKN members. Ratio of PROLANIS-DMP members with controlled clinical outcomes, measured by vital signs and laboratory results, increased from 1,17% in April 2020 to 1,68% in September 2020. This specifies efforts of primary care providers to maintain the DMP program during the COVID-19 pandemic. Non-specialty referral ratio decreased from 2,28% in April 2020 to 1,74% in September 2020, allowing an economic savings of 9,8 billion rupiahs due to the number of patients treated by primary care providers and not referred to hospitals.

Conclusion

The data synthesized shows considerable evidence in how modifying key-performance indicators in Indonesia's Performance-Based Capitation (KBK) in the time of COVID-19 shows improvements of healthcare outcomes measured by contact rate, number of virtual consultation and PROLANIS-DMP clinical outcomes. The data synthesized also reveals how the modification creates potential economic savings by maintaining JKN-members in primary care with minimum non-specialty referrals.

Effect of the Epidemic of COVID-19 on the Operation of Tertiary Public Hospitals: Evidence from 19 Tertiary Public Hospitals in Beijing, China

PRESENTER: **Jiali Teng**

AUTHOR: Youli Han

Background: Because of the outbreak of the epidemic of COVID-19, hospitals have taken lots of measures for prevention and control, which have brought great changes to the operation of hospitals and both challenges and opportunities to the development of hospitals. In the normal situation of prevention and control of the epidemic, changes in the volume of services and structure of diseases may bring transformation of new medical service model. The aim of this study was to analyze the effect of the epidemic on the operation of public hospitals, and so as to provide policy suggestions for the development of hospitals under the normal epidemic situation.

Methods: The study is designed to compare the actual operation of hospitals during the epidemic with the simulated counterfactual operation. In this study, 20% of tertiary public hospitals with similar size in Beijing were selected, and specialized hospitals for infectious diseases were excluded. Finally, we selected 19 tertiary public hospitals in Beijing as research objects. The epidemic period analyzed in this study is from 2020 to 2021. Outpatient and emergency department visits, inpatient visits, medical income, hospital distributable income, average outpatient and emergency income and average inpatient income were selected to reflect the operation of the hospital. A descriptive method was used to analyze the changes in 2020. In addition, based on the monthly data from April 2017 to December 2019, the Multiplicative Season ARIMA(MS - ARIMA) model was applied to predict the monthly data during the period of 2020 and 2021, and we finally compared the gap of actual and predicted values. Monthly data from April 2017 to December 2020 come from Beijing Health Comprehensive Statistical Information Platform.

Results: (1) The total number of outpatient and emergency department visits, inpatient visits, medical income and hospital distributable income in 2020 decreased by 36.2%, 35.5%, 22.5% and 21.8%, respectively, compared with the same period in 2019. However, the total number of average outpatient and emergency income and average inpatient income in 2020 increased by 26.4% and 16.5%, respectively, compared with the same period in 2019. (2) The results of the ARIMA models showed the total number of actual outpatient and emergency department visits, inpatient visits, medical income and hospital distributable income in 2020 decreased by 39.2%, 40.3%, 29.9% and 28.0%, respectively, compared with the predicted values under the assumption that COVID-19 did not occur. Analyzing the monthly trend in 2020, it was found that all indicators

reflecting hospital operation except average inpatient income had a larger impact of the COVID-19 from February to July 2020 compared to the other months, which was consistent with the development trend of COVID-19 in Beijing. (3) During the epidemic, some hospitals provided online consultation, diagnosis and treatment services, and half of the patients visited online were from outside Beijing.

Conclusion: The impact of the epidemic on tertiary public hospitals is relatively large, so hospitals should strengthen the diagnosis and treatment services, Internet medical, delicacy management and so on in the situation of the normalization of the epidemic.

The Demand for Longevity, Health and Long-Term Care Insurance after COVID-19

PRESENTER: **Cheng Wan**, UNSW Sydney
AUTHORS: Hazel Bateman, Hanming Fang, Katja Hanewald

We conduct an online experimental survey to elicit and analyse preferences for retirement portfolio including longevity, health and long-term care insurance products after the COVID-19 pandemic outbreak. Our sample consists of 1,000 respondents who completed the survey in China in Aug-Sep 2020. We designed a sequence of experimental tasks to elicit the preferred allocation of retirement financial assets across a savings account, a life annuity, critical illness insurance and long-term care insurance. We collect variables measuring the effects of COVID-19 on personal finance, mental stress, and risk-taking behaviours. We also collect a comprehensive array of covariates including personal preferences, financial competence and other demographic and socio-economic factors. We observe a high variation of insurance demand by individual background. On average, the most preferred retirement portfolio contains health-contingent insurance that covers half of the expected out-of-pocket (OOP) costs for critical illness and long-term care expenditures, a monthly annuity of CNY 717, with the remaining retirement wealth kept in a savings account. The portfolio that covers half of the OOP cost for long-term care is most effective to increase annuitisation. Findings inform the development of retirement products in China and other developing economies facing population ageing and incomplete insurance markets.

Assessment of Impact of COVID-19 Pandemic on GDP, Employment and Poverty in Nepal

PRESENTER: **Shiva Adhikari**, Nepal Health Economics Association

The COVID-19 pandemic has multi-faceted and widespread impact on the Nepalese economy. This report presents the findings of assessment of the COVID-19 impacts on Gross domestic product (GDP), employment and poverty by utilizing the national account, labour survey, annual household survey data. These findings need to be interpreted cautiously given the uncertainty of the upcoming situations and paucity of even historical data.

The shortfall in the real growth rate of gross valued added in FY 2019-20 is estimated to be -7.68 percent with -1.58 percent shortfall in agriculture and -10.16 percent short fall in non-agriculture gross value added. High intensity of impact is seen in tourism sector; however, it has 5.7 percent weight in total gross value addition (GVA). Low intensity of impact of Covid-19 is found in public health, government services, electricity, gas, water and communication. A total contribution of these sector to GVA is only 5.69 per cent.

It is estimated that from 6.6 lakhs to 9.2 lakhs persons might lose their jobs in the domestic economy during the fiscal year. The domestic job losses come mainly from the non-agriculture sector of the economy. From 5.1 lakhs to 6.4 lakhs Nepalese working abroad might return to homeland during this fiscal year. This means that the economy will have from 11.7 lakhs to 15.6 lakhs people looking for employment. It is assumed that these job losses will add pressure to agriculture and rural employment.

An additional 1.65 percent of population (about five lakhs people) is estimated to fall below poverty line due to the short-term economic impact of COVID-19, thus, falling under the transient poverty category. At the same time, poverty intensity is estimated to increase from 3.40 to 3.74 percent.

Informal workers, including the self-employed, casual and wage workers, and relatively low-income people are disproportionately hit by COVID-19. Some members of households and migrant workers suffer from economic vulnerability. Many of migrant workers were not able remit money to their family. Due to shocks in the economy, many of them are vulnerable to transient poverty.

A Systematic Review of the Cost-Effectiveness of Telehealth in Primary Care

PRESENTER: **Ms. Keshia De Guzman**, Centre for Health Services Research, The University of Queensland
AUTHORS: Centaine L Snoswell, Liam J Caffery, Anthony C Smith

Background

There has been a rapid uptake of telehealth in primary care during the coronavirus (COVID-19) pandemic and the challenge now is ensuring that telehealth will be sustainable post-pandemic. One key requirement for service sustainability is confirming economic viability, where the costs and effectiveness of telehealth services are assessed. To achieve this, we conducted a systematic review examining the cost-effectiveness of telehealth in primary care. Prior to COVID-19, telehealth uptake was slow and sporadic, even though the benefits have long been recognised. Telehealth has been increasingly used during COVID-19 because it obviates the need for direct physical contact. In response to this, governments have enacted temporary policies to expand telehealth reimbursement during COVID-19. As a result, telehealth experience in primary care settings has grown exponentially in 2020. The evidence collated by this review has the potential to inform global policies while healthcare policy regarding telehealth is being closely examined.

Objective

To investigate the cost-effectiveness of telehealth services in primary care by summarizing economic evaluations of real-time videoconference and telephone consultations.

Data and methods

A systematic literature search was conducted to identify articles that conducted economic evaluations of telehealth services in primary care settings. Searches of PubMed, EMBASE, Scopus and CINAHL databases were undertaken using keywords relating to telehealth, primary care, and economic or cost. Title, abstract and full-text reviews were conducted, and reference lists of returned articles were searched by hand. Data extraction of study characteristics, economic analysis, and description of telehealth service models was performed. The Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist was used to evaluate study reporting quality.

Results

Twenty articles were selected for final inclusion. Four studies conducted six analysis types that assessed costs and effectiveness outcomes through a cost-consequence analysis, cost-utility analysis, and cost-effectiveness analysis. Five studies conducted a cost-minimisation analysis and eleven conducted a simple cost analysis. Telehealth service models described in this review included triage services, substitution services, other services, and new services. There was a widespread of reporting quality when studies were assessed again the CHEERS checklist, with an average score of 68%. Most studies reported that telehealth was cost-effective, although the quality of this evidence is dependent on study context, analysis type and service model delivered.

Conclusions

Telehealth services appear to be cost-effective when used in appropriate clinical scenarios, when clinician time efficiency is improved, and when overall health service utilisation is reduced. However, telehealth implementation should be motivated by the potential overall benefits rather than cost reduction alone. Telehealth can benefit patients and clinicians, facilitate multidisciplinary care, improve societal productivity, and expand the capacity of primary care services. The evidence summarized in this review demonstrated the diversity of services that could be delivered by telehealth, and given appropriate applications, telehealth in primary care can be cost-effective.

Motherly Advice – Effects of a Digital Feedback Platform on Quality of Delivery Care in India

PRESENTER: **Dr. Igna Bonfrer**, Erasmus School of Health Policy & Management
AUTHOR: Dr. Sumiti Saharan

Background

India has made significant strides in improving maternal health, but still contributes to one-fifth of infant and maternal deaths globally. Quality health care can avoid most of these deaths. Evidence increasingly points to lack of motivation of health workers as one of the factors causing delivery of low quality care. To motivate health workers, financial incentives have been suggested, but there is no conclusive evidence that these are effective. Non-financial incentives such as feedback, building on intrinsic as opposed to the extrinsic motivation, can potentially provide an avenue towards improved quality of maternal care.

Intervention

This study assesses a digital feedback tool "Together for her" that allows women in India to provide feedback on the quality of delivery care they received in private hospitals catering for women of low- and middle- socioeconomic status in Maharashtra and Uttar Pradesh. This feedback is made available via an online dashboard to providers and in summarized form via a digital platform to expectant mothers.

Methods

Using an event based difference-in-differences (DiD) model with coarsened exact matching (CEM), we exploit the stepwise roll-out of the digital feedback tool between April 2017 and October 2019. We control for time-invariant facility characteristics, time trends and a limited set of mothers' characteristics. Facilities onboarded into the program at different points in time, i.e. "the event". Feedback was collected among a total of 28,684 women who delivered in one of 135 intervention and control facilities before or after the start of the intervention for deliveries up to 12 months before the onboarding and 24 months after. Women provided feedback without the health care provider present.

Control facilities (n = 82 with 4,878 deliveries) met the inclusion criteria and were onboarded but did not reach a minimum of 15 reviews necessary to have the summarized feedback made available online and/or did not access the provider dashboard to review the feedback they received. Intervention facilities were matched to control facilities based on size, socioeconomic status of the catchment area and single- or multispecialty status.

Quality was assessed using mothers' reports on four binary indicators from the WHO Maternal Care Guidelines: skin-to-skin contact within 15 minutes, support to start breastfeeding within an hour, counselling on danger signs and receipt of family planning guidance before discharge.

Results

Skin-to-skin contact before the intervention was low in intervention (19 percent) and control (14 percent) facilities and went up to 37 and 18 percent. Similar increases were found in breastfeeding support and to a lesser extend in family planning guidance. The DiD estimate shows a 12 percentage point (pp) ($p<0.000$) increase in skin-to-skin contact, a 6 pp increase in early breastfeeding support ($p<0.000$) and no effect on danger sign and family planning counselling. The estimates provide a lower bound becasue we do not compare to "pure" controls but to comparable facilities that participated in the onboarding.

Conclusion

This study suggests that feedback from recent mothers to providers is likely to improve quality of care, probably through improved motivation of providers.

A Journey of Telemedicine Payment Mechanism in Indonesia

PRESENTER: **Mrs. Wan Aisyiah Baros**, BPJS Kesehatan
AUTHORS: Lutfan Lazuardi, Dedy Revelino Siregar, Benyamin Saut Parulian, Rasinta Ria Ginting, Nilna Rahmi, Erzan Dhanalvin, Citra Jaya

Telemedicine services has been officially launched in Indonesia since 2017 after piloted in many areas across the country for about five years. The telemedicine services aim at increasing healthcare access in areas with lack of health professionals. During the pilot project, an investment on technology and infrastructures to support the telemedicine services have been set up. Additionally, regular training for the health professionals as well as administrative staffs have been conducted. However, the adoption of telemedicine services seem to be slow and the number of the cases that utilized telemedicine is still considered very low. In the effort to achieve universal health coverage (UHC), Indonesia implemented the national health insurance (namely Jaminan Kesehatan Nasional-JKN) since 2014. But, the telemedicine services is not yet included as a benefit package under the national health insurance scheme. To respond to this issue, the Indonesian Healthcare and Social Security Agency (BPJS-K) conducted an implementation research with the aimed to tested the integration of telemedicine services into the national health insurance scheme as well as to facilitate the suitable payment mechanism. An action research model was proposed to implement the new payment system and the integration of the telemedicine services. Two different health program were selected i.e. chronic disease and maternal health program as focus of the this action research. Tele-echocardiography, tele-ultrasonography and tele-consultation were applied to support the healthcare delivery. A new payment based on fee-schedule non capitation was agreed among stakeholders involving the Ministry of Health, National Healthcare and Social Security Agency as well as healthcare providers and the health professional association. A tariff was set at IDR 40.000 (around 3 USD) for each services. This tariff is a median range and was calculated considering the unit cost that include the consumables and variable costs. Fifteen health facilities in 5 different regions across Indonesia were participated. Quantitative and qualitative data were collected from patients and health providers. 121 telemedicine services was performed during the first 3 months of the implementation. The number is increasing by the time probably also due to the Covid-19 pandemic. Telemedicine services are contributing to the 22% of the total referral cases of two observed health program in this study which are chronic disease and maternal health program. Based on the response from the health provider, 90% agreed that telemedicine services improved the access to healthcare facility. Additionally, the 71% patients feel satisfy with the services. Although the health providers expected that the tariffs will be increased, but the current tariffs with fee-schedule basis (non-capitation) method is accepted. This payment was considered an important enabler for telemedicine services, to facilitate the payment between primary health centres to the referral hospital. To conclude, the new payment mechanism which is based on fee-schedule (non-capitation) services were able to facilitate the telemedicine services.

Identifying Financing and Promotion Strategies to Increase Parental Preferences for Childhood Vaccines: A Discrete Choice Experiment in China

PRESENTER: **Dr. Mengcen Qian**, Fudan University
AUTHOR: Jiayu Guo

Immunization is recognized as the most cost-effective way of preventing and controlling diseases. Many childhood vaccines recommended by the World Health Organization have been listed as non-NIP (National Immunization Program) vaccines in China. Individuals have to pay fully out-of-pocket for the shots and the uptake is voluntary. Despite the severe disease burden of the related diseases, coverage rates have been low due to the expensive prices of these vaccines, particularly for underserved areas. This study focused on childhood Varicella and PPV13 vaccines. We aim to identify financing and promotion strategies that effectively promote parental preferences for the two vaccines.

We conducted a discrete choice experiment in Jiangsu, Guizhou and Qinghai provinces during July to August 2020. Areas were selected to present different economic development levels. Parents of children under six were invited to participate in the experiment at point-of-visits. For Varicella vaccines, our design of attributes and levels included efficacy (50%, 70%, or 90%), , adverse event incidence (0.1%, 0.05%, or 0.01%), protection duration in years (3, 5, or 10), time of visits (1, or 2), total costs (RMB) (100, 200, or 400), the choice of friends (yes, or no), can be financed by the personal account of insurance (yes, or no). For PPV13 vaccines, our design is generally similar to that of the Varicella vaccines except that we did not include the time of visit attribute, modified levels of total costs (RMB) (700,1400, or 2800), and added international products (yes, or no). A sequential orthogonal factorial design was used to extract a set of 48 paired comparisons, which were then randomly divided into 3 sets of 16 questions. The sets of questions were randomly distributed to the participants. In each question, the participants were required to select a preferred vaccine and then asked whether they were willing to immunize their children with the selected vaccine.

A total of 578 and 606 parents participated in the Varicella vaccine and the PPV13 vaccine experiments, respectively. We used a mixed logit model to fit the choice results. We found that parents were more preferred to the vaccine that was chosen by their friends, suggesting a strong herd

behavior in immunization decision making. For Varicella vaccines, the public was willing to pay on average additional 102,17 RMB for the product that was chosen by their friends. In contrast, we only found that such attributes only significantly improved parental preferences for PPV13 vaccines in more developed Jiangsu province. Allowing individuals to pay for vaccination costs via their personal account of health insurance was expected to resulted in 4-6 percentage points increase in uptake rates. The effect of such financing policy was estimated to be much smaller than a direct reimbursement via government subsidies.

Preferences and Values for Rapid Genomic Testing in Critically Ill Infants and Children: A Discrete Choice Experiment

PRESENTER: **Ilias Goranitis**, The University of Melbourne

Healthcare systems are increasingly considering widespread implementation of rapid genomic testing of critically ill children, but evidence on the value of the benefits generated is lacking. This information is key for an optimal implementation into healthcare systems. A discrete choice experiment survey was designed to elicit preferences and values for rapid genomic testing in critically ill children. Preferences were elicited for the following attributes: (1) *'Number of children who receive genetic diagnosis'*, (2) *'Time between test initiation and results'*, (3) *'Chance of improving the process of child's medical care'*, (4) *'Chance of improving child's health outcomes'*, and (5) *'Cost of testing to you'*. The survey was administered to members of the Australian public and families with lived experience of rapid genomic testing. A Bayesian D-efficient explicit partial profiles design was used, and data were analyzed using a panel error component mixed logit model. Preference heterogeneity was explored using a latent class model and fractional logistic regressions. The public (n = 522) and families with lived experiences (n = 25) demonstrated strong preferences for higher diagnostic yield and clinical utility, faster result turnaround times, and lower cost. Society on average would be willing to pay an additional AU$9510 (US$6657) for rapid (2 weeks results turnaround time) and AU$11,000 (US$7700) for ultra-rapid genomic testing (2 days turnaround time) relative to standard diagnostic care. Corresponding estimates among those with lived experiences were AU$10,225 (US$7158) and AU$11,500 (US$8050) respectively. Our work provides further evidence that rapid genomic testing for critically ill children with rare conditions generates substantial utility. The findings can be used to inform cost-benefit analyses as part of broader healthcare system implementation.

6:00 AM –7:15 AM TUESDAY [Health Care Financing And Expenditures]

Health Care Financing and Expenditures Poster Session 1

MODERATOR: **Aparnaa Somanathan**, World Bank

Applied Stakeholder Analysis in Mapping Political Actors Involved in the Implementation of Universal Health Care in 25 Provinces in the Philippines

PRESENTER: **Dr. Geminn Louis Apostol**, Thinkwell LLC
AUTHORS: Helena Marie Alvior, Mary Camille Samson

Introduction

Stakeholder perceptions on health policy reforms are key inputs for evidence-based policy development and implementation (Lavis, 2009; WHO, 1993). To this end, stakeholder analysis (SHA) is a useful tool for gathering insights on stakeholders' interests in, positions on, and power to influence health policy issues that aim to achieve universal health coverage (UHC). There is little evidence on the use of SHA in health policy development and even less in informing the politics of implementing health system reforms towards UHC. This study demonstrates the utility of SHA as a tool for evidence-based policy development for UHC, drawn from the experience of doing SHA with political actors in 25 provinces involved in the pilot implementation of the recently enacted UHC Law in the Philippines.

Methodology

We used a participatory process to systematically identify political actors with 'significant influence on decisions, policies, and outcomes' in relation to the pilot implementation of the UHC Law (Wolsfield, 2015). We used group brainstorming and cognitive interviewing techniques to assess stakeholder perception on five domains: [1] stakeholder interests, [2] position, [3] level of knowledge, [4] degree of power/influence, and [5] capability to mobilize resources to implement the UHC Law. We also tracked changes in stakeholders' responses to various reform scenarios. We studied qualitative data through thematic analysis. We determined frequencies for categorical responses in each domain and mapped in three-dimensional stakeholder matrices.

Results

An average of 26 stakeholders for each province were identified (n=642), categorized as: elected local officials (27%, n=173), local health authorities (23%, n=148), local administrators (18%, n=115), healthcare providers (16%, n=103), civil society (12%, n=77), and non-profit organizations (4%, n=26). The majority of political actors agreed on the overall goals and provisions of the UHC Law, especially those in low-income municipalities for whom the law presents opportunities to address financing gaps. Political actors in high-income localities feel that they have less to gain from UHC implementation and more to lose as authority is recentralized, and so are generally less supportive.

Differences in socioeconomic context and provincial development roadmaps also generate differences in interests and positions of stakeholders regarding pooling of local funds, delineation of financing roles among agencies and levels of governments, and transfer of administrative power over health human resources. Limited policy knowledge and lack of implementation clarity represent significant barriers to ownership and engagement of local stakeholders and private sector actors. Perceptions of additional financing and administrative burden negatively affect stakeholders' position on UHC implementation.

Conclusions

Differences in context and localization of UHC policy reforms exert strong influence in the interests of stakeholders and their position on the reforms. While cross-contextual policy comparisons around these specific issues will be difficult, learning is still possible around the approach to analysis, the factors influencing judgements, and implications for and possible approaches to stakeholder and political management. Given the dynamic nature of policy change and the complex nature of UHC reforms, doing SHAs in iteration can offer clearer insights to support policy change towards ensuring the political viability of UHC policy reforms.

Is Ethiopia's Community-Based Health Insurance Scheme Achieving Its Objectives? A Systematic Review and Meta-Analysis

PRESENTER: **Dr. Girmaye Dinsa**, Fenot Project

Is Ethiopia's Community-based health insurance scheme achieving its objectives? A systematic review and Meta-analysis

Summary

This paper undertook a systematic review and META analysis of studies assessing the impact of Ethiopia's community-based health insurance (CBHI) scheme - on health utilization, out-of-pocket payment (OOP) and resource mobilization - as well as its performances regarding members' satisfaction - in terms of willingness to pay for, enrollment in to and dropout of the scheme. Number of studies assessing the performance and impact of CBHI is growing and synthesizing this stock of literature would provide an evidence base for CBHI-related policies going forward.

Methods

A systematic search for relevant studies published before December 2020 was undertaken in PUBMED, Google Scholar as well as grey literature from local universities and stakeholders. Out of 49 studies identified using the search strategy 35 studies were included in the analyses since they assessed the impact of CBHI on one or more of the key outcome variables (OOP, utilization) and/or assessment of the demand for and performance of CBHI (client satisfaction, enrollment, dropout).

Results

This review finds that health utilization among CBHI members is significantly higher while OOP is lower compared with non-CBHI members in nearly all studies (N=7 and N=4 respectively) included in this review. Furthermore, the META analysis shows willingness to join CBHI was estimated to be 78% (include meta-analysis), with an average willingness to pay of ETB 200 (80% of the current insurance premium). Furthermore, education, wealth, and having a household member with chronic disease are correlates of insurance membership, while some religious values are factors deterring people from joining insurance scheme.

Conclusion

The Ethiopian CBHI scheme is effective in increasing health utilization, reducing OOP at point of use, and the majority of the population is willing to join the scheme. Ethiopia needs to improve quality of care and diversify as well as strengthen insurance schemes to cover more people in order to pave the way for universal health coverage.

Challenges of Achieving Financial Risk Protection Against Ill-Health in the Era of Universal Health Coverage in Bangladesh

PRESENTER: **Taslima Rahman**, Murdoch University

AUTHORS: Domenico Gasbarro, Khurshid Alam

Background: All United Nations member countries, including Bangladesh, are committed to ensuring full financial risk protection to achieve Universal Health Coverage (UHC) by 2030. This study examines how Bangladesh is progressing to achieve financial risk protection in health care over time.

Method: We analyzed data from the latest three rounds of nationally representative Household Income and Expenditure Surveys (HIES) in Bangladesh (2005, 2010, and 2016) with sample sizes of 10,080, 12,240, and 46,076 households, respectively. We refined the normative food, housing (rent), and utilities approach developed by the WHO Barcelona Office for Health Systems Strengthening to measure the levels and distributions of catastrophic health expenditure (CHE) and impoverishment through a detailed exploration of households with zero out-of-pocket (OOP) health expenditure. We also examined the level and distribution of CHE through the traditional budget-share and capacity-to-pay approaches. Due to substantial differences between OOP health expenditures calculated from health (OOP_h) and consumption modules (OOP_c) in HIES, we employed three models for estimating incidences of financial risk protection indicators consisting of OOP in both their numerator and the denominator; Model 1: OOP_h in the numerator but OOP_c in the denominator; Model 2: OOP_c in both numerator and denominator; Model 3: OOP_h in both numerator and denominator.

Findings: OOP expenditure soared during the study period, particularly between 2010 and 2016 (from US$106.3 to US$243.8 in models 1 and 3; from US$68.5 to US$106.3 in model 2). CHE incidence showed increasing trend over three periods: 13.6%, 13.8%, 19.2% (model 1); and 11.5%, 11.9%, 16.6% (model 3) with a minor variation (model 2). Between 2005 and 2016, the incidence of impoverishment due to OOP also increased from 4%-5.8% (5.6-9.2 million individuals), 1.2%-1.3% (1.7-2.1 million), and 1.3%-2.6% (2.1-3.6 million) in model 1, 2, and 3, respectively. Further impoverishment of the poor households was a more severe problem than impoverishment of the non-poor. Additionally, at least 5% of households were at-risk of impoverishment in all three models during the study period. Households who did not spend on health care declined from about 50% in 2005 and 2010 separately to 25% (models 1 and 3). However, the proportion of households who forgo health care due to financial reasons always remained small (less than 1%). The poorest households were invariably the least financially protected group throughout the study period while in 2016, the burden on households with chronically ill individuals was also notable. CHE measured through 10% of budget share threshold (the Sustainable Development Goals indicator 3.8.2) shows the highest incidence among all methods in 2016 (25.6%, 10.4%, 24.6% in models 1, 2, and 3 respectively) but has a pro-rich distribution.

Conclusion: Financial protection in health care in Bangladesh exhibit deteriorated trajectory over 2005-2016. The poorest and chronically ill households bear a disproportionate burden of OOP expenditure. Reversing the worsening trends of CHE and impoverishment and addressing the inequities in their distributions in Bangladesh will require a significant shift from the country's excessive dependence on private OOP sources to public sources in financing health care.

Evidence of Catastrophic Health Expenditures in the National Health Insurance Scheme in Indonesia

PRESENTER: **Rifqi Abdul Fattah**, Center for Social Security Studies, Universitas Indonesia

AUTHORS: Hasbullah Thabrany, Augustine Asante, Virginia Wiseman

ABSTRACT

Background

In 2014, Indonesia implemented a major health reform by integrating various social health insurance programs and social assistance programs into the single payer National Health Insurance Scheme called *Jaminan Kesehatan Nasional* (JKN). Currently the JKN covers 224 million people, or 82% of the Indonesian population. The JKN aims at increasing equitable health care and reducing catastrophic out of pocket expenditures by all population in 2024. This study examined the incidence of catastrophic health expenditure (CHE) and its determinants using three thresholds of 10%, 25%, and 40% of non-food household consumption expenditure.

Methods

This paper is part of the study of Equity in Health Financing (ENHANCE), a collaborative study of the London School of Hygiene and Tropical Medicine, University of New South Wales, and Universitas Indonesia. Two cross-sectional household surveys were conducted in 2018 and in 2019 to see the changes in access and OOP expenditures. The surveys were conducted in 10 provinces covering 6,463 households in Indonesia representing about 70% of the total population. The study used systematic random sampling from provinces to neighborhood levels. The determinants of CHE were analyzed using logistic regressions.

Results and discussions

The JKN population coverage increased from 64.01% in 2018 to 73.81% of the total sample in 2019. The incidence of CHE at the 10% threshold decreased from 9.24% in 2018 to 5.97% in 2019, while at 25% and 40% threshold, the CHE declined from 6.87% to 3.06% and from 5.76% to 2.17%, respectively. In 2018, CHE incidence among JKN members was lower among non-JKN members. However, in 2019, only at 40% threshold, the incidence of CHE among JKN members was significantly lower among the JKN members. Multivariate analysis demonstrated that the presence of one or more child under 5 years, the presence of one or more person aged 60 or older, and employment of the household heads correlate significantly to the CHE. The regulation allowing top up payment to upgrade to VIP room for the JKN members during the observation period might be accountable for high OOP expenditures among the JKN members.

Conclusion

JKN is moving towards the goal of preventing impoverishment. Extending the JKN coverage is expected to reduce CHE. Further study to examine what specific services that incurred high OOP is recommended.

Making Financial Risk Protection Universal : Root-Cause Analysis of High OOPE

PRESENTER: **Anuji Upekshika Gamage**, KDU
AUTHOR: Sridharan Sathasivam

Background: Out-of-pocket-expenditures (OOPE) are rising and currently, remain at 51% (2018) of the current health expenditure in Sri Lanka. High out-of-pocket expenses for healthcare have been shown to impede seeking healthcare and health status quality of life and can drive families towards impoverishment and threaten equity in healthcare. An effectively conducted Root-Cause-Analysis (RCA) could help to identify/ diagnose determinants of inefficient healthcare performance leading to high OOPE.

Aim: To identify determinants of high out-of-pocket expenditures to determine the most modifiable and impactful policy options.

Methods: A Root-Cause-Analysis (RCA) was conducted to obtain deep insights into high OOPE for NCDs, to help policy-makers understand the modifiable causes. An extensive literature search and exploration of available data were conducted to identify the root causes for the high OOPE, including the Sri Lanka Household Income and Expenditure Data (HIES), Global Health Expenditure Database (GHED) and expert opinion. The identified root causes were then grouped into three categories using the "system" "T" for totally-modifiable, "P" for partially-modifiable, and "N" for not-modifiable(T,P,N). The root-causes were also qualitatively assessed for their potential health impact, based on evidence and the expert opinions of economists, public health specialists, healthcare financing specialists, and an economic evaluation using available data. This analysis enabled identification of the most modifiable and potentially highest impact causal factors for "high OOPE amongst patients with NCDs." Policy options were developed to address these identified causal factors.

Results: Four main categories of underlying root causes that are related to government service provision leading to high OOPE amongst patients with NCDs were identified: 1. Improving the timely availability of drugs and laboratory services; 2. Extending after-hour government laboratory, pharmacy, and clinic services; and 3. Implementation of Electronic-Health-Records (EHR). The identified root-causes leading to targeted policy options were quantitatively assessed for their potential health impact and their economic costs. The final evaluation qualitatively balanced these quantitative results with political and operational considerations. With a goal of reducing OOPE for NCDs to 30%, the EMR option was evaluated to be the most cost-effective strategy with a relatively high political and operational feasibility.

Conclusion: 1.Root-cause-analysis helped identify modifiable and impactful underlying causes, which led to the development and comparative evaluation of feasible and impactful policy options to address these underlying causes. **2.** Electronic-Health-Record system is the most cost-effective and feasible policy option through which OOPE can be reduced

Managing Out-of-Pocket Spending on Health Based on Myanmar National Health Account Findings

PRESENTER: **Phyu Win Thant**, Ministry of Health and Sports
AUTHORS: Thant Sin Htoo, Ye Min Htwe, Khin Thu Htet, Patricia Hernandez

Introduction

Out-of-pocket spending on health (OOPS) refers to any direct health payment made by households at the point of service. Global evidence suggests that high OOPS negatively impact households and the health system in a number of ways. Based on the findings, this paper aims to provide the evidence gap by addressing the implication of out-of-pocket spending on health and proposing the relevant policy options for financial protection by reducing OOPS.

Methodology

This analysis is based upon Myanmar National Health Account (NHA) Studies and World Health Organization Global Health Expenditure Database. In Myanmar, NHAs have been generated since 1998, with System of Health Accounts(SHA) 1.0 methodology. The latest update of NHA (2016-2018) is the health expenditure analysis in Myanmar using the new accounting framework SHA 2011.

Findings

The analysis found that total health expenditure has been increasing throughout the period. Likewise, the similar trend could be seen in OOPS, which is the main source of financing for health expenditure in Myanmar (76% in 2018). There is no major change in external health expenditure (around 10% since 2000 to 2018). Domestic general government health expenditure also steadily increased from 2000 to 2018 and a similar trend is observed for GDP.

Expenditure by types of services shows that outpatient care accounts for the largest share of OOPS (54%). A reduced OOPS is valid for inpatient care and payments for medicines (20% & 26% respectively)

Focusing on the types of illnesses addressed, NHA data shows that for inpatient care, the largest share of OOPS goes towards treatment of non-communicable diseases(40%), while for out-patient care, it goes towards treatments classified as 'other'.(46%)

Discussion

The study mentions that Myanmar health care services are largely financed by OOPS and its percentage share is comparatively higher than regional countries. It alarmingly highlights the urgent needs of the action to manage this level of OOPS in Myanmar.

Data shows that while there is a gradual increase in general government expenditure, it is far less than the growth rate in GDP. The low tax revenue limits the government's capacity to invest in human capital, including an increase in health spending, thus, health as a share in General Government Expenditure has not grown.

There should also be necessary action to advocate for larger allocation of spending on health within existing government budget. It is estimated that Myanmar government should increase Government Health Expenditure 4.6 fold to enhance Primary health care, provide financial protection and health coverage according to Sustainable Development Goals.

Improve efficiency in public health expenditure is the critical one. Though Ministry of Health is trying to improve public finance management, efforts should be accelerated, particularly as the GDP is likely to contract in 2021 as a result of global recession and COVID-19 pandemic.

Conclusion

In conclusion, OOPS remains remarkably high over the past two decades in Myanmar. More public resources for health are in urgent need which could be generated from higher allocations to health and better spending of existing resources.

Financing UHC amidst the Pandemic: Revisiting the Role of Earmarked Funds for UHC in the Philippines

PRESENTER: **Loraine Gallevo**, The Palladium Group
AUTHORS: Maria Alma P Mariano, Eileen Diane Cheng-Fernandez, Frances Rose Elgo-Mamaril, Maria Socorro Santos, Ma. Teresa S Habitan, Alejandro N Herrin, Carlo Irwin A Panelo

Background

The Philippines is among the few countries where earmarked revenues from excise taxes will fund nearly half of the estimated universal health coverage (UHC) costs amounting to USD 6.7B based on post-pandemic projections. The sustainability of using earmarked revenues has been questioned as excise taxes are expected to decline with consumption. In addition, the steep reduction in the consumption of tobacco and alcohol products as a result of COVID-19 lockdowns was not anticipated.

Methods

We estimated the available fiscal space for health by reviewing multiple sources of health funding, such as health earmarks and general revenue sources. The projected health earmarks were adjusted to account for the reduced collection of excise taxes owing to the pandemic. The projected revenues from general sources were simulated using trends in fund earmarks to the Department of Health (DOH) and PhilHealth and disbursement performance. The projected fiscal space was then compared to medium term expenditure projections accounting for COVID-19 response to determine the funding gaps.

Results

Excise tax revenues were earlier projected to grow by an average of 20% per year starting from 2016 - higher than the 5-year average rate of increase in budgets for the national government as a whole (11% average), the DOH (10%) and PhilHealth (8%). But because of the pandemic, revenue sources from excise taxes on alcohol and tobacco are expected to decline by as much as 53% in 2020. Initial government estimates predict UHC requirements from 2021 to 2023 will increase by as much as 14 percent due to pandemic response from an initial USD 17.18 billion to USD 19.52 billion.

Conclusions and recommendations

The Philippines will need to revisit its UHC investment plans and revise performance targets, priority strategies, investment requirements and implementation timelines to account for the "new normal." A priority measure would be to identify joint-use costs between UHC reforms and COVID-19 adaptation measures. This will allow funding for key system reforms that will also address more pressing COVID-19 priorities, such as investing in standard infection control and prevention measures in public facilities, embedding telehealth systems within primary care, and strengthening immunization infrastructure for what will be the most massive vaccination campaign in the country's history. For the long term, the government will need to revisit its funding strategy for UHC. In the case of the Philippines, having health earmarks provides a source of funding other than general revenue sources that may secure a minimum level of funding for health. But general revenues will have to cover for budget deficits when earmarked sources fail to deliver on their promise.

Medical Costs and Out-of-Pocket Expenditures Associated with Multimorbidity in China: Quantile Regression Analysis

PRESENTER: **Mr. Yang Zhao**, The University of Melbourne
AUTHORS: Rifat Atun, Barbara McPake, Puhong Zhang, John Tayu Lee

ABSTRACT

Objective

Multimorbidity is a major growing challenge in many low-income and middle-income countries (LMICs) and leads to substantial negative health and economic effects on individuals, health systems and societies. Yet, it is not adequately addressed. This study investigates the effect of multimorbidity on annual medical costs and the out-of-pocket expenditures (OOPE) along the cost distribution.

Methods

The data from the nationally-representative China Health and Retirement Longitudinal Study (CHARLS 2015), which included 10,592 participants aged ≥ 45 years, and 15 physical and mental chronic diseases, was used for this nationally representative cross sectional study. Quantile multivariable regressions were employed to understand variations in associations of chronic disease multimorbidity with medical cost and OOPE.

Results

Overall, 69.5% middle-aged and elderly Chinese had multimorbidity in 2015. Increased number of chronic diseases was significantly associated with greater health expenditures across every cost quantile groups. The effect of chronic diseases on total medical cost was found to be larger among the upper tail than those in the lower tail of the cost distributions (coefficients 12, 95% CI 6–17 for 10th percentile; coefficients 296, 95% CI 71–522 for 90th percentile). Annual OOPE also increased with chronic diseases from the 10th percentile to the 90th percentile. Multimorbidity has larger effects on OOPE and is more pronounced at the upper tail of the health expenditure distribution (regression coefficients= 8 at the 10th percentile and 84 at the 75th percentile, respectively).

Conclusion

Multimorbidity of NCDs is increasingly costly to healthcare systems and OOPE on multimorbidity care can severely compromise financial protection and universal health coverage. Interventions that improve the management of multimorbidity among patients with poor health is likely to yield substantial financial gains for the individual and health systems in China.

How to Describe the Socioeconomic Impact of Cancer on Patients and Their Families: An Evaluation of Terminology By Global Regions and Healthcare Systems

PRESENTER: **Dr. Karla Hernandez Villafuerte**, Deutsches Krebsforschungszentrum (DKFZ)
AUTHORS: Ms. Rachel Eckford, Michael Schlander, Anna Spier,

Background: After 2010 there has been an exponential increase in the number of articles that evaluate the socioeconomic impact of cancer. This topic has been approached under different perspectives and has resulted in a heterogeneity of definitions and methodologies. Consequently, whether the influx of articles has brought more confusion than clarity to the topic is open for debate. Central to this issue are the inconsistencies in the terminology used to identify and describe potential financial problems of cancer patients and their families. Whether these disparities can be attributed to differences among healthcare systems or simply to an inconsistent/under defined framework is unclear. This study explores the current terminology used to refer to the socioeconomic impact of cancer with particular attention given to variations among geographical regions and healthcare systems.

Methodology: We conducted a systematic review of articles that evaluated the socioeconomic impact of cancer. The search criteria were based on an initial non-systematic review of previous literature reviews on this topic. We searched three databases: Pubmed, Econlit, and Web of Science and identified 595 articles published from January 1970 to September 2020 that met our inclusion criteria. To evaluate the trends in terminology, we first randomly selected 177 articles from the 595 selected studies for which all years were accounted and in which the proportions represented the number of articles by year. We extracted from the selected articles' abstracts 123 terms that were used to refer to the socioeconomic effect of cancer. Second, we used the R statistical program´s package 'tm' to search for each term in all full-text articles, excluding the reference section. This allowed us to identify articles in which the selected terms appear at least once.

Results: Regardless the healthcare system, global region, or year, "financial burden" is the term used in the highest proportion of articles (70.8% of all articles). However, the definition and methodology used to measure "financial burden" differs considerably. "Financial toxicity" became a relevant term after 2015. It is the second most cited term in the US (46.7%), while in other regions its ranking is located between seven and nine, with 14.8% and 31.8% of the articles using it. "Catastrophic health expenditure(s)" and similar terms are listed as the most important terms only for Asia (over 31%). Finally, the significance of terms related to the subjective effect of the socioeconomic impact of cancer (i.e. "financial distress", "financial stress(es/ors)", and "financial strain") increased across time, regardless of the geographical region. However, their ranking is particularly high in articles that included patients from the US, Canada, Australia and New Zealand.

Conclusion: Consistent terminology and standardized measures of the socioeconomic impact of cancer are needed. This comes with a caveat that a standardized measure for one country may not be ideal for another. Further research outside of the US is needed to better assess how the socioeconomic impact of cancer patients is defined and measured.

Situational Analysis of Financing of Surgery in Sub-Saharan Africa: A Scoping Review

PRESENTER: **Martilord Ifeanyichi**, Radboudumc

Background: To improve access to safe and timely surgery, obstetrics, and anaesthesia (SOA) care, several sub-Saharan Africa (SSA) countries are either already implementing, developing or committed to developing National Surgical, Obstetric and Anesthesia Plans (NSOAPs). While policy designs require thorough baseline analyses, there are limited insights into the financing of surgery at country levels in SSA. This study provides a situational analysis and collation of current knowledge on financing of surgery across SSA.

Methods: We performed a scoping review of scientific databases, grey literature, and websites of development organisations. Screening and data extraction were conducted by two independent reviewers; and abstracted data were summarized using a thematic narrative synthesis per the financing domains: mobilization, pooling and purchasing.

Results: The search resulted in 5533 unique articles among which 149 met the inclusion criteria: 132 were related to mobilization, 17 to pooling, and 5 to purchasing. Neglect of surgery in national priorities scale is widespread in SSA and no report was found on national level surgical expenditures or budgetary allocations. Financial protection mechanisms are weak or non-existent: poor patients forego care or face financial catastrophes in seeking care, even in the context of universal public financing (i.e. free care) initiatives.

Conclusion: Financing of SOA in SSA care is as poor as it is under-investigated, calling for increased national prioritisation and tracking of surgical funding. Improving availability, accessibility, and affordability of SOA care require comprehensive and inclusive policy formulations.

Decomposition of Outpatient Health Care Spending By Disease: A Novel Approach Using Insurance Claims Data

PRESENTER: **Michael Stucki**, Zurich University of Applied Sciences

AUTHORS: Mr. Simon Wieser, Ms. Janina Nemitz, Maria Trottman

Decomposing total health care spending by disease, type of care, age, and sex can lead to a better understanding of the structure of health care spending. The lack of diagnostic coding in outpatient care poses a challenge to such an exercise in Switzerland. However, health insurance claims data hold a broad variety of diagnostic clues that may be used to identify diseases even in the absence of diagnostic coding.

We use claims data from a large health insurer to identify 42 diseases of the exhaustive Global Burden of Disease classification. We combine information on medication (ATC codes), inpatient treatments (DRG codes), physician specialization and disease-specific treatment and examination codes from the different tariff catalogues to identify diseases. We determine disease-specific spending by direct (clues-based) and indirect (regression-based) spending assignment for several outpatient services.

Our results show a high precision of disease identification for most diseases. Estimates of disease prevalence rates are close to those reported in other studies. Overall, 81% of outpatient spending can be assigned to diseases, mostly based on indirect assignment using regression. We find that outpatient spending is highest for musculoskeletal diseases (19.8%), followed by mental disorders (11.6%), sense organ diseases (8.7%) and cardiovascular diseases (8.5%). Neoplasms account for 7.5% of outpatient spending.

Our study shows the potential of health insurance claims data in identifying diseases when no diagnostic coding is available. The disease-specific spending estimates may inform Swiss health policies in cost containment and priority setting.

Forecasting Healthcare Expenditure As a Proportion of GDP: Linear Extrapolation Is Not Appropriate

PRESENTER: **Mendel Grobler**

Introduction

Linear extrapolations of healthcare expenditure as a proportion of GDP predict an unsustainable fiscal future, where national income will potentially be spent almost entirely on healthcare if action is not taken. Consequently, in several healthcare systems there have been the application of austerity measures to overlay existing efficiency measures, indicating that efficiency (or the appearance thereof) matters less than predicted budgetary crisis.

Methods

The OECD was selected as being the most influential forecasting body, although it is recognized that policy action will be driven by country-specific forecasting. The United States and United Kingdom were selected from within the OECD for individual assessment. The literature was searched to identify reports forecasting healthcare expenditure as a proportion of GDP, based on a minimum of 100 years of historic data. The reports retrieved were reviewed critically, with particular focus on the period of data used, and the methods applied in forecasting share of healthcare expenditure as a proportion of GDP.

Results

Forecasting publications by the OECD, the US Centers for Medicare and Medicaid services (CMS) and the UK Office for Budgetary Responsibility (OBR) were retrieved for review. All reports applied decomposed modelling to predict expenditure using demographics and income as variables, yet all applied linear methods of extrapolation to forecast healthcare expenditure as a proportion of GDP. The OECD used 14 years of historic data, from 1995 to 2009, and applied a constant linear growth of 1.7% as a base case, but then adjusted this downward under cost containment assumptions. CMS used data from 1990 to 2017 but based their extrapolations on the last 14 years of data using a constant 5.5% annual rate of growth. The UK OBR did not reveal the historical period used but applied a linear growth forecast based on "demographic and cost pressures". The literature search identified only one publication that used more than 100 years of data, and this publication used a non-linear mathematical function to forecast healthcare expenditure. Analysis of the source data used by this report showed that a sigmoid function most closely fitted the data. Re-examination of published OECD healthcare as a proportion of GDP data indicated that a sigmoid function provides a better fit than a simple linear one for several countries, including the US and the UK.

Discussion

The healthcare sector has been dogged for almost a century by predictions of uncontrolled growth in expenditure and a crisis of affordability. However, review of long term data shows that year on year linear growth in healthcare expenditure as a share of GDP only emerged in the 1950's and waned at the commencement of the 21st century. Therefore, forecasts based on assumptions of continued linearity outside this period will not only be inaccurate but may drive excessive austerity measures in already vulnerable health systems. Since the mortality and morbidity outcomes from constraints on expenditure are rarely calculated, the opportunity cost of these expenditure constraints will unfortunately remain unknown.

Income Elasticity of Health Spending: A Case of Russia

PRESENTER: **Dr. Evgeniy Zazdravnykh**, National Research University Higher School of Economics

AUTHOR: Andrey Aistov

Russia experienced a serious transformation of its health care system in the last 30 years. It moved from public to a combined private and public health care system. In addition, different private pharmacy chains have emerged for the last 20 year and they replaced public pharmacies simplifying the process of medicine purchasing. Moreover, private health insurance and paid health care services became available for many Russians. At the same time, the household income and health care expenditure was growing since the year 2000. Did health spendings growth because of household income growth or institutional development? In this study, we try to examine this question using a unique natural experiment. We use the information about the exogenous increase in wages of certain public sector employees to estimate the effect of income change on health spending. In this study, we employ the Russian Longitudinal Monitoring Survey – HSE individual-level data to calculate income elasticity of health expenditure. We calculate income elasticities for the consumption of medicines, inpatient and outpatient care, dentistry. First, we estimate associations between household income and health spending without addressing the problem of endogeneity. Our results show that dentistry and inpatient care are luxury goods. Outpatient care, medicines are necessary goods. Second, we try to solve the problem of endogeneity using the

exogenous increase in wages of public workers. Results show that an increase in income has small or no effect on the health care consumption regardless of whether a household consumes medicine, inpatient or outpatient care, or dentistry. We suppose the increase in household income had a minor effect on health spending. Thus, the only driver of this pattern can be institutional development. However, to examine the role of institutional development in the growth of health spending requires conducting further research.

Finding the Limit: Global Review of Coverage of Interventions in Health Benefit Packages

PRESENTER: **Kratu Goel**, World Health Organization

AUTHORS: Andrew Mirelman, Tessa Edejer, Melanie Bertram, Karin Stenberg, Shannon Barkley

Introduction/ Objective:

The provision of a comprehensive health benefit package is a critical step for countries on their path to universal health coverage. Designing the benefit package requires answering questions around what services are funded, which sections of the population are to be covered, to what extent are interventions covered financially, and what are the exclusion criteria. The objective of this work is to evaluate and determine what the current status of health benefit package provision is globally. We also hope to determine where the intervention coverage boundaries lie within a country's largest public-sector-financed benefit package. It explores in detail the health benefit packages that countries are committing to provide. We also ask countries to define the boundaries of their basket of goods and services through proxy interventions.

Methods:

A survey was issued to all WHO member state countries with respondents coordinated through WHO regional and country offices. The survey was conducted in conjunction with the WHO HTA Survey 2020 however respondents frequently collaborated with members of relevant national or subnational health insurance/benefit package organizations. To develop the survey, relevant experts in health category areas at WHO were consulted to identify four proxy interventions ranging from simplest and least resource intensive to most complex and most resource intensive. We cover almost 30 different programs ranging across the spectrum of disease areas including Maternal, newborn, childhood, and adult health (MNCAH), Non-communicable diseases, Communicable diseases, Sexual and reproductive health and Traditional and complimentary medicine. The data was analyzed descriptively according to the domains of the survey, which included gathering information of the health financing system, its linkage with the health benefit package provided, and contents of the benefit package for general and specific conditions.

Results:

The results provide a detailed picture of the nature of benefit packages provided in countries and the range of interventions covered within countries. We have also obtained information about which essential medications are covered and what the extent of that coverage is. There is a wide range of heterogeneity in the interventions considered as "core medical care" around the world and their coverage. However, we have conducted a country comparison of these core medical interventions and services including a comparison of coverage of a list of essential medicines. These interventions are financed through different mechanisms, highlighting the different priorities faced by countries on specific interventions which may be determined based on historical settings, burden of disease, evidence or a mix of all of the above.

Conclusion:

Decisions on resource allocation and service system designs is critical for countries. The benefit package can be considered as an important product to assess country capacity and progress towards universal health coverage. This work seeks to fill the gaps in the knowledge base, review recent decisions and country experiences, and highlight country-specific coverage decisions regarding the range of services to be financed collectively.

6:00 AM –7:15 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Economic Evaluation of Health and Care Interventions in Practice Poster Session

MODERATOR: **Rachael L Morton**, Professor and Director of Health Economics, NHMRC Clinical trial Cancer, The University of Sydney

Cost and Cost Effectiveness Evaluation for Drone Delivery of Immunization Products to Hard-to-Reach Health Facilities in the Democratic Republic of Congo.

PRESENTER: **Archimède Bofambu Makaya**, VillageReach

AUTHOR: Gabriella Ailstock

Governments in sub-Saharan Africa are exploring the use of drones as an integrated component of health supply chains to address long-standing supply chain challenges in low and middle-income countries. Medical delivery drones have demonstrated the potential to enable faster and more reliable access to health products in several countries over the short term. However, evaluations of the cost and cost-effectiveness of medical drone delivery operations are lacking.

Through the Drones for Health (D4H) initiative, the Democratic Republic of Congo's (DRC) Ministry of Health (MoH), supported by VillageReach, is integrating drone transportation into the health supply chain of Equateur province, DRC. D4H aims to improve the availability of immunization products and reliability of laboratory sample transportation, in 69 hard-to-reach health centers, by outsourcing transportation to a drone logistics service provider. Given the potential benefits of this intervention and dearth of published evidence on drone transportation costs, a comprehensive cost analysis is underway to compare drone-augmented distribution approaches to traditional land-based distribution.

This analysis uses a comprehensive approach to evaluate D4H with the following foci: i) start-up costs, ii) immunization supply chain (iSC) costs, including drone operations and iii) cost-effectiveness. This multi-pronged approach was designed to assist the DRC MoH to make evidence based decisions on expanding the D4H approach within and outside of Equateur province and to inform MoH budgets for expansion.

The start-up costs analysis seeks to capture the costs of introducing drone operations to the health supply chain, to inform potential expansion by the MoH in other provinces. Costs considered here include infrastructure investments, drone network design, aviation regulatory approvals, community sensitization and training of drone operators and health workers, amongst others.

To capture costs of activities within the iSC and analyze the impact of drone introduction on these costs, we applied an activity-based costing approach to the iSC for hard-to-reach facilities. We assessed procurement, management, storage and transportation costs before and after drone introduction across four iSC tiers: Province (n=1); Zone (n=7); Drone distribution hubs (n=3); Health center (n=24). Extrapolation from sample facilities was conducted to estimate total supply chain costs for the 69 intervention facilities.

To guide the tradeoffs between cost and performance considered in the cost-effectiveness analysis, qualitative and quantitative stakeholder interviews were conducted with DRC national (n=10) and provincial (n=40) stakeholders, as well as global stakeholders (n=in process) to prioritize supply chain performance dimensions. Where multiple dimensions were prioritized or prioritized differently across stakeholders, cost-effectiveness was facilitated using an analytical hierarchy process which allowed performance dimensions to be combined using weights derived from stakeholder preferences. Using these stakeholder prioritized performance dimensions, we calculated various cost-effectiveness measures for the pre and post iSC drone introduction.

Although this evaluation is ongoing, baseline results and preliminary endline results will be presented along with the unique methodological approach taken to provide the DRC MoH with data and concrete budget figures for potential expansion. This evaluation and an ongoing evaluation in Ghana will be the first globally to publicly quantify cost and cost-effectiveness of drone transport for health products.

Economic Evaluation of Meningococcal C Vaccination in Fiji Following the 2016-2018 Meningococcal Disease Outbreak

PRESENTER: **Natalie Carvalho**, University of Melbourne

AUTHORS: Emma Watts, Rita Reyburn, Patrick Abraham, Eric Rafai, Aalisha Sahukhan, Andrew Clark, Fiona Russell

Background: Invasive meningococcal disease (IMD) has rapid onset, high fatality, and high risk of long-term complications. Fiji Ministry of Health and Medical Services (MoHMS) recently delivered a national meningococcal C (Men C) vaccination campaign (1-19yrs) as part of its response to an outbreak of meningococcal disease declared in 2018 and are now considering introducing routine Men C vaccination to maintain protection from Men C disease. However, conjugate vaccines are expensive, particularly for countries that do not benefit from Gavi prices. At the same time, there are important health systems costs associated with responding to an outbreak.

Objectives: To evaluate the potential impact and cost-effectiveness of the following Men C vaccination strategies over the period 2018-2040 in Fij: (i) mass vaccination of all individuals aged 1-19 years in the year 2018; and (ii) mass vaccination in 2018 followed by national routine vaccination of adolescents aged 13 years every year between 2022 and 2040.

Methods: We used the UNIVAC decision-support model to evaluate the impact and cost-effectiveness of the two Men C vaccination strategies. We compared both strategies to no vaccination and to each other. We used real-world data on the cost and short-term impact of the 2018 mass campaign, and modelled alternative 'what-if" scenarios to assess the potential impact of the two strategies (and no vaccination) on Men C outbreaks expected to occur over the period 2018-2040. The scale and frequency of Men C outbreaks in the absence of vaccination was assumed to follow the same pattern observed in historical trends and based on population susceptibility in the absence of routine immunization. Health outcomes were measured in cases, deaths, long-term sequelae and disability-adjusted life years (DALYs). The primary outcome measure was the incremental cost-effectiveness ratio (discounted cost per DALY averted). We use a health systems perspective, including both government and donor costs, with a societal perspective undertaken in sensitivity analysis. Future costs and benefits were discounted at 3%. We ran deterministic scenario analyses to explore the impact of uncertainties in our data and assumptions.

Results: The 2018 mass vaccination campaign cost US$2.8 million. Preliminary results indicate that the 2018 mass campaign was cost-effective, with an incremental cost-effectiveness ratio (ICER) below GDP/capita (US$6,267). Routine immunisation would cost $4.4 million or $1.5 million (discounted) over 20 years, with PAHO pricing for Men C versus low-cost vaccine respectively. The number of IMD cases, deaths and DALYs averted due to routine immunisation varies depending on when a second outbreak is modelled to occur.

Conclusion and implications:

Middle-income countries face substantial challenges in introducing costly vaccines such as Men C. A cheaper pentavalent meningococcal vaccine may obtain WHO pre-qualification in the future, potentially offering protection from outbreaks at a more affordable cost. These findings will provide evidence to inform Fiji MoHMS' decision on routine Men C vaccine introduction. Given the uncertainty in model parameters, strengthening surveillance of meningococcal disease remains critical to monitor disease incidence.

Cost-Effectiveness Analysis of Seasonal Influenza Vaccination in Children Aged 6-69 Months in China

PRESENTER: **Dr. Xiaozhen Lai**, Peking University Health Science Center

Background: Vaccination is one of the most effective ways of preventing and controlling influenza, while seasonal influenza vaccine has not been introduced to China' National Immunization Program (NIP). To inform immunization policy-making in China, this study aims to assess the cost-effectiveness of introducing influenza vaccination in China's NIP for children aged 6-59 months.

Methods: We performed a cost-effectiveness analysis based on a decision-tree Markov model to estimate the impact of influenza vaccination in NIP on the disease burden, quality-adjusted life years (QALYs) and disease costs for influenza-affected young children in China. The analysis adopted a societal perspective in a lifetime time horizon. The immunization schedule for children was given special consideration, including the recommended two-dose vaccination for children aged under eight who were vaccinated for the first time, and the differentiated vaccine dosage (0.25ml or 0.5ml) for children aged less or more than three. All costs were discounted at 3% and reported in 2017 US dollars (US$ 1=6.8 CNY), adjusting for inflation if necessary. Cases and deaths averted, QALYs gained and incremental cost-effectiveness ratios (ICER) were estimated to compare the status quo and NIP scenarios. The incremental cost per QALYs gained was compared with the 2017 GDP per capita (US$ 8 818) and three times the GDP per capita (US$ 26 453). Univariate and probabilistic sensitivity analyses were performed to test the robustness of results and assess the sources of uncertainty.

Results: The introduction of influenza vaccination in China's NIP could avert approximately 17.5% (126 412 cases and 353 deaths) of influenza disease within a single birth cohort at the national level. The ICERs per case averted, per death averted, and per QALY gained were US$ 2 318, US$ 829 026, and US$ 27 620, respectively. The ICER per QALY gained was less than three times the 2017 GDP per capita (US$ 26 453), indicating that introducing influenza vaccination in China's NIP was not estimated to be cost-effective for this target-group. Sensitivity analyses revealed that the most important parameters were the incidence of influenza and the costs of vaccination.

Conclusion: This study is the first in China to assess the cost-effectiveness of influenza vaccination for young children from the societal perspective. Introducing influenza vaccination in China's NIP seems not cost-effective nationally, so step-by-step measures were recommended to inform policies on expanding influenza vaccination coverage in China. The model is useful in identifying key elements for economic evaluation of influenza vaccines, and in future studies, more accurate data are required to increase the reliability of the results.

Is Haemophilus Influenzae Type B Conjugate (Hib) Vaccine Cost-Effectiveness? A National and Provincial Level Analysis in China

PRESENTER: **Mr. Haijun Zhang Sr**

Background

Globally, Haemophilus influenzae type b (Hib) vaccine has substantially reduced the burden of Hib invasive disease, However, China remains the only World Health Organization (WHO) member country not to include Hib vaccine into its national immunization program (NIP), although it accounts for 11% of global Hib deaths. Hib vaccines are paid by individuals 100% out of pocket in the private market so the coverage rates in China are relatively low and very diversified by regions and income levels.Meanwhile, provincial level estimates are particularly needed, as provinces in China can make their own policies of adding new vaccines according to the Vaccine Management Law newly released in 2019. We aimed to assess the cost-effectiveness of including Hib vaccine in China's NIP at the national and provincial levels.

Methods

Using a decision-tree Markov state transition model, we estimated the cost-effectiveness of Hib vaccine in the NIP compared to the status quo for the 2017 birth cohort. Data on treatment costs and vaccine program costs were derived and calculated from China Center for Disease Control and Prevention (CDC) and national health insurance databases from China Healthcare Insurance Research Association (CHIRA). Hib disease burden data and other model parameters were obtained from international published data. Hib cases and deaths averted, quality-adjusted life years (QALYs) gained, and incremental cost-effectiveness ratios (ICER) were predicted by province and nationally. One-way, scenario and probabilistic sensitivity analyses were done to explore model uncertainties.

Findings

Including Hib vaccine in the NIP was projected to prevent 2,977 deaths (93% reduction) and 252,171 cases of Hib disease (92% reduction) for the birth cohort at the national level. The inclusion of the Hib vaccine in the NIP was cost-effective in 28 of 31 provinces, including cost-saving in Tibet, Xinjiang and Qinghai, and highly cost-effective nationally with an ICER of US$ 7872 per QALY gained. One-way and scenario sensitivity analyses indicated results were robust when varying model parameters. In probabilistic sensitivity analysis, Hib vaccine had a 70% probability of being highly cost-effective. When accounting for herd immunity, Hib vaccine in the NIP remained cost-effective nationally and in 13 provinces.

Interpretation

The introduction of Hib vaccine in China's NIP is highly cost-effective nationally and provincially in most provinces. Provinces with lower socioeconomic status, higher disease burden and limited access to Hib vaccine in the current private market, such as those in the west region, would benefit the most from adding Hib vaccine to the NIP. In the absence of a national policy decision on Hib vaccine, this analysis provides evidence for provincial governments to include Hib vaccine into local immunization programs to substantially reduce disease burden and treatment costs.

Estimated Cost-Effectiveness of Schistosomiasis Control for Preschool Aged Children in 5 Countries

PRESENTER: **Harveen Baxi**, MSH
AUTHORS: Christian Suharlim, Hector Castro, Colin Gilmartin

Objective: Schistosomiasis is a Neglected tropical disease (NTP) that affects more than 207 million people in 74 countries, including over 50 million preschool-aged children (PSAC) in Africa. When left untreated, schistosomiasis can cause a range of harmful and sometimes irreversible health effects, like anemia, cognitive deficits and infertility, while perpetuating cycles of reinfection and poverty within communities. Despite this global burden, there is no approved recommendation for the mass drug treatment in PSAC yet. While generally, praziquantel (PZQ) is used to treat schistosomiasis, the WHO has only recommended a case-by-case strategy due to the unavailability of a suitable pediatric formulation. Alterations have been made to the original WHO PZQ dose pole to include PSAC. However, the current drug formulation is not recommended for treating children under the age of four because of its bitter taste and size and is still mostly given as crushed tablets along with juice or bread. The data and knowledge about the risk and infection burden are not clear. This study's primary objective was to calculate and optimize the expected economic and health impact for a pediatric PZQ formulation under different pricing, epidemiologic, and uptake scenarios in Kenya, Tanzania, Côte d'Ivoire, Zimbabwe, and Uganda.

Methods: We developed a user-friendly modeling tool with an embedded decision tree. Default indicators were extracted from the World Bank (economic and demographic indicators, currency exchange rates) Institute of Health metrics evaluation database (epidemiology indicators). Disease dynamic indicators and delivery cost estimates were extracted from publicly available peer-reviewed articles. Pharmaceutical costs were assumed at $0.067 per 150 mg tablet. The tool was developed to be dynamic, allowing changes in the key input parameters. The model analyzed demographics, treatment parameters, epidemiology/disease parameters, costs, and coverage scenarios parameters. Sensitivity analysis for pharmaceutical costs was also conducted.

Result: A mass-drug administration (MDA) of a potential pediatric PZQ formulation to all PSAC in Kenya, Tanzania, Côte d'Ivoire, Zimbabwe, and Uganda, will require an investment of 7.3, 9.1, 3.9, 2.2, and 7.2 million USD, respectively. Illustratively, the investment will help avert 15,977 in-patient days and 26, 263 out-patient visits in Kenya. It will also help save $ 46,091 out of pocket expenses and gain 14,631 school-years. For all the countries, over 91% of the MDA cost will be on pharmaceuticals. Alternatively, a test-treat approach will require more resources given the labor-intensive test. A low pharmaceutical cost resulted in a preference towards MDA over test-treat strategy.

Conclusion: An MDA program with a potential pediatric PZQ formulation for PSAC will decrease the in-patients and out-patients days due to schistosomiasis complications in Kenya, Tanzania, Côte d'Ivoire, Zimbabwe, and Uganda. This will help reduce the economic burden of the disease, especially on the caregivers, in addition to the conspicuous health gains to the infected patient. It will also contribute positively to educational gains in children. To further optimize resource use, a hyper-localized strategy based on local epidemiology will be needed.

Cost-Effectiveness and Budget Impact Analysis of a Symptomatic Approach to TB Screening for High Risk Groups in Malaysia

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AUTHORS: Asmah Razali, Mohd Shaiful Jefri Nur Sham Kunusegaran, Farhana Aminuddin

Background Tuberculosis (TB) screening among the high-risk groups is considered as the cornerstone for the country's TB elimination programme. New methods and approaches to TB programme being introduced albeit the scarce resources put an enormous stress on the country to weigh the trade-off between different approaches in enhancing the overall performance of TB case detection. Hence, the cost-effectiveness as well as budget impact analysis are important measures to be taken into consideration in deciding on the best strategy for the country's TB programme.

Objectives To measure the cost-effectiveness of a symptomatic approach to TB screening and their budget impact in comparison to the existing strategy among high-risk groups in Malaysia.

Methods This study used a secondary data from Disease Control Division, Ministry of Health Malaysia and TBIS 204S for year 2016 to 2018 from Sabah and Sarawak State Health Departments. A decision tree model was developed to measure the cost-effectiveness of a symptomatic approach to TB screening against the existing TB screening strategies, of which to screen both the asymptomatic and symptomatic. The outcome of Cost-Effectiveness Analysis (CEA) is presented in term of cost per TB case detected and the Incremental Cost-Effectiveness Ratio (ICER). Deterministic and Probabilistic Sensitivity Analysis were also performed to measure the robustness of the model. Subsequently, the budget impact over 5 years, from 2018 to 2022 were also estimated for both screening approaches.

Results Symptomatic approach to TB screening was found to be more cost-effective than existing TB screening approach of both asymptomatic and symptomatic with ICER of MYR423.98. The key driver for ICER was the costs of conducting Sputum for Acid Fast Bacilli (SAFB). Budget Impact Analysis showed that switching from the existing TB screening approach towards a symptomatic approach would result in an estimated yearly cost-saving of MYR 11.6 million to 14.7 million, while around 843 to 948 per year of TB cases would be undetected (missed TB case detected).

Conclusions This study suggests that the policy makers have to weigh both the cost-effectiveness measure as well as budget impact in deciding the better approach to TB screening. Adopting a symptomatic approach to TB screening would result in cost saving but also lead to result fewer TB cases being detected. However, this extra budget from cost-saving could be used for strengthening other areas of TB programme such as investment in new technology for TB case detection and screening improvement for latent TB. Thus, any decision made must be in concordance to the objectives of the country's TB programme. Future research on latent TB as well as the cost-effectiveness of other methods used in TB screening programme shall complement the result of this study

Keywords: Cost Effectiveness Analysis, Budget Impact Analysis, Tuberculosis, TB Screening

Epidemiologic and Economic Analysis of EARLY Antiretroviral Therapy with Bictegravir/Emtricitabine/Tenofovir Alafenamide in Spain

PRESENTER: **Maria Presa**, PORIB
AUTHORS: Vicente Estrada, Miguel Gorgolas, Jose Alberto Peña, Elena Tortajada, Miguel Angel Casado

Introduction:

An early initiation of antiretroviral therapy (ART) can help human immunodeficiency virus (HIV)-positive patients to achieve and maintain virological suppression earlier, preventing HIV transmission compared to a late initiation.

This study aimed to assess the potential epidemiological and economic impact of a rapid treatment initiation (within 14 days after HIV diagnosis) with bictegravir/emtricitabine/tenofovir alafenamide (B/F/TAF) on HIV transmission in Spain compared to the current initiation observed in the clinical practice.

Methods:

A previously-developed transmission model was customized to estimate the cumulative HIV infections incidence and potential cost-savings based on number of infections avoided in Spain over a 20-year time horizon. The analysis compared rapid therapy initiation with B/F/TAF (9 days since

the diagnosis until treatment initiation) to a late initiation (35 days) with a pool of integrase strand transfer inhibitors (INSTIs), non-nucleoside reverse transcriptase inhibitors (NNRTIs) and protease inhibitors (PIs). In one-year cycles, the model represented the prevalent population of individuals with HIV in Spain, that are split among different infection states with different risks of transmission: diagnosed, diagnosed and in care, in care and on ART, and on ART and virally suppressed. To explore the effect of treatment in populations with varying risk of transmission and prevalence of HIV, population subgroups like men who have sex with men (MSM), heterosexual males and females and people who inject drugs (PWIDs) were included. Infectious individuals contributed to the incidence of new HIV infections in that year via their risk of transmission which was estimated by sexual contact among MSM or heterosexual population, and needles and syringes sharing among PWID, state of HIV infection and ART usage. HIV lifetime cost (€, 2020) included direct and indirect costs of HIV. Epidemiologic-, treatment-, transmission- and cost-related parameters were derived from the literature and validated by an expert panel. One-way sensitivity analyses (OWSA) were carried out.

Results:

In the base case, a rapid therapy initiation with B/F/TAF is expected to avoid 1,294 new HIV infections over the next 20 years compared to late initiation with a pool of INSTIs, NNRTIs and PIs. By population subgroups, under the rapid initiation strategy, a total of 925, 348 and 21 HIV infections could be averted amongst MSM, heterosexuals and PWIDs, respectively. Considering the lifetime costs of treating the infections avoided over the next 2 decades, the reduction in the HIV incidence could result in potential savings of €421 million. According to OWSA results, the time for ART initiation was the parameter with the highest impact on HIV incidence. Initiation of B/F/TAF therapy at day 7, could avert 92 additional cases (+7.1%) versus initiation at day 9 and increase cost-savings up to almost €451, representing additional savings of €33 million (7.36%) compared to base case.

Shortening time horizon to 10 years would imply avoidance of 390 new infections, and savings of €127 million.

Conclusions:

These results suggest that the rapid initiation of B/F/TAF in newly diagnosed patients is a high value strategy for the Spanish National Health System, by reducing HIV incidence and thereby reduce future related costs.

Cost-Effectiveness of MRI-Guided Thrombolysis for Stroke Patients with Unknown Time of Onset

PRESENTER: **Louisa-Kristin Muntendorf**, University Medical Center Hamburg-Eppendorf

Background and Purpose

The treatment of ischemic stroke with intravenous thrombolysis (IT) is currently restricted to a time window of less than 4.5 hours from symptom onset. Stroke patients with unknown time of onset are currently excluded from IT, suffering from long-term disability and death. The WAKE-UP trial proved to extend treatment to this currently under-served patient population and proved clinical effectiveness of MRI-guided IT. The aim of this study was to assess the cost-effectiveness of MRI-guided IT with intravenous alteplase for acute ischemic stroke in patients with unknown time of onset compared to placebo.

Methods

A Markov model was designed to predict cost-effectiveness over 25 years. The analysis was based on the WAKE-UP trial, a European multi-center randomized controlled trial investigating the effects of IT with alteplase vs placebo following a mismatch in MRI imaging in patients with unknown time of onset. The model consisted of an in-patient acute care phase and a rest-of-life phase. Health states were defined by the modified Rankin Scale (mRS). Probabilities of mRS scores after 90 days post-stroke were taken from the WAKE-UP trial. After the initial stroke, patients remained in their mRS score until death or recurrent stroke. Health state utilities were extracted from published literature. Cost data of acute care were taken from the University Medical Center Hamburg-Eppendorf, Germany. To establish cost of long-term care, mRS scores were matched to German care degrees based on expert opinion. Incremental costs and effects over the patients' lifetime were estimated. The analysis was conducted from a German societal perspective. To assess uncertainty in the model we conducted univariate and probabilistic sensitivity analysis (Monte Carlo Simulation).

Results

Treatment with alteplase dominated placebo with incremental cost savings of 51,009€ ($40,807) and 1.30 QALYs when costs and effects were discounted at 5%. Univariate sensitivity analysis revealed the ICER to be sensitive to the relative risk of favorable outcome (mRS states 0-1) compared to non-favorable (mRS states 2-6) for placebo patients after stroke. The ICER was also sensitive to costs of long-term care, as well as patient age at initial stroke event. In all cases alteplase remained dominant over placebo. Probabilistic sensitivity analysis confirmed the results.

Limitations

Long-term care cost were based on expert opinion, which could lead to limited validity of estimates.

Conclusion

MRI-guided IT with intravenous alteplase compared to placebo is cost-effective in ischemic stroke patients with unknown time of onset.

Is It Too Expensive to Fight Cancer? Analysis of Incremental Costs and Benefits of the Croatian National Plan Against Cancer

PRESENTER: **Ana Bobinac**
AUTHORS: Eduard Vrdoljak, Mario Sekerija, Stjepko Plestina, Ingrid Belac Lovasic, Vera Katalinic Jankovic, Livio Garattini, Luka Voncina

In 2019, Croatia was the last EU country to publish a comprehensive National Plan Against Cancer (NPAC), a country-level public health programme designed to reduce cancer incidence and mortality rates and improve the quality of life of cancer patients. The rational for creating and implementing a large-scale NPAC lies in the improvement of prevention, diagnosis and treatment of cancer, which should result with advancements in overall oncological care in Croatia and its outcomes for patients. Fighting cancer is an especially pressing issue for Croatia, as it records some of the highest age-standardised cancer mortality rates out of all the European Union member states.

The measures envisaged by the Croatian NPAC are accompanied by their respective price tags and budgeted per year of implementation. Conversely, a review of National cancer plans in Europe revealed that in many other countries, elements crucial to healthcare policy-making and to the efficacy of the National cancer plans such as financing, resource allocation or governance are missing or inadequate, hindering on their usefulness and applicability. National cancer plans rarely define concrete budgets with the detailed costs required to achieve the desired improvements, typically listing desired changes and interventions that would, if implemented, impact cancer incidence, mortality rates and other important outcomes. Moreover, the plans typically do not define measurable outcomes that provide hard targets for improvement or the milestones required for monitoring the progress of their implementation. Given these issues, it is not surprising that there is little discussion or information on the overall cost-effectiveness of the mix of measures proposed by any National cancer plan.

To contribute to this debate, our study analyses the expected impact of the activities proposed by the Croatian NPAC on cancer incidence and survival as related to their respective direct and indirect costs over the period of the upcoming 11 years, thereby answering the following question: how cost-effective is it to fight cancer?

We evaluated the impact of NPAC on two main outcomes, namely, reduced incidence and the improved survival of cancer patients, expressed as life-years gained (LYGs), which enabled the calculation of cost per LYG ICERs. In the analysis of costs, we considered both the direct costs of NPAC activities as well as the wider indirect societal costs of cancer, thus permitting the calculation of the ICER both from the narrower national health insurer's perspective and the wider societal perspective. Sensitivity analysis was performed.

We estimated that on average, for all patients benefiting from the implementation of the NPAC in Croatia, an additional LYG would be yielded at the additional cost of €1,021 (societal perspective). The NPAC can, for some sites, even be considered a dominant intervention due to the negative cost/LYG ratio, meaning that it generates additional LYGs while at the same time reducing total societal costs. Taking a narrower health insurer's perspective (i.e., accounting only for the direct costs), the NPAC produces an additional LYG at an additional cost of €1,408. Both cost per LYG estimates can be considered cost-effective investment options.

Economic Evaluation of Hemodialysis and Kidney Transplantation for End Stage Renal Disease Patients in Myanmar

PRESENTER: **Phyu Win Thant**, Ministry of Health and Sports
AUTHORS: Thet Mon Than, Khine Thet Win, Sai Myo Nyunt, Thant Sin Htoo

Background/Aim. The burden of Chronic Kidney Disease in general and the end-stage renal disease in particular has continued to grow throughout the years and challenges the societies globally. Effective health care policies become critical to save the lives of the patients, and at the same time, there is a need for the efficient utilization of limited health care resources. Although there is a rising demand on cost-effective approach to medical decision making, there is currently no published report on the costs of renal replacement therapies(RRT) in Myanmar for estimating the resource requirement as well as no cost-effectiveness study of ESRD treatment modalities in our country setting. This study aimed to assess cost-effectiveness of kidney transplantation in comparison of hemodialysis[HD] in Myanmar.

Methods. Decision Analytic Model was constructed to compare the possible clinical and economic effects of hemodialysis and kidney transplant treatment options over five years in Myanmar. Microsoft Excel was used to develop the model for ESRD that was followed up for five years after having treatment. Intervention effectiveness was based on number of deaths and Quality adjusted life years (QALY). For evaluation purpose, cost per life saved or cost per QALY gained were analyzed to make the comparison between hemodialysis and kidney transplant to determine their cost-effectiveness.

Results For a transplant patient, it was estimated to be about 4,709 USD for preparation of transplant operation, 8,633 USD for operation and 537 USD for hospitalization. Initial preparation costs of HD were significantly lower than that of transplant cost, making 194 USD per capita. One session HD cost was 47 USD per capita. Total annual cost of HD was estimated to 7,433 USD per capita which was more than transplant patient annual follow up cost (1,603 USD). The discounted cost for 5-year HD made 30,321 USD, for 5-year Kidney transplant was 19,174 USD per capita and for Kidney transplant with graft rejection was 36,976 USD per capita. Cost effectiveness analysis results showed that kidney Transplant was the preferred treatment modality compared to HD for the 5 years period, accounting for saving USD 39,132 for one death averted and USD 5,967 for one QALY gained respectively.

Conclusion. The various types of Renal Replacement Therapy differ significantly in terms of their costs and effectiveness, with hospital hemodialysis imposing the higher costs and offering the lower quality of life. Government should consider the sufficient effort to be promoted to pursue the cost effective RRT which is the kidney transplant. Although it is challenging for current health care system of Myanmar to prioritize kidney transplant, the effective long term plan should be developed not only for service readiness but also for financial protection of the ESRD patients to access the life-saving health care. The results of this research provide insight into cost-effectiveness of two different renal replacement therapies in Myanmar.

The Cost of Providing Consultative Palliative Care Services in a Tertiary Hospital Setting

PRESENTER: **Mr. Linda Mbuthini**, University of Cape Town
AUTHORS: Lucy Cunnama, René Krause, Jennifer Moodley

Background

The Sub-Saharan African region has sparse palliative care established to cater for patients facing life limiting conditions. In South Africa, costing frameworks for palliative care interventions for the public sector do not exist and the cost of running a comprehensive palliative care programme remains unknown. There are few costing studies to inform costs of palliative care models which are necessary for decision makers to base their decisions on. The aim of this study was to determine the costs and cost drivers for hospital based consultative palliative care service (HBCPCS) from a providers' perspective.

Methods

In this empirical costing study we developed and utilized a costing tool that employed a mixed bottom-up and top-down costing method to estimate the unit cost of providing HBCPCS in a tertiary hospital in Cape Town, South Africa, called Groote Schuur Hospital (GSH) adopting a public provider perspective. All inputs where valued using bottom-up, ingredients-based methods, except for direct staff where a top-down approach was utilized to allocate the staff's salary to palliative care services. We collected costing data by conducting inventory audits, informal interviews and informal observations. All inputs required in the production of the HBCPCS were checked against a costing framework for economic evaluations of palliative care interventions to ensure that the cost estimates were as inclusive as possible. All inputs with a lifespan of more than one year were annuitized using a 3% rate. Costs are presented in 2019 South African Rands.

Results

The total annual cost for running the HBCPCS was R2 494 419 including both recurrent and capital costs. Recurrent items alone accounted for 96% (R2 392 407). While, capital items accounted for 4% (R102 013) during the study period. The total cost per visit was R642 including the standard drug treatment package (R16). The major cost driver in the service was personnel, accounting or 91% of the total annual cost. While a scenario analysis shows that when the size of the team is double the current size then the cost of direct personnel would increase to R4.4 million.

Conclusion

The incremental unit cost of HBCPCS, offered in tertiary public hospital, can be considered inexpensive when added as an adjunct to inpatient care for patients in a public tertiary hospital, the major cost driver being personnel. With a cost of R2.4 million per annum these services can be provided in a tertiary hospital.

Economic Burden of Multiple Sclerosis in Low- and Middle-Income Countries: A Systematic Review

PRESENTER: **Jalal Dahham**, Maastricht University
AUTHORS: Rana Rizk, Ingrid Kremer, Silvia Evers, Mickael Hiligsmann Sr.

Background

Although the economic burden of multiple sclerosis (MS) in high-income countries (HICs) has been extensively studied, information on the costs of MS in low- and middle-income countries (LMICs) remains scarce. Moreover, no review synthesizing and assessing the costs of MS in LMICs has yet been undertaken.

Objective

Our objective was to systematically identify and review the cost of illness (COI) of MS in LMICs to critically appraise the methodologies used, compare cost estimates across countries and by level of disease severity, and examine cost drivers.

Methods

We conducted a systematic literature search for original studies in English, French, and Dutch containing prevalence or incidence-based cost data of MS in LMICs. The search was conducted in MEDLINE (Ovid), PubMed, Embase (Ovid), Cochrane Library, National Health Service Economic Evaluation Database (NHS EED), Econlit, and CINAHL (EBSCO) on July 2020 without restrictions on publication date. Recommended and

validated methods were used for data extraction and analysis to make the results of the COI studies comparable. Costs were adjusted to $US, year 2019 values, using the World Bank purchasing power parity and inflated using the consumer price index.

Results

A total of 14 studies were identified, all of which were conducted in upper-middle-income economies. Eight studies used a bottom-up approach for costing, and six used a top-down approach. Four studies used a societal perspective. The total annual cost per patient ranged between $US463 and 58,616. Costs varied across studies and countries, mainly because of differences regarding the inclusion of costs of disease-modifying therapies (DMTs), the range of cost items included, the methodological choices such as approaches used to estimate healthcare resource consumption, and the inclusion of informal care and productivity losses. Characteristics and methodologies of the included studies varied considerably, especially regarding the perspective adopted, cost data specification, and reporting of costs per severity levels. The total costs increased with greater disease severity. The cost ratios between different levels of MS severity within studies were relatively stable; costs were around 1–1.5 times higher for moderate versus mild MS and about two times higher for severe versus mild MS. MS drug costs were the main cost driver for less severe MS, whereas the proportion of direct non-medical costs and indirect costs increased with greater disease severity.

Conclusion

MS places a huge economic burden on healthcare systems and societies in LMICs. Methodological differences and substantial variations in terms of absolute costs were found between studies, which made comparison of studies challenging. However, the cost ratios across different levels of MS severity were similar, making comparisons between studies by disease severity feasible. Cost drivers were mainly DMTs and relapse treatments, and this was consistent across studies. Yet, the distribution of cost components varied with disease severity.

Keywords: Multiple Sclerosis; Economic Burden; Cost of Illness; Low- and Middle-Income Countries; Systematic Review

Short-Term Cost-Effectiveness of a Group-Based Lifestyle-Integrated Functional Exercise Program: Results from the Life-Is-Life Trial

PRESENTER: **Sophie Gottschalk**

Background: The Lifestyle-Integrated Functional Exercise (LiFE) program has been shown to be effective in improving strength, balance, and physical activity while simultaneously reducing falls in older people. However, implementing the original, individually delivered program (LiFE) would require substantial resources. A group format (gLiFE), on the other hand, requires fewer resources and could thereby reduce costs. Therefore, the aim of this study was to compare costs and effectiveness of gLiFE with iLiFE by conducting a cost-effectiveness analysis.

Methods: The analysis was conducted alongside a randomized controlled trial (LiFE-is-LiFE) testing gLiFE regarding its non-inferiority to LiFE. Participants were randomly assigned to LiFE (n=153) or gLiFE (n=156). Resource use from societal and payer's perspective was assessed retrospectively at baseline and at 6 months follow-up. Costs associated with inpatient and outpatient health care utilization, informal and formal service utilization as well as intervention costs were included. Cost-effectiveness of gLiFE was assessed over 6 months using different effect measures (quality-adjusted life years [QALY, EQ-5D-5L], physical activity [mean number of steps/day], and falls). Incremental cost-effectiveness ratios (ICER) were determined and cost-effectiveness acceptability curves (CEAC) were constructed based on net-benefit regressions to account for statistical uncertainty. Different willingness to pay (WTP) values were assumed.

Results: From a societal perspective, mean costs and QALY were almost identical between the two interventions, the number of falls was somewhat higher in gLiFE. From the payer's perspective, the ICER for gLiFE compared to LiFE were €60,019 per QALY and €5,088 per fall prevented. Based on the CEAC, the cost-effectiveness of gLiFE had to be rated as uncertain for both effect measures and perspectives. In contrast, gLiFE demonstrated cost-effectiveness for increasing physical activity at willingness-to-pay values per additional 1,000 steps/day of €1,400 (societal perspective) or €400 (payer's perspective).

Conclusions: Compared to LiFE, gLiFE might be cost-effective for increasing physical activity in older adults but was unlikely to be cost-effective with regard to QALY or for preventing falls. The cost-effectiveness of gLiFE should be evaluated long-term and compared to a regular care group.

Comparison of Ureteroscopy, Extracorporeal Shock Wave Lithotripsy, and Percutaneous Nephrolithotomy for the Treatment of Urolithiasis Based on Health Insurance Claims Data

PRESENTER: **Claudia Schulz**, University Medical Center Hamburg-Eppendorf

AUTHOR: Dr. Hans-Helmut Koenig

For kidney stones with a lifetime prevalence of approx. 10%, intervention choices may be: (i) Ureteroscopy (URS) with hardly any contraindications, (ii) extracorporeal shockwave lithotripsy (ESWL) with fewer complications, but a worse stone-free rate, and (iii) percutaneous nephrolithotomy (PCNL), which entails a high stone-free rate, but more complications than URS. As kidney stones are likely to reoccur, stone-free rates, health care costs and sick leave days in the long run are highly relevant. Yet, existing literature mainly focused on a short follow-up. The aim of our study was to compare URS, ESWL and PCNL with regards to complications within 30 days, as well as re-intervention, health care costs and sick leave days within 12 months based on health insurance claims data.

This retrospective cohort study was based on German health insurance claims data. We included all AOK insurants who were treated with URS, ESWL or PCNL in 2008-2016. We investigated the number of complications within 30 days, as well as time to re-intervention, number of sick leave days and health care costs from a payer perspective within 12 months. Health care costs were calculated as inpatient and outpatient hospital and ambulatory costs. We applied Poisson, Cox proportional hazard and gamma models and adjusted for patient and treatment variables.

There were 166,551 urolithiasis patients, of which 105,126 (63.1%) were treated with URS, 47,819 (28.8%) with ESWL and 13,507 (8.1%) with PCNL. Mean age was 52.2 years and 65.8% were male. ESWL patients (mean 0.7, SD 4.4) had significantly fewer, and PCNL patients (mean 1.7, SD 6.8) significantly more 30-day complications than URS patients (mean 1.4, SD 4.5). Time to re-intervention within 12 months was significantly decreased for ESWL (mean 153.9, SD 168.0) and PCNL (mean 260.0, SD 155.0) compared to URS (mean 312.0, SD 120.0). ESWL (mean 17.9, SD 41.7) and PCNL (mean 17.4, SD 42.8) were correlated with a significantly higher number of sick leave days compared to URS (mean 16.5, SD 40.3). Regarding health care costs, ESWL (mean EUR 5,980.1, SD 6,679.0) and particularly PCNL (mean EUR 9,178.4, SD 9,741.0) were significantly more costly than URS (mean EUR 5,558.0, SD 7,280.0).

URS treatment showed benefits in terms of a long stone-free time, few sick leave days and low health care costs within 12-months. Therefore, it is the most frequent treatment choice. However, ESWL patients had fewer complications than URS patients. Moreover, in literature PCNL was shown to have the best stone-free rate, although complications and costs were highest. ESWL and PCNL may be performed for selected patient groups with carefully evaluated indications. Further analyses with a longer follow-up, and with a focus on recurrent urolithiasis patients are planned.

Patterns of Healthcare Use and Costs of Diagnostic Skin Biopsies in the Primary Health Care Setting: Analysis of Linked Administrative Data in the Australian Melanoma Genomics Managing Your Risk Randomised Controlled Trial

PRESENTER: **Stephen Law**, NHMRC Clinical Trials Centre, The University of Sydney

AUTHORS: Anne E Cust, Amelia K Smit, Kathy Dempsey, Richard A Scolyer, Rachael Morton

Background

Skin cancer is the most common and most expensive type of cancer in Australia, with more than 16,000 new cases of melanoma and almost 980,000 new cases of keratinocyte (non-melanoma) skin cancers treated annually. Skin cancer diagnosis and treatment in the primary health care setting may involve many types of medical and surgical procedures and subsequent pathology tests. The traditional costing approach, which only considers the index procedure, may underestimate actual resource use and costs. This analysis aimed to identify related healthcare use, such as doctor

consultations, on the date of the diagnostic skin biopsy and to evaluate their impact on cost estimations in Australia using a health system perspective.

Data and methods

This analysis was based on 57,398 linked Medicare Benefits Schedule (MBS) claims between July 2017 and June 2020 from a population cohort of 1,024 Australians aged 18-69 years enrolled in the Australian Melanoma Genomics Managing Your Risk trial. Diagnostic biopsy of skin was identified according to the MBS item (#30071). All other MBS items on the date of biopsy were extracted and assessed.

Results

Over the 36-month period, there were 154 participants who had 339 MBS claims for diagnostic biopsy of skin and these claims cost AUD$12,423 to the Australian health system. On the date of biopsy, these participants had another 636 MBS claims which cost $29,707. When analysed by type of healthcare, 175 of 636 claims (27.5%) were pathology charges for initiation of a patient episode (#73924, 73926, 73928. 73939); 185 (29.1%) were for tissue pathology (#72816, 72817, 72818, 72823, 72824, 72830, 72846, 72847); 152 (23.9%) were for a primary care doctor (i.e. GP) attendance or other non-referred medical practitioner (#3, 23, 36, 44, 53, 54, 5040) and 59 (9.3%) were for specialist doctor attendances (e.g. dermatologist, surgeon) (#104, 105).

Discussion

Results of this analysis suggest at least 65% of MBS items and 70.1% of costs may be underestimated, if the index procedure alone is considered when costing diagnostic biopsies in the primary health care setting. Additional underestimation is likely to occur if related healthcare services are claimed a few days before or after the index procedure. There is a need to develop a prediction algorithm to facilitate the collection and analysis of administrative data to inform comprehensive costing of these services in the future.

6:00 AM –7:15 AM TUESDAY [Demand And Utilization Of Health Services]

Demand and Utilization of Health Services, and Demand for Health Insurance Poster session 1

MODERATOR: **Shamima Akhter**, ThinkWell Global

Unravelling Barriers and Enablers to Universal Health Coverage: Operationalizing Tanahashi Framework for Bottleneck Analysis in a District Level Study

PRESENTER: **Veenapani Rajeev Verma**, Indian Institute of Technology

AUTHOR: Umakant Dash

BACKGROUND: Concept of ***Universal Health Coverage*** enunciates the principle that people have access to effective health coverage while ensuring the protection from financial hardship when paying for them. While basic definition of universal health coverage is conceptually straight forward, translating it to a ***feasible metric*** is quite intractable. Coverage metric obtained from household survey alone in not succinct as it only captures service contact which cannot be construed as actual service delivery as it ignores comprehensive assessment of ***provider-client interaction*** and ***quality of care*** components.

OBJECTIVES: This study was undertaken to a) Estimate a comprehensive metric of effective coverage for different packages of healthcare services viz. ***Ambulatory care***, ***Maternal and child care***, ***Inpatient care*** and ***Immunization care*** using mixed-method approach and b) Discern barriers and enabling factors to Universal Health Coverage

AREA SETTING: The study was conducted in Poonch district of Jammu and Kashmir, which is a ***remote, rural, impoverished and conflict-prone*** area bounded by LoC with Pakistan.

FRAMEWORK, DATA AND METHODS: District representative field surveys encompassing ***household survey(1600 households)***, ***health facility assessment(census of 186 facilities)*** and ***patient exit survey (250 respondents)*** in tandem with Key informant interviews and Focused Group Discussions with various stakeholders were conducted in study area to discern the measure and barriers to effective coverage. Various domains embedded in ***Tanahashi Framework*** of effective coverage viz. ***Availability, Accessibility, Acceptability, Contact Coverage and Effective coverage*** were elucidated. Availability metric was discerned by employing ***SARA framework*** and creating a composite index using ***Principal Component Analysis*** as a measure of ***Structural quality***. Accessibility was derived via ***Spatial Accessibility*** and ***Travel time modelling*** using vector and raster based methods using ***ArcGIS 10.7*** and ***AccessMod 5.0;*** Acceptability was unravelled via creating concise index using ***process indicators*** of quality of care gathered through patient exit interviews; Contact coverage metric was estimated via ***utilization*** indicators collected from household survey. Furthermore, linking of various surveys were done by using a suite of ***GIS*** (Geographical Information Systems) techniques such as ***Exact match linking***, ***Ecological linking*** and creating ***Kernel Density Estimation*** surfaces to link utilization/contact coverage with quality indices estimating ***effective coverage.***

RESULTS: indicated a significant ***drop along the cascade*** from ***Availability to Effective coverage***. Quality-adjusted effective coverage estimates were 20%-48% lesser than crude coverage estimates, this divergence was most exacerbated for ambulatory care, where supply did not commensurate with need of target population. Additionally, analysis indicated other major bottlenecks of ***Geographical Inaccessibility*** and ***Poor Provider Readiness*** as major impediments to Universal Health Coverage. First major ***bottleneck*** identified was from Availability(79.3%) to Accessibility(42.8%) and second major impediment was from Contact Coverage(29.5%) to Effective Coverage(11.1%).

CONCLUSIONS AND POLICY IMPLICATIONS: Coverage is impeded by ***geographical inaccessibility*** coupled with ***poor quality of service delivery.*** Efforts to be directed by policymakers to bolster health service quality, particularly for services that have achieved relatively high utilization. The study didn't incorporate private and informal providers underestimating coverage and *limiting* its generalizability.

Keywords: *Universal Health Coverage, Tanahashi Framework, GIS Applications, Effective coverage, Quality of Care, Geographical Inaccessibility*

Broadening the Spotlight on Equity: Measuring Differences in Access to High Quality Prenatal Care in Indonesia

PRESENTER: **Rabiah Adawiyah**, The Kirby Institute, UNSW

AUTHORS: David Boettiger, Tanya Applegate, Rebecca J Guy, Ari Probandari, Virginia Wiseman

Background: Equity in access to health care is an important criterion for the allocation of resources in health systems. Many low- and middle-income countries (LMICs) are seeking to track the performance of their health system in achieving universal health coverage, including access to high-quality healthcare. Poor-rich inequalities in maternal health and professional delivery care are significantly higher than many other forms of care in LMICs**.** Despite the passing of various policies to improve maternal health, Indonesia still faces challenges in reducing maternal mortality - specifically, in avoiding delays in receiving quality maternal healthcare. No study in the last decade has measured differences in access to high-quality prenatal care in Indonesia. In this paper, we explore variations in the quality and utilisation of prenatal care in Indonesia across different clinical settings and providers, geographic regions, and socioeconomic groups.

Methods: We used data from the Indonesian Family Life Survey (IFLS), a nationally representative cross-sectional household survey. 16 931 households in 312 communities were matched with a representative sample of both public and private health facilities available in the same communities. Quality of health facilities was assessed using both structural quality indicators and a knowledge score constructed using provider vignettes in the IFLS. Total household consumption was used to measure socioeconomic status. Differences in quality scores across providers, districts and socioeconomic groups were measured using the standardized quality scores for urban/rural and Java-Bali and outer Java-Bali regions.

Findings: Public health centres offer above average-quality prenatal care (both in terms of the availability of structural inputs and provider knowledge) with an average quality score of 52.4 compared to 33.48 for private providers. Private nurses and general practitioners (GPs) offer below average-quality care as well as most service providers located in rural areas. We found that there are no significant differences in access to quality care between socioeconomic groups; however only 78.2% and 89.8% of the poorest women in outer Java-Bali received full prenatal care during their pregnancy and had a facility-based delivery, respectively, compared to 87.9% and 94.5% of those women in the highest socioeconomic group.

Conclusion: Measurement of not only the availability of quality care but also equity in access to quality of care is necessary for assessing progress towards universal health coverage in Indonesia. While it seems that there are no significant differences in access to high-quality prenatal care between socioeconomic groups, the poorest women still receive fewer prenatal services. Private providers, which are the main source of care for pregnant women in Indonesia, rich and poor, exhibit lower levels of clinical knowledge and their facilities have fewer structural inputs to deliver quality care compared to those in the public sector. Strengthening public and private partnerships and improving access to continuing professional development opportunities, especially among providers located in rural areas should be priority if sustained improvements in access to quality maternal health care are to be achieved in Indonesia.

Inequities in Morbidity and Healthcare Utilization in India: Estimates from Various Rounds of Cross-Sectional Survey from 2004 to 2017-18

PRESENTER: **Veenapani Rajeev Verma**, Indian Institute of Technology
AUTHOR: Umakant Dash

Background: Health outcomes in India are characterized by pervasive inequities due to deeply entrenched socio-economic gradients amongst the population. Therefore, it is imperative to investigate these systematic disparities in health, however, evidence of inequities does not commensurate with its policy objectives in India. Thus, our paper aims to examine the magnitude of and trends in horizontal inequities in self-reported morbidity and utilization captured by untreated morbidity in India over the period of 2004 to 2017-18.

Methods: The study used cross-sectional data from nationwide healthcare surveys conducted in 2004, 2014 and 2017-18 encompassing sample size of 3,85,055; 3,35,499 and 5,57,887 individuals respectively. Erreygers concentration indices were employed to discern the magnitude and trend in horizontal inequities in self-reported morbidity and untreated morbidity. Need standardized concentration indices were further used to unravel the inter-regional and intra-regional income related inequities in outcomes of interest. Additionally, regression based decomposition approach was applied to ascertain the contributions of both legitimate and illegitimate factors in the measured inequalities.

Results: Estimates were indicative of profound inequities in self-reported morbidity as inequity indices were positive and significant for all study years, connoting better-off reporting more morbidity, given their needs. These inequities however, declined marginally from 2004(HI: 0.049, $p<0.01$) to 2017-18(HI: 0.045, $P<0.01$). Untreated morbidity exhibited pro-poor inequities with negative concentration indices. Albeit, significant reduction in horizontal inequity was found from 2004(HI= -0.103, $p<0.01$) to 2017-18(HI = -0.048, $p<0.01$) in treatment seeking over the years. The largest contribution of inequality for both outcomes stemmed from illegitimate variables in all the study years. Our findings also elucidated inter-state heterogeneities in inequities with high-income states like Andhra Pradesh, Kerala and West Bengal evincing inequities greater than all India estimates and Northeastern states divulged equity in reporting morbidity. Inequities in untreated morbidity converged for most states except in Punjab, Chhattisgarh and Himachal Pradesh where widening of inequities were observed from 2004 to 2017-18.

Conclusions: Pro-rich and pro-poor inequities in reported morbidity and untreated morbidity respectively persisted from 2004 to 2017-18 despite reforms in Indian healthcare. Magnitude of these inequities declined marginally over the years. Health policy in India should strive for targeted interventions closing inequity gap.

Key words: *Horizontal Inequities, Erreygers Concentration Index, Self-reported morbidity, untreated morbidity, Decomposition of Inequalities, National Sample Survey Data*

Forgone Care and Horizontal Inequity in Healthcare Use: Differences between Immigrants and Natives in Nine European Countries

PRESENTER: **Luigi Boggian**, Université catholique de Louvain
AUTHOR: Prof. Sandy Tubeuf

This paper assesses disparities in foregone healthcare among native and immigrant respondents in 15 European countries using data from the Survey on Health Ageing and Retirement in Europe (SHARE). Self-reported unmet needs for care refer to the fact that individuals report to have foregone healthcare services for a variety of reasons. We define the immigrant status using the country of origin to identify European and non-European first-generation immigrants, non-European second-generation immigrants, and non-citizens. We estimate the contribution of the immigrant status to the likelihood to forego care and explore a number of channels to try to explain disparities in foregone care between immigrants and natives. Our results show that both first- and second- generation immigrants are more likely to renounce to care even after controlling for health needs and socioeconomic factors, the effect being mainly driven by immigrants of non-European origin. We explore potential channels to explain these inequalities including language barriers, social trust, religiosity, disparities in health shocks and health insurance coverage. Our findings highlight that all culture-related channels partially absorb disparities in foregone care, while among non-cultural channels only health insurance coverage contribute to explain differentials.

Gender Differences in Use of Home and Community-Based Care: A Longitudinal Analysis of the Effects of Widowhood and Living Arrangements

PRESENTER: **Stefania Ilinca**, European Centre for Social Welfare Policy Research
AUTHORS: Ricardo Rodrigues, Stefan Fors, Susan Phillips, Eszter Zolyomi, Afshin Vafei, Johan Rehnberg

Background and Objectives: Persistent inequalities in access to community-based support limit opportunities for independent living for older people with care needs in Europe. Our study focuses on disentangling the effects of gender, widowhood and living arrangement on the probability of receiving home and community-based care, while separating the shorter-term effects of transitions into widowhood (bereavement) and living alone from the longer–term effects of being widowed and living alone.

Methods: We use comparative, longitudinal data from the Survey of Health, Ageing and Retirement in Europe (collected between 2004 and 2015 in 15 countries) specifying sex-disaggregated random-effects within-between (REWB) models, which allow us to examine both cross-sectional and longitudinal associations among widowhood, living arrangements and community-based care use.

Results: We find widowhood and living alone are overlapping but independent predictors of care use for both older women and men, while bereavement is associated with higher probability of care use only for women. Socio-economic status was associated with care use for older women, but not for men in our sample.

Discussion: The gender-specific effects we identify have important implications for fairness in European long-term care systems. They can inform improved care targeting towards individuals with limited informal care resources (e.g. bereaved older men) and lower socio-economic status, who are particularly vulnerable to experiencing unmet care needs. Gender differences are attenuated in countries that support formal care provision, suggesting gender equity can be promoted by decoupling access to care from household and family circumstances.

Socio-Economic and Rural-Urban Differences in Healthcare and Catastrophic Health Expenditures Among Cancer Patients in China: Analysis of the 2011-2015 China Health and Retirement Longitudinal Study

PRESENTER: **Mr. Yang Zhao**, The University of Melbourne
AUTHORS: Shenglan Tang, Wenhui Mao, Tomi F Akinyemiju

Abstract

Background In China, cancer deaths account for one-fifth of all deaths and exerts a heavy toll on patients, families, the healthcare system, and society as a whole. This study aims to examine socio-economic and rural-urban differences in treatment, health service utilization and catastrophic health expenditure (CHE) among cancer patients in China, and to investigate the association of different treatment types with health service utilization and CHE.

Methods We analyzed two waves of nationally representative data from the China Health and Retirement Longitudinal Study with 17,224 participants in 2011 and 19,569 participants in 2015. The main treatment types evaluated for cancer included Chinese traditional medicine (TCM), western modern medication excluding TCM, both western modern medications and TCM, surgery, and radiation/chemotherapy. CHE is defined as the point at which annual household health payments exceeded 40% of non-food household consumption expenditure. Multivariable regression models were performed to examine the association of cancer treatments with health service utilization and as well as incidence of CHE.

Results The age-adjusted prevalence of cancer is 1.37% for 2011 and 1.84% for 2015. Approximately half of the cancer patients utilized treatment for their disease, with a higher proportion of urban residents (54%) than rural residents (46%) receiving cancer treatment in 2015. CHE declined by 22% in urban areas (25% in 2011 and 19% in 2015) but increased by 31% in rural areas (25% in 2011 to 33% in 2015). There was a positive association of cancer treatment with outpatient visit (Adjusted Odds Ratio (AOR)=2.098, 95% CI =1.453, 3.029), admission to hospital (AOR=1.961, 95% CI=1.346, 2.857), as well as CHE (AOR=1.796, 95% CI=1.231, 2.620). Chemotherapy (AOR: 2.53, 95% CI: 1.55, 4.12) and surgery (surgery: AOR: 2.15, 95% CI: 1.44, 3.20) were each associated with a 2-fold increased risk of CHE,

Conclusion The burden of cancer among Chinese adults is increasing and about one- fourth cancer patients experienced CHE. Yet disparities among urban-rural, and different socio-economic status still exist. The disparity in CHE has actually increased between the rural and urban population. To reduce financial burden of cancer and bridge the socio-economic gaps, meaningful changes to improve health insurance benefit packages are needed to ensure universal, affordable and patient-centered health coverage for the Chinese cancer patients.

Devil in the Details: How Urgency and Costs Influence the Effects of Cost-Sharing on Healthcare Service Consumption Patterns

PRESENTER: **Michael Berger**, Department of Health Economics, Center for Public Health, Medical University of Austria
AUTHORS: Eva Six, Thomas Czypionka

Background

Cost-sharing takes a prominent role in the financing of many healthcare systems worldwide. Decision makers frequently use them as a tool to alleviate the pressure on public healthcare budgets. Apart from generating revenue directly, cost-sharing is a means to influence and steer the behaviour of patients to control demand for healthcare services and thereby deal with the problem of moral hazard. The effect of cost-sharing on demand for healthcare services has been heavily studied in the literature. However, researchers often apply a macro-perspective to approach these issues, opening the door for the fallacy of assuming uniform demand reactions across a spectrum of different healthcare services. The aim of this article is to estimate the price elasticity of a variety of healthcare services to highlight how they depend on urgency and price.

Methods and data

We utilise a dataset of pseudonymised longitudinal patient-level routine data on healthcare service consumption between Q2-2015 and Q2-2017 of three different social health insurance providers in Austria covering 1,035,177 patients with 2,370,463 healthcare service contacts. We estimate the price elasticity of a set of 11 healthcare services differing in terms of urgency and price. We combine matching via entropy balancing and difference-in-differences estimation in a two-stage study design following a reduction in the co-insurance rate by one of the social health insurance providers from 20% to 10% in Q2-2016. We further test the robustness of our result using different frequencies on the dependent variable (quarterly versus two-period set-up) and placebo regression.

Results

We find that the reduction of the co-insurance rate led to a small increase in demand for routine ECQs (+1.5%) and a negligible increase for electromyography (+0.1%) over the whole post-treatment period. Only the effect for routine ECG is statistically significant and robust to our sensitivity analyses. For the nine other healthcare services, pre-trends fail the necessary conditions for a difference-in-differences framework.

Discussion

Our results show that price elasticities of different healthcare services depend on their urgency and costs and cast a new light on previous empirical evidence on price elasticity of healthcare services derived without differentiation between services. Routine ECGs and electromyography are two comparatively expensive healthcare services in the outpatient sector. But whereas routine ECGs are often performed during a health check-up and can easily be postponed by patients, electromyography can be more urgent and patients do not have discretion over the timing of the healthcare service consumption. For healthcare services that are urgent, low cost or both, we do not find evidence that a change in co-insurance rate affects demand. A limitation to our study is that some of the healthcare services are not frequently consumed and may be prone to distortions by regional or seasonal fluctuations which may cause deviations in pre-trends. In combination with a small effect size, this likely contributes to the comparatively low statistical significance of the findings.

How Do Older Adults with Mental Disorders Respond to Complex Cost-Sharing Design?

PRESENTER: **Judith Liu**, University of Melbourne
AUTHORS: Yuting Zhang, Cameron Kaplan

Mental disorders are of major medical and economic significance throughout the U.S., but little is known about how patients with mental disorders respond to changes in insurance benefit design. We use 2007-2018 Medicare claims data and identify subpopulations by mental disorders. We focus on the gradual elimination of the Medicare prescription drug coverage gap beginning in 2011, and examine the effects on medication use and out-of-pocket spending by drug type with a difference-in-difference approach. We compare the estimates across mental health groups and to the general population. Our results show that closing the gap substantially reduced individuals' annual out-of-pocket spending. The reduction was larger for those with more severe disease (Alzheimer's and dementia: -$554.7; severe mental disorders: -$435.97, common mental disorders: -$366.29; general Medicare population: -$183.87). The policy also increased branded drug utilization, with the effect for patients with Alzheimer's and dementia being much smaller than the other groups (3% vs 19−20%), and decreased generic drug utilization for all groups (2−4%). Our findings provide evidence that patients' responses to price changes vary across mental disorders and by drug type. Lowering medication costs has differential impacts across diseases and may not be sufficient to improve adherence for all conditions, in particular those with severe mental health disorders such as Alzheimer's and dementia.

Regional Medical Practice Variation in High-Cost Healthcare Services: Evidence from Diagnostic Imaging in Austria

PRESENTER: **Michael Berger**, Department of Health Economics, Center for Public Health, Medical University of Austria
AUTHOR: Thomas Czypionka

Background

In their quest to align healthcare expenditure with actual revenues, policy makers can find a viable option in the reduction of wasteful spending to increase the efficiency of healthcare systems without cutting back on vital services. Medical practice variation can be a useful signpost to spot wasteful spending. In this paper, we focus on Magnetic Resonance Imaging (MRI) which is a popular yet cost-intensive diagnostic measure whose strengths compared to other medical imaging technologies have led to increased application. But the benefits of aggressive testing are doubtful. The purpose of this paper is to determine the extent of regional medical practice variation of high-cost diagnostic imaging in a healthcare system characterized by social health insurance (SHI) system with comprehensive coverage and regional autonomy of payers to regulate access. The empirical evidence from Austria is of interest due to Austria's high rate of MRI exams per capita and its strong (regional) fragmentation in the public financing and governance of healthcare.

Methods and data

We use a set of routine healthcare data on outpatient MRI service use of Austrian patients between Q3-2015 and Q2-2016 on the district level to investigate the extent of medical practice variation in a two-step study approach. In total, the dataset covers 587,054 outpatient MRI exams and 172,769 MRI episodes in outpatient departments of hospitals. In the first step, we use multivariate regression models to identify the influence of selected district-level control variables. In the second step, we use a Blinder-Oaxaca decomposition to highlight how much of the difference in MRI use between high and low MRI-utilization districts is explained through observable characteristics, e.g. epidemiological factors. We test the robustness of our results using two different definitions on the outcome variable.

Results

We find that the payers' autonomy in regulating access to MRI scans is a strong contributor to the regional variation in MRI utilization, reducing the number of MRI scans per 1,000 population by roughly 18. Epidemiological, socio-economical and supply-side factors only account for a minor share of the observed differences. The statistical composition suggests that a substantial fraction of more than 70% of the regional variation in MRI utilization remains unexplained by the observable district characteristics used in our study.

Discussion

Our study has two interesting implications: first, our results suggest that the dynamic behind the regional variation of MRI utilization differs from that of healthcare services in general which, in recent empirical work, is by and large explained by differences in patient characteristics. It has been proposed that the reasons for regional variation differ between institutional settings and types of care, but they may even vary across healthcare services. Second, in the context of Austria, we show that there is ample potential to curb costs by streamlining the use of MRI, e.g. by fostering national guidelines. We caution are explorative and do not allow for a causal interpretation and may be subject to a certain bias due to the district-level aggregation and absence of data on privately-funded healthcare use.

Geographic Variation in the Utilisation of Medical Devices in Four European Countries: A Multilevel Model Analysis

PRESENTER: **Stefan Rabbe**, Universität Hamburg
AUTHORS: Meilin Möllenkamp, Antal Zemplenyi, Gábor Kovács, Zsolt Abonyi-Toth, Benedetta Pongiglione, Hedwig Bloomestein, Pim Wetzelaer, Renaud Heine, Jonas Schreyögg

Objective

This study aims at exploring and comparing treatment variation in medical device utilisation in three different countries (Germany, Italy and the Netherlands), using patient level data of hospital discharge records. Previous studies showed that healthcare utilisation varies considerably between geographic regions. However, we investigate, whether the variation found at a regional level is indeed due to geographic differences, or can rather be explained by differences at the hospital- or patient-level.

Methods

We selected nine case studies with medical devices (i.e. stents and PTCA for myocardial infarction, laparoscope for prostatectomy and hysterectomy with benign or malign neoplasm, knee implants for arthrosis, cochlea implant for patients with hearing impairment, treatment of spinal stenosis, and treatment options for femur fracture) based on diagnosis and procedure codes used for the treatment of major conditions. Not all of the eight devices are available for all countries due to data availability. Further, we identified relevant explanatory variables to capture demand- and supply-side factors.

Our analysis is based on patient-level data including hospital and regional level characteristics for the years 2012–2016 and applied a three-level logistic random intercept model to assess the determinants of patients receiving a defined treatment related to a medical device. Country specific estimates are calculated. Differences between the countries are assessed by comparing explanatory variables and the amount of the total variation attributable to each level via intraclass correlation (ICC).

Results

For example, for the case of drug-eluting stent (DES) vs. bare metal stents (BMS), the share of DES is higher in Germany (Mean: 84.6%) than in Italy (Mean: 77.2%). In both countries, the share of DES has increased from 2012-2015. For Germany, DES utilisation is higher in Western compared to Eastern Germany. Moreover, results indicate that the largest part of the total variation is due to the patient-level. Still, a substantial part of the total variation is attributable to the hospital level (ICC-Germany: 20.6%; ICC-Italy: 20.9%) and only a minor part to the NUTS3 level (ICC-Germany: 9.8%; ICC-Italy: 10.4%). This suggests that the regional level compared to the hospital level plays a subordinate role for the case of stents in Germany and Italy. Preliminary results for the other case studies suggest a similar pattern. Results for the other countries are still pending.

Discussion

The preliminary results for Germany and Italy for the cases of DES vs. BMS are surprisingly similar. However, the regional level in Italy explains more of the variation in stent utilisation. One reason for this could be that the Italian healthcare system is more decentralised, with regions having their own HTA bodies. The fact that a substantial part of the variation in both countries is attributable to the hospital level could be an indication of the presence of potentially supply-driven variation. Further investigation of other case studies can improve the understanding of regional variation in Europe.

Determinants of Use of Hospital Tiers for Major Cardiovascular Diseases in China between 2009 and 2017

PRESENTER: **Muriel Levy**, Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford

Background: In the context of major healthcare reforms in China, differential cost-sharing in health insurance schemes were implemented to reduce overcrowding of higher tier hospitals and encourage utilisation of lower tier hospitals. The effects of cost-sharing on patients' choice of hospital remain uncertain. This study examined the effect of health insurance and patient characteristics on choice of hospital tier for stroke, ischaemic heart disease (IHD) and any cause in urban and rural areas in China in 2009-2017.

Methods: In a prospective study of 0.5 million adults, aged 30-79 years from 5 urban and 5 rural areas in China, data on hospital admissions were obtained by linkage to health insurance records. Hospitals were classified as tier 1 (<100 beds), tier 2 (100-500 beds) and tier 3 (>500 beds). McFadden's choice models were fitted separately in urban and rural areas. Reimbursement rates and deductibles were included as alternative-specific variables and interacted with hospital tier. Case-specific variables included: reimbursement ceiling, demographic, socioeconomic, lifestyle and morbidity factors, and calendar year and area fixed effects.

Results: The effect of cost-sharing on choice of hospital tier differed between urban and rural areas. In urban areas, higher reimbursement rates in all tiers were associated with higher use of corresponding hospital tier. Higher deductibles were associated with lower use of tier 3 hospitals only for stroke, and with lower use of all hospital tiers for IHD. In rural areas, only reimbursement rates in tier 3 hospitals were associated with higher use of these hospitals for stroke, and the effects of deductibles were inconclusive for both diseases. In both urban and rural areas, the effect of ceiling varied by hospital tier and disease.

While urban residents had a strong preference for the use of tier 3 hospitals (approximatively 70% of admissions), the use of different hospital tiers was more evenly distributed for rural residents. In both urban and rural areas, higher socioeconomic groups and patients with more severe disease types were more likely to choose higher than lower tier hospitals. In urban areas, increasing the deductibles in tier 3 hospitals had the largest effect to guide patients with IHD from tier 3 towards tier 1 and 2 hospitals.

Conclusions: Health insurance characteristics influenced the choice of hospital tier differently in urban and rural areas in China, with urban residents being more sensitive to changes in cost-sharing. Despite increases in reimbursement rates, rural residents and individuals from lower socioeconomic groups still have lower access to higher tier hospitals. Further initiatives are needed to harmonise health insurance benefits across schemes, to decrease inequalities in access to different hospital tiers, and to encourage utilisation of lower tier hospitals.

Optimal Portfolio Choice with Longevity and Health Insurance: A Developing Country Context

PRESENTER: **Cheng Wan**, UNSW Sydney

AUTHORS: Hazel Bateman, Katja Hanewald

We derive the optimal portfolio for retirees in a developing country context facing uncertain lifespan, catastrophic medical expenditures, and long-term care costs. In the model, retirees can choose from a portfolio consisting of life annuities, critical illness insurance, long-term care insurance, and a savings account. The model is calibrated with Chinese data. We find that in emerging economies like China, an optimal portfolio highly depends on a retiree's economic background. For retirees with an average pension, we find that at least 30% of retirement wealth is allocated for critical illness insurance, while at least 40% is allocated for a life annuity for those with a low pension. The demand for long-term care insurance is usually between 5% to 15% of retirement savings. Choice of a lower medical spending reduces the demand for critical illness insurance, however it provides a larger welfare compared with an adequate medical spending. These optimal insurance amounts for retirees with different economic backgrounds can inform governments and insurers to design innovative solutions for retirement and to advise retirement planning. Finally, our study suggests that bundling longevity and health-related insurance products is one way to achieve a lower price and it can increase annuity demand for some retirees.

Effects of Private Health Insurance Incentives on the Take-up Among the Elderly in Australia

PRESENTER: **Judith Liu**, University of Melbourne

AUTHOR: Yuting Zhang

This paper studies the impact of financial incentives to purchase private health insurance (PHI) for the elderly population. Over the past three decades, Australian government has implemented multiple interventions to increase the take-up rates of private health insurance (PHI). Prior work has estimated the effects of tax and price incentives on the demand for PHI, mostly focusing on the policies introduced during 1997-2000. However, the recent changes in the rates of PHI is not well understood, and there is limited evidence on the effects for the elderly.

From April 1, 2005, the government provided higher rebates for older Australians: rebate increased from 30% to 35% for people aged 65–69 years old, and increased to 40% for people aged 70 years and over. From July 1, 2012, the government implemented means testing to the PHI incentives, which decreased PHI rebates and increased Medicare Levy Surcharge for higher-income households. Means-tested rebates vary by age.

We examine the impact of these changes on PHI coverage of older Australians. We use the Australian tax return data from 2000 to 2012. We employ event-study and difference-in-differences designs to estimate the impact on PHI coverage arising from this change in tax incentives. We also explore the heterogenous effects across different socioeconomic groups.

Our results suggest that after the implementation of higher rebates in 2005, the take-up rate increased for people aged 65-69; however, there is no such effect for people aged 70 and above, who were actually provided higher rebates. We also find that women are more responsive to the rebate increase than men. In addition, the effects are larger in urban areas.

Assessment of Participation of Community Pharmacies in National Health Insurance Scheme of Nigeria

PRESENTER: **Prof. Shafiu Mohammed**, Health Systems and Policy Research Unit (HSPRU), Ahmadu Bello University, Zaria, Nigeria

AUTHORS: Yakubu Teslim Oladosun, Samirah Nduwan Abdu-Aguye, Mustapha Mohammed, Fatima Auwal, Shuaibu Aliyu, Abubakar Shaaban, Hadiza Usman Maaji, Muhammad Aminu Zayyad, Basira Kankia Lawal, Umar Ibrahim Idris, Hadiza Yusuf, Aliyu Yauba Kaigamma, Kamilu Sarki Labaran

In Nigeria, the National Health Insurance Scheme (NHIS) was established in 1999 as part of health sector reform and active implementation began in 2005. The scheme aimed at providing health insurance to enrolled citizens with good quality and cost-effective health services. As part of health care providers, community pharmacies (CPs) are relevant stakeholders in the provision of universal health coverage for the populace because of their closeness to communities and easily accessible to the public. Operational assessment of CPs participation provides an impetus in aligning policy reforms that meet stakeholders' needs and expectations. However, there is scarce of studies which pay attention on the CPs perspectives. This study aimed at providing relevant information to improve the participation of CPs in the NHIS. We assessed the extent of involvement of the CPs and their interactions in the NHIS including enabling and hindering factors affecting their participation. This study was conducted between August and November 2018 in these States (Kaduna, Kano, Borno, Abuja). Community pharmacies in these States were interviewed using structured questionnaires which were self-administered. All data collected were analyzed using computational softwares, and the results presented as tables and charts. There was very low participation of CPs in the NHIS. General customers increased very significantly compare to NHIS customers in the past years. Majority (76.7%) of CPs were dissatisfied with the NHIS implementation in the last 3-years. Some of the factors causing the non-participation were identified to be non-recognition as primary health care provider, delay in- and non-reimbursement of claims, lack of prescriptions and reliable methods of payments. Conclusively, this study revealed that participation of CPs in the NHIS was relatively poor. This assessment of CPs perspectives can assist policy-makers and implementers to monitor and evaluate the health insurance implementation. Enabling and hindering factors derived from this study is useful for providing evidence-based information for achievable implementation of the NHIS. Regulatory and policy implications are discussed.

Effect of Health Insurance Premium Changes on Labour Market Outcomes: Evidence from Rwanda

PRESENTER: **Emmanuel Rukundo**, University of Bonn

AUTHOR: Sarah Schroeder

In 2011, the government of Rwanda implemented a health insurance premium policy change that increased insurance premiums for non-poor individuals by 200 percent while proving poor households with waivers. Exploiting the variation emanating from a community-based classification of poor and non-poor households, we use three rounds of nationally representative cross-sectional surveys and apply a difference-in-differences with kernel matching to estimate the effect increased premiums on labour supply in the short and medium term. We find that premium increases reduced time allocation to non-agricultural activities. We provide a conceptual framework, which allows for endogenous household responses due to changes in the health insurance premium via income thresholds. Our findings suggest that households reduce their labour supply to gain eligibility for premium waivers, i.e. be classified as a poor household. The policy implications suggest that a revisiting of the community-based targeting is worthwhile in addressing the unintended effects of a possibly flawed targeting method.

Health Shocks and the Demand for Long-Term Care Insurance

PRESENTER: **Christine Leopold**, University of Augsburg

With the aging of the population in Western countries, the challenge of care provision for governments raises. The private insurance sector offers an option to cope with the expected care costs. Despite the substantial financial risk of high care costs for individuals, the market for private long-term care insurance (LTCI) is small.

Previous literature found experience with long-term care (LTC) to be a relevant factor for the demand for LTCI. Experience with LTC was depicted by dependent family members or friends in those studies. What remains unclear is the role of first-hand experience with care dependency for LTCI purchasing behavior.

The aim of this study is to show the effect of someone's own health risk as one aspect of experience with care dependency on the demand for private, supplementary LTCI.

SHARE, a European panel data set of individuals aged 50 and older, is used for the analysis. A health shock serves as proxy for first-hand experience.

To circumvent identification problems, the health shock of the partner in the same household serves additionally as proxy for first-hand experience. The results of the fixed effects estimation show that neither a health shock of the individual itself nor of the partner has a significant effect on the

possession of private, supplementary LTCI.

Advantageous selection, identification problems with observational data or the limited time frame could explain these results.

This paper contributes to the empirical literature on determinants for private LTCI purchase and extends it to a new form of experience with dependency, namely a health shock as proxy for first-hand experience. Furthermore, the analysis highlights that further research to solve the puzzle of the small private LTCI market is needed. For a better understanding, data with information about the motives of private, supplementary LTCI purchase would be helpful for future research.

6:00 AM –7:15 AM TUESDAY [Specific Populations]

Specific Populations Poster Session 1

MODERATOR: **Judit Simon**, Medical University of Vienna

Factors Leading to Institutionalization Among the Oldest Old. Longitudinal Findings from the AgeCoDe-AgeQualiDe Study.

PRESENTER: **Dr. Elzbieta Buczak-Stec**, University Medical Center Hamburg-Eppendorf
AUTHORS: André Hajek, Martin Scherer, Wolfgang Maier, Michael Wagner, Steffi G. Riedel-Heller, Dr. Hans-Helmut Koenig

Background

In the next decades, the proportion of individuals in highest age, 85 years old and older, is projected to rise considerably. Due to the strong association between old age and the need for long-term care, the number of individuals in need for care is also projected to increase noticeably. From a societal perspective, admission to an old age or a nursing home (NH) is expected to be associated with a marked economic burden. Therefore, the purpose of this study was to identify the determinants on institutionalization exclusively among the oldest old (85+) using panel regression models.

Methods

Longitudinal data for this study were gathered from a multicenter prospective cohort study ("Study on Needs, health service use, costs and health-related quality of life in a large sample of oldest-old primary care patients (85+)"; AgeQualiDe). This study used data from the Follow-Up (FU) 7 (n=861), FU 8 (n=755) and FU 9 (n=640). Main reasons for drop-off were refusal and death.

Our outcome variable of interest was institutionalization. Individuals admitted to an old-age home, nursing home or residing in assisted living were defined as institutionalized.

As regards to sociodemographic variables age, sex, widowhood, and the educational level (CASMIN) were used. Social support was measured using the Lubben Social Network Scale. In our analysis, we also included a set of variables indicating functioning and health status (cognitive impairment – GDS, functional decline – IADL, depressive symptoms - Geriatric Depression Scale). We also adjusted for visual impairment, hearing impairment, urinary and fecal incontinence.

To study the factors leading to institutionalization longitudinally we used logistic random-effects models with participant level random effect. Regression analyses were stratified by sex.

Results

At baseline, complete measures were available for 763 individuals. The average age was 88.9 years (SD 2.9), range 85-100, 68% were female. By FU9, 23% of individuals were institutionalized, 106 individuals died and 412 individuals remained in their home.

Regressions showed that conditional odds of being institutionalized were lower for men. Furthermore, higher age increased the odds of being institutionalized (OR=1.27). Widowed individuals had more than eight times higher odds of being institutionalized compared to non-widowed individuals (OR=8.95) and institutionalization was associated with functional decline (OR=0.16). The results of the analysis showed (both in total sample and in stratified analysis), that social support and depressive symptoms were not significantly associated with institutionalization. Moreover, in all regression models, institutionalization was not significantly associated with urinary and fecal incontinence as well as with visual and hearing impairments.

Discussion

Study findings showed that institutionalization was significantly associated with female sex, increasing age, widowhood status, and functional decline longitudinally, whereas it was not significantly associated with e.g. cognitive decline and lower social support. Our findings stress the importance of functional decline for institutionalization among the oldest old. Preventing or postponing functional decline might help to delay as far as possible institutionalization.

The Link between Sexual Orientation and Preferences to Move into a Nursing Home in Old Age

PRESENTER: **Dr. Elzbieta Buczak-Stec**, University Medical Center Hamburg-Eppendorf
AUTHORS: Dr. Hans-Helmut Koenig, André Hajek

Background

Most individuals are reluctant to move into a nursing home (NH), preferring to age in the own home as long as possible. When the individual's care needs increase, preferences shift towards nursing home care.

While there is a general increase in acceptance of sexual and gender minorities, older Lesbian, Gay, Bisexual and Transgender (LGBT) individuals residing in institutionalized settings perceive that they are discriminated against, due to their sexual orientation. Most research to date has not been nationally representative and has relied on qualitative data. Using nationally representative data, the aim of this study was to identify determinants of preferences related to NH care among LGBT individuals, and specifically whether they plan to move into a NH in old age.

Methods

In this study, data from the most recent sixth wave were derived from the German Ageing Survey (DEAS). In 2017 (6th wave), around 6,600 individuals participated. The additional written drop-off questionnaire (concerning sensitive issues e.g. sexual orientation) was filled in by approx. 85% (5,608 individuals).

Our outcome measure was preferences related to moving into a NH or retirement home (yes; no). The independent variable of interest was sexual orientation (dichotomized responses into sexual minority (homosexual, bisexual or other) and heterosexual)). In our final model, we adjusted for set of socioeconomic, psychosocial and health-related factors.

Multiple logistic regressions with integrated cross-sectional drop-off sampling weights to obtain a nationally representative sample and to solve the problem of selective panel mortality were used. Penalized logistic regressions were also calculated.

Results

Altogether 4,645 individuals provided data concerning sexual orientation, and other control variables. Weighted mean age was 60.8 (0.3) years, 7.3% belonged to sexual minorities and 4.9% had the preference to move into NH in the future.

Regressions showed that sexual orientation was not significantly associated with plans to move to a NH. Preference to move into NH were consistently positively associated with age (OR: 1.04 (1.02-1.07), not having at least one child (OR: 2.17 (1.41-3.36)), high education (OR: 3.82 (1.32-11.11)), greater loneliness (OR: 1.44 (1.05-1.96)) and worse physical functioning (OR: 0.99 (0.98 - 1.00)).

Conclusion

Our results showed that plans to move to a NH did not differ significantly between heterosexual individuals and sexual minorities. This may indicate that sexual orientation does not play a significant role in shaping preferences around moving into a nursing home *in general*. In contrast, other factors like age, greater loneliness and worse physical functioning were important. Those factors should be taken into account when shaping and updating policies on nursing homes.

Grandchild Care and Depressive Symptoms Among Rural Chinese Grandparents from a Gendered Perspective: Using a Coarsened Exact Matching Method

PRESENTER: **Dr. Dantong Zhao**, Xi'an Jiaotong University

Background: Caring for grandchildren has been regarded as one of the main roles for the middle- and old-aged adults, especially among rural Chinese grandparents. Based on a gender difference in grandparental role engagement and the theory of role strain and role enhancement, this study aimed to examine gender differences in depressive symptoms of rural Chinese grandparents caring for grandchildren.

Methods: A total of 4833 rural grandparents with at least one grandchild were selected from China Health and Retirement Longitudinal Study (CHARLS) conducted in 2015. Grandchild care was measured by grandchild care provision (Yes, No) and intensity (Low, High). Depressive symptoms were accessed by the Center for Epidemiologic Studies Depression Scale (CES-D). We used coarsened exact matching (CEM) to balance the covariates of caregivers and non-caregivers. After the matching, 1975 non-caregivers and 2212 caregivers were identified (N=4187). Moderation effect of gender on association between grandchild care and depressive symptoms was tested. Multilevel linear regression was employed to examine gender differences in depressive symptoms of grandparents caring for grandchildren, based on grandfathers and grandmothers subsample.

Results: Grandmothers undertook more grandchild care (54.42% vs 51.43%) and provided more care at high intensity (59.59% vs 49.17%) than grandfathers. Gender's moderation effect was found on association between grandchild care intensity and depressive symptoms. In stratified analysis, grandmothers providing grandchild care were associated with lower depressive symptoms (Coef.=-0.087, 95%CI: -0.163, -0.010), compared with non-caregivers. Grandmothers with high intensity of grandchild care were associated with higher depressive symptoms (Coef.=0.194, 95%CI: 0.026, 0.361), compared with those with low care intensity. However, such associations were not statistically significant among grandfathers.

Conclusions: Our findings highlight gender differences in depressive symptoms of rural Chinese grandparents caring for grandchildren. We encourage grandparents to engage in grandchild care but not at high intensity. Much care and attention should be placed on middle- and old-aged adults' mental health condition with increasing trend towards grandchild care involvement in the context of aging population and universal two-child policy in China, especially females. This suggests the need to make preventive health care and curative health care strategies related to middle- and old-aged women more specific and refined.

Keywords: Gender difference, Depressive symptoms, Grandchild care, Intensity, Rural China

The Difference in Preventive Care Service Utilization between Older Migrants and Non-Migrants in China

PRESENTER: **Wanyue DONG**

Objectives: With the increasing number of older migrants in China, it has become a top priority to ensure the healthy integration and equity rights of the elderly migrants. This study aims to illustrate the difference in preventive healthcare service utilization between older migrants and non-migrants using a matching method and exploring the factors affecting preventative health-seeking behaviors among the older in China.

Methods: Data were drawn from the China Migrants Dynamic Survey 2015 and China Health and Retirement Longitudinal Survey 2015, where16,993 respondents were included in the study (11,405 older migrants and 5,588 older non-migrants). The Propensity score matching method was used to analyze the difference in check-up rate between older migrants and non-migrants, Logistic regression was used to analyze factors affecting preventative health-seeking behaviors among older migrants.

Results: The check-up rate of the older migrants was 35.7%, which was significantly lower than that of 53.5% among older non-migrants after matching (t=-3.78, P<0.001). Whether being migrants, educational level, employment or not, self-rated health status, health insurance were the main factors that significantly affect the older seeking preventive health services in China.

Conclusions: Older migrants adopted negative strategies in preventive healthcare services utilization compared to non-migrants. In order to meet the physical examination needs older migrants, active strategies should be adopted.

The Economic Burden of Influenza-like Illness Among Children, Chronic Disease Patients and the Elderly in China: A National Cross-Sectional Survey

PRESENTER: **Dr. Xiaozhen Lai**, Peking University Health Science Center

Background: The disease burden of seasonal influenza is substantial in China, while influenza vaccination has not been included in China's National Immunisation Program (NIP), and there still lacks nation-wide estimates of its economic burden. This study aims to examine the influenza-like illness (ILI) prevalence, healthcare seeking behaviours, economic impact of ILI and its influencing factors among children aged 6–59 months, chronic disease patients aged 18–59 years, and the elderly aged above 60 years during the 2018–19 influenza season in China.

Methods: From August to October 2019, a total of 148 community health centres from ten provinces in China were approached to join the national on-site survey using a multistage sampling method. For children aged 6–59 months, we asked their parents or grandparents who accompanied them to health centres to finish the compulsory immunisation procedure. For chronic disease patients and the elderly, we asked them in health centres or gathered them in neighbourhood committees. The structured questionnaire recorded respondents' socio-demographics information, ILI occurrence in the past season, health care seeking behaviours after ILI, and economic burden of ILI which consisted of direct (medical or non-medical) and indirect costs. A two-part model was then adopted to predict the influencing factors of total economic burden (in log form).

Results: A total of 6668 children's caregivers, 1735 chronic disease patients, and 3849 elderly people were recruited in the survey. There were 45.73% of children, 16.77% of chronic disease patients and 12.70% of elderly people reporting ILI during the 2018–19 influenza season, and most participants chose "Outpatient service only", "OTC medication only" or "Outpatient + OTC" after ILI. The average total economic burden of ILI was about 1848 yuan (USD 266.1) for children, 1105 yuan (USD 159.1) for chronic disease patients, and 2064 yuan (USD 297.2) for the elderly. Two-part regression showed that age, gender, whether the only child in the family, region, and household income were important predictors of ILI economic burden among children, while age, region, place of residence, basic health insurance, and household income were significant predictors of ILI economic burden among chronic disease patients and the elderly.

Conclusion: Large economic burden of ILI was highlighted, especially among the elderly with less income and larger medical burden, as well as children with higher prevalence and higher self-payment ratio. It is important to adopt targeted interventions for high-risk groups, and this study can help national-level decision-making on the introduction of influenza vaccination as public health project.

What Are the Reasons for High Cesarean Section Rates in Switzerland? A Longitudinal Analysis from 2010 to 2018

PRESENTER: **Anja Yvonne Bischof**, University of St. Gallen
AUTHOR: Alexander Geissler

Background: Due to the condition of the mother or position of the child, caesarian section (CS) can be unavoidable. If there is no medical indication for CS, however, expectant women tend to overestimate the benefits of the surgery, neglect the potential harm and decide for an elective CS. Health professionals might aggravate this tendency for economic reasons. Thus, the rate of CS is increasing globally. While the impact of factors related to the expectant mother (e.g. personal, socio-economic or psychological) and factors related to the healthcare professional (e.g. regional or economic) has only been partially investigated, an extensive, large-scale proof for well-developed obstetric care systems is lacking.

Problem Setting: As CS cause high costs and no additional benefits in countries with mature health care systems, a rising number of obstetric surgeries is problematic. The WHO suggests a CS ratio of 10-15%, whereas 32.1% of all neonatal were delivered by CS in Switzerland in 2018. Adding to higher costs of CS compared to vaginal delivery, the mother as well as the newborn carry verifiably higher risks of long-term morbidity and mortality. Against this backdrop, there is a high relevance to examine the stated triggers of CS in a well-developed country's health care setting.

Method: This study draws on Federal Statistics data including all women delivering in Swiss public or private hospitals (98.3% of all births) from 2014 to 2018. Elective CS were identified based on a holistic evaluation scheme. Independent-samples t-test measures the difference in mean values between elective CS and spontaneous vaginal deliveries. Logistic regression analysis is chosen to measure the impact of individual factors, such as age or income (personal trigger) or distance to hospital (regional trigger).

Results: Around 8% of all CS are conducted on an elective basis in Switzerland. We furthermore found that CS rates either remained at the same level or slightly decreased over the years. Although the south-western part of Switzerland experienced a marginal reduction in conducted CS, the average CS rate still exceeds 25% in the corresponding cantons. All differences in mean values derived from the t-test were on the highest significance level ($p<0.001$). The logistic regression analysis displays a positive correlation on a significant level between some selected variables and CS. Interestingly, increasing mother age enhances higher CS rates. Besides, a correlation of a higher insurance class and an increased probability of delivering by CS is detectable. On the other side, psychological triggers highly depend on the individual's attitude and personal background, which impedes the quantification of these variables.

Conclusion: Women with a certain manifestation of characteristics such as higher age, supplemental insurance or higher income tend to ask for elective CS. Having shown this impact of various triggers, it is suggested to adjust the incentive policies for health care professionals. Future research efforts should take supply- and demand-side interventions into consideration to lower the CS rate sustainably. Furthermore, the impact of midwives or gynecologists on the women's decision on the suitable mode of delivery is discussed as a promising research avenue.

Direct and Indirect Costs of Acute Diarrhea in Children Under-Five Years Old in Indonesia

PRESENTER: **Dr. Jarir At Thobari**, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada
AUTHORS: Sutarman Sutarman, Asal Wahyuni Erlin Mulyadi, Emma Watts, Natalie Carvalho, Mr. Frederic Debellut, Andrew Clark, Yati Soenarto, Julie Bines

Background

Diarrhea remains a main cause of morbidity and mortality amongst children under five years of age in low- and middle-income countries. Currently, there is little published literature on the economic impact of diarrhea on the health care system and households in Indonesia. This study aimed to estimate direct and indirect costs of acute diarrhea in children under-five years old treated in both outpatient and inpatient care settings.

Methods

Direct medical cost data, including room costs, professional fee, diagnostic cost and medication cost, were extracted retrospectively for 450 children under five years old with acute diarrhea receiving inpatient care at 12 public and private hospitals, and 8 primary health centers in two provinces, Central Java, and Yogyakarta in 2017-2019. Outpatient costs were estimated by collecting unit costs associated with standard diarrhea case management in children, across a range of facilities. A structured interview of 120 patients' parents was also conducted retrospectively to estimate direct non-medical costs, including cost for transportation, over the counter (OTC) medicine, and food supplements, as well as indirect costs of income loss due to absence from work. We did not estimate non-medical or indirect costs for outpatient clinic visits

Results

The weighted average direct medical cost per case of hospitalized and non-hospitalized diarrhea across all health facility types was US$307.80 and US$14.60, respectively. The average direct medical costs for diarrhea cases in children hospitalized in public hospital tertiary, high-secondary, low-secondary public hospital was USD $511, $396, $240, respectively, and $424 for private hospital and $70 for primary health centers. Costs for diarrhea outpatients in public hospitals, private hospitals, primary health center and private physician clinics were $27.80; $96.60, $0.80, and $27.70, respectively. The average direct non-medical household costs and indirect costs for a diarrheal admission were US$12.30, and US$89.70, respectively. Within the group of patients using the out-of-pocket method to pay for medical care services, the average total direct medical cost for a diarrheal admission in a type A public hospital constituted 79.6% (US$ 453/568.5) of an average family monthly income in this survey.

Conclusion

This study highlighted essential details on the direct and indirect costs per case of diarrheal inpatient and outpatient care. Planned economic evaluations of a rotavirus vaccination program require estimates of the costs that could be averted by preventing diarrhea episodes. The weighted average costs per episode estimated in this study will be used for cost effectiveness analyses of vaccination strategies.

Long-Term Health Effects of the Great London Smog of 1952

PRESENTER: **Nicolau Martin Bassols**, Monash University

We explore the causal effects of in-utero and early childhood exposure to the Great London Smog (1952) on health outcomes at old age. The Great London Smog (1952) was a severe air-pollution event that affected London during 5 days of December 1952. Retrospective assessment has attributed 12,000 deaths to that event. Individuals that experienced that acute pollution event in-utero or at early childhood could have suffered long lasting detrimental health effects. We use the Biobank which, for a large number of older aged individuals, collects information about their currents health and information about their birth conditions. Using a DID methodology, we show that individuals exposed in-utero to the Great London Smog (1952) were more likely to be hospitalized due to respiratory causes from 1997 to 2020 (administrative data), to report respiratory problems during their life, to currently consume drugs for the respiratory system and to present risk values in spirometry examinations. We contribute to the literature providing causal long-term effects of pollution shocks in-utero.

Environmental Regulations, Air Pollution, and Infant Mortality in India: A Reexamination

PRESENTER: **Mr. Olexiy Kyrychenko**, CERGE-EI

This paper reexamines empirical evidence on the effectiveness of environmental regulations in India from a recent study by Greenstone and Hanna (2014) – henceforth, GH. GH is an important piece of empirical evidence for this line of research. It examines the impact of environmental regulations in India on two integral dimensions of effectiveness, policy-induced changes in air pollution and associated changes in infant health. Yet, GH report that air pollution control policies in India have been effective in improving air quality but had a modest and statistically insignificant effect on infant mortality. These somewhat counterintuitive findings are likely the result of the limited availability of reliable air pollution data and the effects of critical confounders.

I show that GH's dataset constructed using readings from the spatially sparse network of public air pollution monitors suffers from potentially inaccurate measures of air pollution, high annual variability in sample size, and the absence of critical meteorological controls. Thus, GH's data could simply be insufficient for credible estimation of the relationship between air quality regulations, their effects on air pollution, and associated responses of infant mortality. Coupled with the prominence of GH's study, this conclusion motivates a reexamination of GH's findings using alternative data sources.

Using satellite-derived estimates for air quality and meteorological conditions, I test the sensitivity of GH's findings to the revised air pollution outcomes, extended number of observations, and meteorological confounders. Three findings emerge. First, air pollution outcomes constructed using GH's and satellite-derived data demonstrate opposite trends. While concentrations of air pollutants have been falling in GH, concentrations of the revised air pollution outcomes have been continuously increasing. Second, GH's findings are highly sensitive to the revised air pollution outcomes and the extended number of observations. There is little empirical support in satellite-derived data for the effectiveness of air pollution control policy found in GH to be strongly associated with air quality improvements. Third, meteorological controls matter. Additionally controlling for meteorological confounders points to somewhat less different patterns in the policies' effects on air pollution from those reported in GH. Likewise, the estimated impact on infant mortality confirms that regulation-induced improvements in air quality need not be health improving.

However, the policies' effects are much weaker than those found using GH's data, and their qualitative patterns estimated using GH's and satellite-derived data differ substantially. Further, the policies' effects estimated using satellite-derived data are not robust across various data-sample combinations and specifications. Thus, it seems equally questionable to interpret air pollution control policies in India as effective based on empirical evidence either from GH's or satellite-derived data.

This paper urges further research exploring the effectiveness of environmental regulations and the prospects for using satellite-derived estimates in a meaningful examination of this important issue. Such research would be a significant step forward for this line of analysis, particularly for developing countries where air pollution control policies are especially contentious.

Keywords: infant mortality, air pollution, environmental regulation, India.

Health-Seeking Behavior and Its Determinants Among Patients with Rare Disease in China

PRESENTER: **Dr. Jiamin Gao**, Beijing Normal University

AUTHOR: Zheng Ma

Background: Rare diseases (RDs), referring to any disease that affects a small number of people, has become an increasingly important health issue worldwide since the total population of various kinds of RDs is huge. China has approximately 10 million patients with RD. Health-seeking behaviors (HSB) are closely associated with health consequences and disease burdens, and several studies have discussed HSB under the different context of diseases. However, evidence on HSB among RD patients is still scanty, particularly in developing countries. The current study aims to examine the HSB and its determinants among patients with RDs under the theoretical framework of Andersen's health behavior models.

Methods: Data are derived from the 2016 China Sample Survey for Quality of Life among People with Rare diseases, an online self-administrated survey conducted in 2016 by the Illness Challenge Foundation (one of the largest umbrella organizations for RD patients in China) with most of the provinces in China included. Since little is known about the geographical distribution and demographic characteristics of RD patients at the time of the survey, therefore, a non-probability, convenience snowballing method was used to recruit participants. A total of 1 771 respondents from 142 kinds of RDs were included. Health-seeking behaviors were measured using two indicators including whether the RD patient access health care services while ill in the past 12 months, and preferences of healthcare facilities. The underlying determinants, being conceptualized as predisposing, enabling, and need factors, were consisted of patients' demographics, socio-economics status, social support, health insurance, medical history, self-care ability, and misdiagnosis experiences. Descriptive analysis and multivariate analysis were performed.

Results: Of the participants, 57.43% reported healthcare service utilization in the past 12 months and 74.53% preferred to choose health facilities at or above the county level as the first option when sick. 65.56% had the experience of misdiagnosis. We found that enabling factors and need factors are the most critical factors influencing the patients' HSB. RD patients who had a higher level of social support including tangible, emotional or informative support was more likely to access healthcare services or higher level of health facilities when ill. There was no evidence shown that social insurance was significantly associated with HSB among RD patients, but those who had ever received a minimum living allowance had a lower rate of health service utilization and more likely to go to the primary health care institution to seek health services. Regarding needed factors, those who were inherited-caused RD, with activities limitations, reported with multimorbidity, had a misdiagnosis experience, had a better knowledge of the RD or satisfied with last healthcare services utilization were more likely to have better HSB.

Conclusions: Our study indicated that patients with RDs who were being well social supported, less experience of misdiagnosis, better knowledge of RD, as well as satisfaction for healthcare services, were more likely to access health services when ill. Our finding highlights the importance of enabling factors in improving HSB among RD patients.

Keywords: Rare disease; Health-seeking behaviors; Determinants; LMICs.

Self-Reported Fever May be a Poor Proxy for the Prevalence of Malaria: Evidence from Nigeria and Tanzania on the Effect of Deforestation on Measured Malaria.

PRESENTER: **Omoniyi Alimi**, University of Waikato

AUTHOR: John Gibson

About 90% of the 0.5 million global annual death toll from malaria occurs in Sub-Saharan Africa, especially amongst young children. While the most popular interventions for reducing the burden of malaria include insecticide-treated nets, improved dwellings, spraying and modification of mosquito habitat (e.g. drainage), use of some of these interventions has reached a plateau in some countries. Recently, a new anti-malaria intervention of reducing deforestation is claimed to be effective. The pathways through which deforestation can increase malaria include ecological effects that increase efficiency of the mosquito vectors and socio-economic changes such as migration that expose people with little tolerance to endemic forms of malaria. It is therefore argued in some studies that reducing deforestation can reduce the prevalence of malaria, presenting a win-win for health and the environment. The evidence on the effect of deforestation on malaria comes especially from linking remote sensing data on forest change to survey reports made by mothers of whether their child had a fever. For example, one influential study from Nigeria estimated the prevalence of malaria by asking mothers whether their child had been ill with a fever during the two weeks preceding the survey.

Fever in children can have many causes other than malaria and so this proxy variable may lead to misleading relationships that divert attention from more effective anti-malaria interventions. In this study we use Demographic and Health Survey (DHS) data from Nigeria and Tanzania which has results from Rapid Diagnostic Tests (RDT) for parasite antigens in a blood drop, and tests using microscopic examination for *Plasmodium* in blood slides. We contrast the effects of local deforestation on these measured forms of malaria with the effects of deforestation on mother's report of children's fever (coming from the same DHS samples).

In contrast to some recent studies, a positive impact of deforestation on malaria prevalence is not apparent when measured malaria (using microscopy or RDT) is the outcome variable. However, effects of deforestation on fever in children are apparent. The contrast between the impact on a measured health outcome and the impact on a proxy measure (the mother's report of fever in children) suggests that caution is needed when using proxy measures of health outcomes. In terms of policy implications, despite the potential attractiveness of adding child health reasons to the list of reasons for reducing the rate of deforestation, the available evidence for these two sub-Saharan African countries does not support this intrepretation, in contrast to some recent studies.

Developing a Predictive Tool to Identify Tuberculosis Patients at Risk of Catastrophic Costs to Triage Eligibility for Social Protection Interventions in Ho Chi Minh City, Vietnam

PRESENTER: **Beatrice Wangari Kirubi Kiru**, Karolinska Institutet

AUTHORS: Rachel Forse, Andrew Codlin, Luan Vo, Thanh Nguyen, Kristi Sidney Annerstedt

Background and Objectives:

About 63% of Tuberculosis (TB) patients in Vietnam experience catastrophic costs during the course of treatment. Catastrophic costs, defined as ≥20% of annual household income spent on an episode of tuberculosis (TB), are associated with limited access to healthcare services and further impoverishment of the TB-affected households. Social protection interventions, coupled with responsive health systems, have the potential to mitigate these costs. A simple evidence-based predictive tool could be useful in identifying patients who are most at risk of incurring catastrophic

costs and higher cost burden, at the point of treatment initiation. The tool could be used to guide the prioritization and scale-up of existing social protection interventions and resources among patients with drug-sensitive TB (DS-TB).

Methods: The study used data from a prospective cohort of 98 DS-TB patients initiated on TB treatment in Ho Chi Minh City, Vietnam, and surveyed throughout six months of treatment by a longitudinal patient cost survey in 2018 and 2019. The Mc Ginn's Framework was used to guide the development of the risk scoring tool. Multivariable Poisson's regression analysis was conducted to derive a predictive model for catastrophic costs incurrence. A weighted score was assigned to the predictor variables based on coefficients and summed up to give a composite predictive score. For each value of the composite predictive score, the sensitivity, specificity, and the proportion of correctly specified participants was calculated to determine a threshold at which the households were most at risk for experiencing catastrophic costs. The risk score was then used to construct The Prospective Risk Observation Tool for Eliminating Catastrophic costs from Tuberculosis (PROTECT) Tool.

Results: Twenty two percent (22%) of participants incurred catastrophic costs. The final risk score included four predictive factors of catastrophic costs, including: positive HIV status, pre-treatment hospitalisation, ≥8 weeks interval between onset of symptoms and initiation of treatment and low household income before TB. The area under the curve (AUC) for the predictive ability of the model was 0.79 (95%CI 0.66-0.92). Internal cross-validation using different tests showed a similar predictive ability of 0.78.

Conclusion: The PROTECT Tool identifies patients who are at risk of incurring catastrophic costs at initiation on TB treatment, stratifies them, and links them to differentiated social protection interventions. Targeting DS-TB patients at highest risk of catastrophic costs for mitigative interventions could guide the scale-up of social protection interventions for TB patients.

Financial Hardship Amongst Tuberculosis Patients in India One Year after Treatment Completion

PRESENTER: **Susmita Chatterjee**, George Institute for Global Health

AUTHORS: Palash Das, Kuldeep Singh Sachdeva, Raghuram Rao, Anna Vassall

India accounts for a quarter of the global tuberculosis burden with an estimated incidence of 2.69 million in 2018. Government of India provides free tuberculosis treatment to all patients registered in an online case notification portal. Studies indicated high cost associated with tuberculosis diagnosis and treatment in India, however, there are no data on economic condition of tuberculosis patients after they complete their treatment. We examined post treatment financial hardship of 365 tuberculosis patients from general population, slum dwellers and tea garden workers/residents as part of an ongoing study.

Financial hardship was examined by comparing pre-treatment and current income of the tuberculosis patients, by estimating treatment costs (if any), and through coping strategies. Costs of treatment for relapse cases, post treatment sequalae were estimated following World Health Organization's guide for calculating tuberculosis patient costs. Both direct and indirect costs were calculated and were presented in 2019 US$.

At around 1-year post treatment follow-up, 14 (4%) had tuberculosis again, with highest cases found among tea garden workers/residents. 63 patients (17%) sought treatment either because of relapse cases or for post treatment sequalae and average treatment cost was estimated US$124 (SD 355), with highest treatment burden was on general population US$186 (SD 548). Of 365 interviewed, 92 (25%) who were at job before tuberculosis treatment could not enter job market after completing their treatment, with highest proportion of jobless was among tea garden workers/residents (31%) followed by slum dwellers and general population (22% each). Total income loss for 92 patients for being jobless in post treatment period was US$48,726. Highest loss was among tea garden workers/residents, US$18,562. A proportion of tuberculosis patients had to borrow and/or sold or mortgaged any property to run the family or for other reasons even after treatment completion. 101 (28%) borrowed from different sources and average amount of borrowing was US$168 (SD 297) with highest burden on general population US$207 (SD 354). About 36% had outstanding loan at the time of interview and average outstanding amount was US$203 (SD 275). 10% had to sale or mortgage their properties during post treatment period and average amount received from sale/mortgage was US$112 (SD 115).

To the best of the authors' knowledge, this is the first study that reported post treatment financial hardship of tuberculosis patients in India. It is evident that the financial hardship continues even after treatment completion. Tea garden workers/residents are the worst affected group, both in terms of disease re-occurrence, and income loss. Several studies have noted poor health, socio-economic and work conditions for this group. Our study results confirmed the added burden of tuberculosis among them. More concerted effort is required to reduce the economic burden during treatment phase so that the financial hardship does not spill over in the post treatment period. As loss of job because of tuberculosis appears as the major determinant of financial hardship, ensuring job security of the tuberculosis patients needs consideration.

6:00 AM –7:15 AM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Health Beyond Health Care Services: Non-Medical Production of Health Poster Session 1

MODERATOR: **Nhung Nghiem**, University of Otago

Market Dynamics and Improving Prescription Behavior in Rural China

PRESENTER: **Yon Fleerackers**, Erasmus University Rotterdam

AUTHORS: Yufeng Sun, Wei Han, Carlos Avila, Yan Xu, Maarten Postma

Background: With a health care system that provides strong incentives for over-prescribing, many places in China remain above the WHO/INRUD maximum benchmarks of 30% of prescriptions involving an antibiotic, and of 10% of prescriptions requiring parenteral administration.

Methods: To evaluate the influence of factors that determine these two prescription behaviors, data of 2,788 out-patient encounters (collected from review of records), were analyzed. These visits occurred in 58 village health stations of northwestern China (mean monthly visit output: 890 per clinic). Both clinics and visits were sampled randomly in 2 counties, with visits using a quota method (consecutively sampled from start date). Two-third of clinics sampled were staffed by only one prescriber. Information on characteristics of the prescriber and the clinic, collected through a facility survey, was merged with this dataset.

For each prescription behavior a binary logistic regression was used, to analyze the factors of influence (dependent variables: antibiotic prescribed (1/0), parental drug prescribed (1/0)). Factors evaluated included demographics (age group, gender) of patient, diagnosis of influenza, level of education of prescriber, his/her work as "barefoot doctor", clinic staffing, clinic density, and health care expenditure per capita.

Results: Antibiotics were prescribed in 36% of clinic visits, and injections or infusions were prescribed in 12%. On average 8.7 Chinese Yuan (CNY) was paid per encounter out-of-pocket for medication.

For age of patient (coeff: 0.88, se: 0.16 / coeff: 1.06, se: 0.20), level of education of prescriber, and for health care expenditure per capita (coeff: 0.30, se: 0.04 / coeff: 0.21, se: 0.05) a statistically significant relationship was found in both models ($p<0.001$). As the per capita out-of-pocket spending on health increases by 5 CNY in villages, its lower educated physicians are likely to prescribe more antibiotics (estimated increase: + 18 percentage points), and its higher educated physicians are likely to prescribe less (estimated decrease: - 10). With the same 5 CNY increase of spending, we estimated far less decrease in the predicted probability of an injection or infusion being prescribed (when physician is either lower or higher educated: - 1 or - 2).

Further, with higher clinic density in a village and higher staffing of a clinic (2 doctors vs. 1), we observe higher rates of injection or infusion. However, in solo practice clinics (vs. duo) we observe higher rate of antibiotics.

Conclusion: Factors of every level were identified as dominant predictors of the two prescription practices: at patient level (age group), at provider level (education level), and at clinic level (group vs. solo practice).

The associations found in this study hint towards the usefulness of investments in the development of capacities of the health work force for the reduction of sub-optimal prescribing patterns in rural areas. The gain expected from a policy which prioritizes such investment in villages with higher levels of health care expenditure, can be measured with respect to its effect on the rate of antibiotics being prescribed, while taking market conditions (i.e. monthly visit output, clinic density and staffing) into account.

Alternative estimation strategies will be reviewed.

Does Perceptions of Healthcare Cost and Quality Affect Outpatients' Choice of Public Hospitals? Evidence from Ningxia Hui Autonomous Region in Rural China

PRESENTER: **Shuying Yin**, School of Public Health, Fudan University
AUTHORS: Min Hu, Wen Chen

Introduction

Policy makers have increasingly focused on allowing consumer choice in modern reform models. Recent reforms in China have aimed to encourage competition among public hospitals on the price and quality front, so as to improve the patient-provider match and promote the "graded diagnosis and treatment" system. A prerequisite for such reforms is that the choice of provider is influenced by the patients' perception of the cost or the quality of healthcare. This study tests whether this condition is satisfied in an outpatient setting in rural China, by estimating the effect of outpatients' perceived cost and perceived quality on the choice of provider among public health facilities.

Data & Methods

We conducted household surveys in 2012 and 2015 at Ningxia Hui Autonomous Region, China. The respondents who sought outpatient care at public health facilities within two weeks before the survey were selected as the study sample. The household surveys captured the family's economic level, the respondents' demographic characteristics, health status and type of diseases, health insurance, awareness of reimbursement policy, distances to the nearest health facilities, out-of-pocket payment of the latest outpatient visit, as well as the perceived quality of different tier health facilities. The mixed logit model was used to estimate the effect of perceived cost and perceived quality on outpatients' provider choice, controlling for individual- and household-level socioeconomic covariates and time fixed effect. The interactions between perceived cost and the patient characteristics, perceived quality and the patient characteristics were then respectively added to the model to capture effect heterogeneity.

Results

Among the different tiers of public hospitals, on average, the probability of outpatients seeking care at a certain tier hospital increased by 6.5% ($p<0.001$) for every unit of perceived quality improvement for that health facility. Although the regression coefficient of the perceived cost was positive (0.088), it was statistically insignificant. The heterogeneous effect results show that factors including higher (vs. lower) educational level, higher (vs. lower) family wealth index level and being married (vs. unmarried) were associated with higher sensitivity to improved perceived quality, while worse (vs. better) self-reported health status, having had (vs. not having had) surgery in the past one year were positively associated with higher sensitivity to perceived cost.

Conclusion

First, our research provides evidence that health care quality might be more important than health care cost in an outpatient choice setting for rural residents in China. The outpatients' perceived quality positively affects their choice among different tiers of public health facilities, while the perceived cost does not directly affect the provider choice. Second, there is heterogeneity in both the influence of perceived cost and perceived quality on outpatients' choice of provider. Overall, the results suggest that the outpatients with better socioeconomic status (SES) are more likely to react to better health care quality when choosing a public health facility, and the results also verify a positive relationship between high health needs and high health care costs.

Patterns of Health Care Utilization and Referrals Amongst HIV Patients in Indonesia: Cross-Sectional Analysis of National Health Insurance Claims Data

PRESENTER: **Ery Setiawan**, Center for Health Economics and Policy, School of Public Health Universitas Indonesia
AUTHORS: Nurjannah Sulaiman, Prih Sarnianto, Ryan Rachmad Nugraha

Introduction As of December 2019, approximately 640,443 people in Indonesia were living with HIV, but only 57% knew their status, only 127,613 (19%) were on treatment, and only 10,009 viral load (VL) tests were performed. Indonesia seeks to scale-up its HIV response and replace declining donor funding through better coverage of HIV/AIDS services by its National Health Insurance Scheme (JKN). This study analyzed current patterns of service use, referral, and costs of HIV care under JKN to identify opportunities to improve coverage.

Method We analyzed JKN claims data from 2015-2016 drawn from a 1% sample that JKN makes public each year. Using ICD10 codes (B20, B21, B22, B23, and B24), we identified [xx] HIV patients and analyzed [xx] claims for HIV/AIDS services at the primary care and hospital levels. For each level, we analyzed patterns of service utilization by patient health status, discharge status, severity level, and total cost per claim.

Results All patients in the sample have HIV. Only 45% of the patients in the sample are receiving ART through JKN, 10% at the primary care level and 35% at hospitals. Most HIV patients (79%) who first seek care at the primary care level are referred to hospital. The referral rate from public primary care facilities was slightly higher (81%) than private providers (77%). The most common referral destination was higher level hospitals: Class B 36%, and Class A 27%, followed by the lowest Class C at 19%. Because JKN pays hospitals for each inpatient case, we were able to estimate the cost of hospital care. Extrapolating the sample of hospital cases to the national level using the available weight score, we estimate that JKN paid USD 27 million a year for HIV hospital services. The cost of primary care cannot directly be estimated because JKN pays a fixed amount per person (capitation).

Discussion PLHIV who are covered by JKN National Health Insurance scheme do not take full advantage of its benefits to receive ART. A high percentage of patients are referred to hospitals and mostly higher-class hospitals, which is more expensive than managing patients at the primary care level. This indicates a possible inefficiency and opportunity to explore more cost-effective service delivery. The higher utilization rate at hospital level may be driven by the capitation payment system which might incentivize primary care providers to refer higher cost patients. Also, HIV is a communicable disease so regulations requiring hospitals to refer patients back to the primary care level do not apply.

Keywords HIV, JKN, Financing

The Effect of Community Screening on Stroke Patients——Onset Prognosis Conditions and Health Outcomes

PRESENTER: **Yuqian Chen**, Shanghai health development and research center
AUTHOR: Fen Li

Background and purpose Stroke community screening (CS) has been well established as a major approach to prevent stroke. However, there is little research to explore its further externality effect on the patients who have been suffered stroke. We sought to indicate CS's impact on stroke patients, including attack and prognosis conditions, and the final health outcomes.

Methods A population-based longitudinal study was conducted in J district, Shanghai, China. 1344 stroke patients were selected from J district, with 1446 hospitalizations in the stroke unit, from January 2016 to December 2019. Data were analyzed by T-test, Logistic regression, propensity score matching, and survival analysis to identify the effect of CS on stroke patients' attack conditions, prognosis conditions, and survival lifetime. Personal characteristics and other stroke risk factors are controlled as control variables.

Results Of 1446 stroke hospitalization, 36.38% were female. The median hospitalization age is 73 (65,82) years old. Except for three hospitalizations with no specific records, other hospitalizations took a median 315(95,1480) minutes to be admitted to the hospital after onset. CS

strongly associated with the higher stroke attack age (coefficient 3.99 ; 95% CI, 2.05–5.93; P=0.000) . Female (coefficient 2.01 ; 95% CI, 0.85–3.36; P=0.002) , current smoking (coefficient -6.27 ; 95% CI, -7.95–-4.60; P=0.000) , hypertension (coefficient 2.35 ; 95% CI, 1.00–3.70; P=0.001) , diabetes (coefficient -4.19 ; 95% CI, -5.41–-2.98; P=0.000) and overweight (coefficient -3.07 ; 95% CI, -4.25–-1.89; P=0.000) are strongly related to stroke onset age. Similarly, it suggested that CS might reduce the stroke admission condition (coefficient -1.60 ; 95% CI, -2.72–-0.47; P=0.005).

Conclusion CS might postpone the stroke onset age and reduce the attack condition. However, after hospitalization, the effect gap could be made up by the standard medical treatment. It seems, in the long-term, people with SCS experience might have a lower living risk. Nonetheless, we need more comprehensive longitudinal data to support the conjecture.

Keywords: stroke; China, stroke community screening, prevention externality

A Cluster Analysis of Asthma and Asthma-Related Comorbidities and the Associations between Maternal Health Status during Pregnancy and the Cluster Memberships of Australian Children

PRESENTER: **Mr. Kabir Ahmad**, University of Southern Queensland

Objective: To identify the clusters of asthma and related comorbidity of Australian children aged 12/13, to determine the differences in each cluster according to specific health outcomes of the children, and finally to investigate the associations between maternal health status during pregnancy and cluster memberships of the children.

Methods: The study participants were the children of the birth cohort of Longitudinal Study of Australian Children (LSAC) who participated in both the Health CheckPoint survey and the 7th Wave of LSAC. Latent class analysis (LCA) was conducted to identify clusters based on the criteria of children afflicted with nine diseases, including asthma and related comorbidities. We used (1) pediatric quality of life (PedsQL), (2) general wellbeing and (3) four spirometry measures (the tests of lung function) to determine differences in health outcomes across the clusters. Multinomial logistic regression analysis was used to investigate the associations of the maternal health conditions and health-related risk factors towards the cluster memberships.

Results: The study applied Latent Class Analysis on 1777 children and identifeid four clusters as an optimal solution based on the prevalence of asthma and related comorbidities – O*verall healthy* cluster (71.6%), *non-asthmatic/allergic* cluster (10.4), *early-onset-asthmatic/allergic* cluster (4.5%), and *asthmatic unhealthy* cluster (13.5%). The children of the *asthmatic unhealthy* cluster experienced the worst health status compared to the children of the healthy cluster in relation to PedsQL, general well-being and spirometry. This study also revealed the concordance of parent-child asthma, as children from mothers having asthma during pregnancy were 2.27 times (OR 2.27, 95% CI: 1.26-4.09) more likely to be in the *asthmatic unhealthy* cluster.

Conclusion: The findings confirm that identifying and targeting the vulnerable groups with these specific criteria of asthma comorbidities would be useful to devise cluster-specific strategies to address the health issues and improve young children's health across Australia.

Keywords: Latent Class Analysis, Cluster Analysis, Asthma and related comorbidities, Pediatric Quality of Life, General Well-being, Spirometry.

Does the Conditional Maternal Benefit Programme Improve Infant Mortality in India?

PRESENTER: **Toshiaki Aizawa**, Waseda University

India, which has the largest number of infant deaths in the world, introduced a conditional maternity benefit programme in 2011, *Indira Gandhi Matriya Sahayog Yojana* (IGMSY). IGMSY provides cash directly to women during the late pregnancy and post-delivery with some conditions related to maternal and child healthcare use. IGMSY aims to partially compensate for wage loss resulted from maternal leaves prior to and after delivery of the child. IGMSY can be thought of as a conditional cash transfer with much narrower aims, focusing exclusively on maternal and child health. In contrast to most of the conditional cash transfers in the world, the IGMSY scheme is universal in the sense that women aged 19 and more are eligible for the cash transfer for their first two live births.

To date, little is known as to whether and how much IGMSY improved the infant mortality, albeit understanding the effect on infant mortality is crucial in the design of the maternity benefit programme. Examining the effect on infant mortality would be an important undertaking to accomplish the United Nations Sustainable Development Goals, especially the third goal: "Ensure healthy lives and promote well-being for all at all ages".

This study estimates the impact of IGMSY on infant mortality through a duration model. In contrast to the dichotomous outcome model, such as the logistic regression to estimate the probability of being dead/alive, the duration model allows us to accommodate right-censored data and truncated data. Moreover, the duration analysis is advantageous in that it takes account of the heterogeneous risk factors at different developmental stages that the binary response model cannot fully capture, thus shedding more light on the complexity of the programme's impact on the trajectory of child survival.

This study estimates its impact on the infant mortality for the first 12 months after birth, exploiting the pilot phase of IGMSY as a natural experiment in which 52 national representative districts were randomly chosen as pilot districts. In the matched-pair difference-in-differences framework, the treatment effect on survival rate is estimated through the fully-data driven random survival forest algorithms. In essence, we identify the treatment effects of the programme based on a comparison of survival rates across eligible and ineligible cohorts in treatment and control districts. The random survival forest elucidates the changes in period-specific heterogeneity of impact on child survival probability.

We find that IGMSY improved the child mortality rate. Approximately 1.7 deaths per 1,000 living infants reduced in their first year thanks to the IGMSY scheme. We also find boys and infants in rural areas consistently enjoy larger improvement. compared with girls and infants in urban areas. Infants with educated mothers and those who do not belong to socially disadvantaged groups indicate larger effects up to the first 10 months, but after the 10 months, infants with less educated mothers and those in socially disadvantaged groups begin to show as large improvement as infants with educated mothers and those belong to non-disadvantaged groups. Overall, we find ensuring evidence that IGMSY improved the infant mortality.

Dental Health and the Effects of a Sugar-Sweetened Beverages Tax on School Absenteeism

PRESENTER: **Marcin Sowa**, The University of Queensland

AUTHOR: Stephen Birch

Attempts to model the effects of sugar-sweetened beverage taxes have so far been limited to health outcomes and savings from health care avoided. Building upon recent evidence linking dental health status to educational outcomes, we extend the analysis to investigate productivity (defined as school attendance) consequences of a tax across social groups.

We develop a policy decision-analytic model that reflects the causal mechanisms linking sugar consumption to educational outcomes. The model population is primary (age 6-11) and secondary (age 12-17) school children and adolescents in Australia, described by the characteristics of baseline sugar consumption, dental health status (decayed-missing-filled teeth), price elasticity of demand for sugary drinks, and school attendance, taking into account their variations in age, gender and socio-economic groups. The model relies on the estimates of the effect size of sugar consumption on dental health, and the evidence of better dental health leading to higher school attendance. Uncertainty related to pivotal causal effects is explored in sensitivity analyses. Scenario analyses include the availability of community water fluoridation and the teenagers' demand for sugar-sweetened beverages being partly independent from their households.

Introducing a 20% sales tax would result in a 0.73% (95% CI: 0.38%; 1.10%), or 4684 (2,412; 7,071) days, reduction in dental health-related school absences in Australia. While positive impacts would be seen in all age, gender and socio-economic groups, the distribution of benefit would be favourable toward boys (63.0% of the total benefit), teenagers (68.4% of the benefit occurring in groups age 12+), and individuals of lower socio-economic status (28.9% of all absences averted are in the bottom quintile, compared to 9.6% in the top quintile.)

Despite modest total impact, the potential for reductions in school absenteeism, the equity profile of the intervention, and the life-long benefits of educational gains, represent attractive outcomes for policy-makers to consider alongside previously documented benefits of curbing sugar consumption.

Comparing Household Expenditure of Smokers and Quitters across Socioeconomic Groups: Results from the Australian Hilda Survey.

PRESENTER: **Anita Lal**, Deakin Health Economics
AUTHORS: Mohammdreza Mohebi, Sarah White, Nikki McCaffrey

Background

Approximately 11% of adults in Australia smoke tobacco daily. However, these rates differ markedly by socioeconomic position (SEP) group. Of daily smokers, 34% are in the lowest socioeconomic group, compared to 9% in the highest. There are also disparities in the number of cigarettes smoked daily by SEP, with the most disadvantaged group smoking on average around 40 more cigarettes per week. Spending on tobacco products, particularly by disadvantaged individuals and households, can negatively affect expenditure on other goods and services. This study aims to compare the household expenditure of smokers and quitters across socioeconomic groups.

Methods

Daily smokers and quitters were compared using the Household, Income and Labour Dynamics in Australia (HILDA) Survey, over the period 2012 to 2018. Regression models using the Generalized estimating equation (GEE) technique were used to aggregate data across the survey waves while accounting for within-participant autocorrelation. Socioeconomic Index for Areas (SEIFA) deciles of relative socio-economic advantage/disadvantage and the Index of Education and Occupation (IEO) were investigated in separate GEE models to avoid autocorrelation. All models were adjusted for age, gender, and remoteness scale. The expenditure variables investigated were groceries, alcohol, meals eaten out, clothing, public transport, utilities and rent.

Results

In the lower SEIFA (more disadvantaged) and IEO deciles, quitters had significantly less spending on alcohol and higher spending on meals eaten out. In the higher SEIFA and IEO groups, quitters had significantly more spending on groceries and public transport. Apart from the very lowest SEIFA and IEO groups, spending on education was significantly higher amongst quitters.

Conclusion

The most robust association between quitters and spending across all groups was the significantly lower spending on alcohol. Tobacco use has been strongly linked with other health-related behaviours, including alcohol and food intake. The decrease in alcohol expenditure occurred across socioeconomic groups, suggesting it was not due to a sudden change in financial circumstances. Quitters from the lowest SEP groups spending more on meals out may be the result of an increase in discretionary income. Expenditure on food at home was not collected as part of the HILDA survey so the extent to which overall food expenditure changed is not known. The finding of more spending on education by quitters than smokers may indicate a time preference difference, whereby quitters may be less present oriented and more able to envisage medium to longer term consequences. The expenditure shifts from tobacco and alcohol to spending in other areas indicate some of the societal financial benefits of smoking cessation.

The Impact of Bushfires on Domestic Violence: Evidence from over 100 Fires

PRESENTER: **Sonja de New**, Monash University
AUTHORS: Rachel Knott, Karinna Saxby

With one in three women experiencing intimate physical or sexual violence by an intimate partner in their lifetime (World Health Organization 2017), intimate partner violence (IPV) is a major public health issue and a major priority area for governments worldwide. However, despite many countries having passed laws on domestic violence, IPV rates continue to increase in many countries (United Nations 2020). There is therefore a vital need to disentangle the factors which contribute to and moderate IPV, in particular among vulnerable groups.

While the causes of IPV are complex and multifaceted, recent reports from agencies involved in relief work point to significant links between experiencing major stressful emergency situations, including natural disasters, and IPV. However due to data availability, only few studies exist that show such links empirically.

Addressing this evidence gap, we investigate the impacts of wildfires on IPV. In recent years, many countries have been affected by wildfires, including those where wildfires were previously rare, and the economic and environmental impacts have been shown to be substantial. One of the most affected countries is Australia, where bushfires are a regular occurrence. For example, the most recent fires in the summer of 2019/20 destroyed 19 million hectares of land, over 3,000 houses and killed 33 people (Filkov et al 2020). With more frequent and severe natural disasters expected through anthropogenic climate change, Australians will need to more frequently cope with such stressors (Masson-Delmotte, et al. 2018).

Because Australia has a long history of severe and frequent bushfires incidents, it allows us to create a longitudinal dataset of bushfires at the postcode level between 2004 and 2019. We link this data with police reports of IPV for the most populous state in Australia, and one of the most impacted ones by bushfires, New South Wales. We exploit regional variation in exposure to natural disasters to estimate whether natural disasters affect police reported rates of IPV. In order to provide causal estimates, we estimate a difference-in-differences-style model that compares the development of IPV rates in regions that experienced major stressful events to the development of rates in regions close by that did not experience these events. Using Census-linked-administrative data, we also explore how the IPV rates associated with bushfires vary over time as well as across key regional characteristics including rurality, socioeconomic disadvantage and availability of support services. Understanding the significance, magnitude, persistence as well as moderators of these effects provides a strong evidence-base to support policy makers and services to provide appropriate, timely and targeted support to bushfire affected communities.

Our preliminary results show that regions affected by bushfires experience, on average, a 16% increase in police-reported cases of IPV. While the largest increase in IPV rates occurs in the first year after the bushfire, these effects persist for up to 4 years after the event. Altogether, our results suggest that disaster response strategies should consider the long-standing effects of natural disasters on IPV and provide targeted support services to women and families beyond the immediate aftermath of disaster.

What Explains Inequalities in Intrinsic Capacity? A Life-Course Decomposition Analysis

PRESENTER: **Yafei Si**, UNSW Sydney
AUTHOR: Katja Hanewald

Ageing commences in young adulthood and results from the cumulative effect of health inequalities over time. Growing research has recently identified the subtle changes in the ageing process during the first half of the life course and before the onset of age-related diseases. Also, there is less agreement on how the different areas of functioning (e.g., physical, psychological), in combination, reflect the overall health status of older individuals. This study aims to quantify socioeconomic inequality in a new validated measure, Intrinsic Capacity (IC), which was proposed by the WHO, using life-course decomposition analysis.

We used longitudinal data from the China Health and Retirement Longitudinal Study (CHARLS) 2011-2013 waves and the CHARLS life course survey in 2014. We used the validated IC, with one general factor and five subfactors, locomotor, cognition, vitality, sensory, and psychological. We used the modified concentration index to quantify the inequality in the IC. We used Ordinary Least Square (OLS) regression to decompose inequality in IC into contributions from different variables. We included a rich set of variables based on need factors (gender, age), non-need factors (economic status, education, and comorbidity), and childhood factors (war, regional and urban/rural status at birth, family socioeconomic status, parents' health status and health behaviors, health and nutritional status, relationship with parents, friendship, and access to health care), to investigate their influence on inequalities in the IC. Our study sample includes 2,191 participants.

The modified concentration index was 0.015 for IC, -0.002 for locomotor, 0.034 for cognition, -0.002 for vitality, 0.008 for sensory, and -0.012 for psychological. There were significant pro-rich inequalities in the IC. However, the inequalities varied substantially across the subfactors, pro-rich in cognition and sensory but pro-poor in locomotor, vitality, and psychological. Overall, the life-course factors explained 10.44% of income-related inequalities in the IC, 34.80% in locomotor, 9.45% in cognition, 36.63% in vitality, 24.06% in sensory, and 5.90% in psychological separately.

The pro-rich inequality in IC was mainly driven by the inequalities in the cognition subfactor. A large share of the inequality in the IC was explained by the life-course factors. The locomotor, vitality, and sensory subfactors were more sensitive to long-term effects from life-course factors than cognition and psychological, suggesting that the inequalities in locomotor, vitality, and sensory results from accumulations of health inequities since childhood. In contrast, cognition and psychological inequities depend more on late-life socioeconomic factors.

The Cost of Health Inequality and the Value of Disease Eradication: An Application to the Double Burden of Disease in Sub-Saharan Africa

PRESENTER: **Raf Van Gestel**, Erasmus University Rotterdam
AUTHORS: Shaun Da Costa, Owen O'Donnell

We propose two measures of population health that, like health adjusted life expectancy (HALE), can be calculated from a health-extended period life table. Unlike HALE, both measures are sensitive to inequality in health adjusted lifespans and in health at each age. The first measure – equivalent health adjusted lifespan (EHAL) – is a generalisation of HALE (and life expectancy). The second measure is the willingness to pay of a risk averse representative agent behind the veil of ignorance for change in lifespan and age-specific health distributions. We use these measures and data from the Global Burden of Disease to evaluate trends in population health in Sub-Saharan Africa (SSA) between 1990 and 2017 and to consider prioritization of diseases. Allowing for aversion to inequality in health at each age has relatively little impact on HALE. But incorporating sensitivity to inequality in health distribution adjusted lifespan has a large impact. While HALE increased by around 20% over the period, EHAL increased by 30%. Allowing for distributional sensitivity substantially increases the value attached to the elimination of communicable diseases (CDs), while it reduces the welfare gain from the elimination of noncommunicable diseases (NCDs). The convergence in the burdens of CDs and NCDs in SSA that has previously been observed is greatly reduced using distributionally sensitive valuation of their respective impacts on population health.

6:00 AM –7:15 AM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Social Determinants of Health and Family Economics Poster Session 1

MODERATOR: **Gang Chen**, Monash University Centre for Health Economics

Evolution of Health Inequalities between Privileged and General Populations: The Comparative Life Expectancies of 57,561 Politicians with 2.6 Million Years of Follow-up

PRESENTER: **Dr. An Tran-Duy**, The University of Melbourne
AUTHORS: Adrian Barnett, Jay A Stiles, Laurence Roope, Philip Clarke

Background

Despite the overall trend of mortality decline as a result of continuous improvements in living standards and healthcare, a few observational studies have shown that, in some developed countries, survival inequalities in adults between socioeconomic groups have increased over the last few decades. However, these studies focused on only a limited number of countries and used data with relatively short follow-up times. Evidence on the evolution of income-related health inequalities over long periods of times is scarce. We aimed to compare life expectancy (LE) between politicians and the populations they represented over the past centuries. We selected politicians as the subjects in our study as they generally earn a high income, and their historical biographical records are regularly maintained in many countries.

Methods

We collated data from countries that have good information on gender, dates of birth and death, and dates that the politicians attained office. To increase data validity, we extensively checked these dates against other sources such as Wikidata and Wikipedia. For LEs of the general populations, we used life tables from both the Human Mortality Database (HMB) and the Human Life Table (HLT) Database. We fitted Gompertz parametric proportional hazards models to politician data within consecutive 10-year time windows and used these models to estimate the remaining LE of a politician aged 45 years (mean age of attaining office) within each time window. We used proportions of male and female politicians within 10-year time windows as weights to calculate the pooled LEs of the corresponding general populations for the comparisons. We used the bootstrap method to estimate 95% CIs of the LEs of the politicians.

Results

Our analysis included 57,561 politicians from eleven countries (Australia, Austria, Canada, France, Germany, Italy, the Netherlands, New Zealand, Switzerland, the UK, and the US) with a combined 2.6 million years of follow-up (mean: 46 years per politician) and 40,637 deaths. The remaining LEs of both politicians and the general population have increased steadily over time since the early 20th century. In the last decade, LEs of politicians were similar between countries, ranging from 39.9 (95% CI, 39.1-40.7) years in Germany to 43.5 (95% CI, 42.9-44.1) years in Italy. The differences in LEs between politicians and the general population were consistent across all countries. These gaps increased during the second half of the 20th century, with the maximum gap ranging from 4.4 (95% CI, 3.5-5.4) years in the Netherlands to 7.8 (95% CI, 7.2-8.4) years in the US. In most countries, the minimum LE gaps occurred in either the 19th or early 20th century. In Canada, the Netherlands and the US, there were periods where politicians had smaller LEs compared to the general population.

Conclusions

Over the last century, politicians have enjoyed a survival advantage over the populations they represented, and the LE gaps were remarkably consistent across many countries. We hypothesized that income and education gaps have been significant factors contributing to the long-run inequalities in LEs between politicians and the general populations.

The Correlation between Deprivation and Health: Evidence from a National Survey in Japan

PRESENTER: **Yui Ohtsu**, Saitama University
AUTHOR: Kuriko Watanabe

In this study, we aimed to examine the correlation between deprivation and health in Japan. Deprivation, which is the key non-monetary indicator of poverty, has been developed to complement monetary indicators such as income. Although poverty, which is one of the most important determinants of health, is frequently measured by income, it is only an indirect indicator of living standards and should be complemented by deprivation, which is defined as an enforced lack of necessities.

To analyze the correlation between deprivation and health, we utilized microdata from the "National Survey on Social Security and People's Life," conducted by the Japanese National Institute of Population and Social Security Research in 2017. We regressed three indicators of health: self-rated health (SRH), instrumental activities of daily living (IADL), and a 6-item version of the Kessler Psychological Distress Scale (K6). The main independent variables were deprivation status and income poverty, while the control variables were age, gender, marital status, education level, and employment status.

The main finding of this study was that deprivation was significantly associated with a decline in health status after adjusting for income poverty. It was estimated that being deprived increased the probability of poor SRH by 2.2 times, the probability of poor IADL by 1.9 times, and the

probability of depression (K6≧13) by 2.7 times. On the other hand, income poverty had little effect on health status after adjustment. It was estimated that income poverty did not significantly increase the probability of poor SHR, poor IADL, or depression.

These results suggest that deprivation has a stronger negative impact on health than income. When considering the relationship between poverty and health, measuring poverty by only income may underestimate the effect of poverty on health.

Gender Differences in Trajectories of Self-Rated Health Among Chinese Older Adults:Evidence from the Chinese Longitudinal Healthy Longevity Survey

PRESENTER: **Dr. Chun Chen**, Wenzhou Medical University
AUTHOR: Shichen Cui

Self-rated health (SRH) is a good predictor of morbidity and mortality. Extensive research has shown that females have worse SRH than males but still tend to live longer. Previous studies used cross-sectional or pooled data for their analyses while ignoring the dynamic changes in males' and females' SRH statuses over time. Furthermore, longitudinal studies, especially those that focused on older adults, typically suffer from the incompleteness of data. The effect of dropout data on the trajectories of SRH is unknown. This research examines gender differences in trajectories of SRH statuses in Chinese older adults under non-ignorable dropout data assumptions. The trajectories of SRH were estimated using the latent growth model. We analyzed the Chinese Longitudinal Healthy Longevity Survey data of 15,613 older adults aged 65 years and over, collected from 2005 to 2014. We found that gender did not predict the change of intercept, slope, and quadratic trajectories of SRH among Chinese Older Adults. The results revealed that the previous wave's SRH score was associated with the likelihood of dropping out of the study at the next follow-up survey. Our results suggest that, under non-ignorable dropout data assumptions, no gender differences were found in trajectories of SRH among Chinese older adults.

The Impact of Spousal Chronic Health Shock on Subjective Well-Being Among Elderly in China: An Urban-Rural Dimension

PRESENTER: **Ms. Dan Cao**, Xi'an Jiaotong University
AUTHORS: Zhongliang Zhou, Dr. Dantong Zhao, Bo Li

Backgrounds

Chronic conditions bring not only heavy economic burden on families, but also had negative emotional and mental impacts to patients and their family members. The aim of this study is to explore the effect of chronic health shock of elderly people on spousal subjective well-being in China from urban-rural dimension.

Methods

We used two most recent databases —2011 and 2015—of China Health and Nutrition Survey, and the total sample were categorized into urban sample and rural sample. Participants were defined as treatment group if his/her spouse was diagnosed with chronic disease in 2015 and not diagnosed in 2011; others were defined as control group. Propensity score matching was used to evaluate the average treatment effect of treated(ATT)of spousal chronic health shock. Ordinary linear square(OLS) regression was also deployed to explore the relationship between spousal chronic health shock and subjective well-being.

Results

The total sample size was 2577, with 1023 in urban area and 1554 in rural area. ATT has been calculated by nearest neighbor matching without caliper (K=4), nearest neighbor matching with caliper (K=4 and caliper is set at 0.01), radius matching with caliper (caliper is set at 0.01), kernel matching, and spline matching. For urban area, the effect of spousal chronic health shock on SWB of elderly is statistically significant by all matching methods. Apparently, for urban area, the results of PSM confirm our expectation that spousal chronic health shock has a negative effect on SWB of elderly. However, for the rural area, the effect was not statistically significant. The results of OLS regression after PSM also suggested that spousal chronic health shock had a negative effect on subjective well-being of urban elderly, and for rural elderly, there was no such an effect.

Conclusions

Our study found that spousal chronic health shock would have a significant negative effect on elderly's subjective wellbeing in urban China. We can explain this relationship in three ways. First, the onset of chronic diseases has brought heavy economic burden to a family and SWB of elderly is relatively associated with economic level. Second, spousal suffering from chronic disease usually means elderly need to become a caregiver and this will bring living burden to him/her. Third, for urban elderly couples with closer marital relationship, if one partner suffers from chronic illness, the other may be lonely and lack of emotional support. In rural China, there was no effect has been found between spousal chronic health shock and elderly's SWB. It is understandable because rural residents have lower educational level and thus they are less sensitive to subjective well-being. Furthermore, rural elderly usually have more ways to participate in labor activities and more family members and friends, which could compensate SWB reduction caused by spousal chronic health shock. This study firstly evaluated the effect of spousal chronic health shock of SWB of elderly from rural and urban dimensions in China. Our results suggest that more attention need to be payed to the elderly whose spouse are suffering from chronic illness, especially in urban area.

Social Network Types and the Urban-Rural Health Disparity Among the Elderly in China: Evidence from China Health and Retirement Longitudinal Study

PRESENTER: **Yue Wu**
AUTHOR: Jianmin Gao

Background: In rural China, the population is 55.62 million and the ageing rate is 22.3% which is much higher than that in urban. However, compared with the urban area, there are congenital deficiencies in rural elderly care services such as healthcare services. Social network types have been proved to have significant impacts on the older population's health and the urban-rural health disparity has been widely observed. However, it is still unclear how much the social network types contribute to the urban-rural health disparity among the elderly in China. This study addresses these gaps by identifying the social network types and measuring its contribution to the elderly health disparity between rural and urban.

Method： 8,664 participants (rural=5,345; urban=3,319) aged 60 years old and over from the China Health and Retirement Longitudinal Survey conducted in 2015 were analyzed. Health was examined by the scale of epidemiological studies of depression（CESD）and instrumental activities of daily living（IADL. Five network types were constructed using the K-means clustering method (i.e., diverse, friend, children, couple and restricted). Oaxaca–Blinder decomposition analysis was used to evaluate the contribution of social network types to the urban-rural health disparity. The sociodemographic covariates are age, gender, non-communication disease status, self-rated health, education, income, work status, housing condition, community condition and the areas.

Results: A diverse network type yielded the most beneficial health outcomes as measured by CESD score and IADL score, and the friend-focused network type is more beneficial than the couple-focused and children-focused type, while the restricted network type is the worst one. The elderly in an urban area has more beneficial types and less unbeneficial types than the elderly in a rural area. We found that the network types have significant impacts on the physical (P-value<0.05) and mental health (P-value<0.05) disparity between the elderly in rural and urban areas.

Conclusion: Though social support from informal social relations is an important part of the support system for the elderly in China, most Chinese elderly are still under a simple support condition such as children-focused condition. The understanding of the association between social network types and the urban-rural health disparity could encourage programs designed to focus on improving and bridging the social capital of older adults in unbeneficial network types in a rural area so that they can enhance healthy ageing equably.

Keywords: Social network types; K-means clustering; urban-rural older population's health disparity; Oaxaca–Blinder decomposition

Towards One Health: Decomposing Maternal Socioeconomic Inequalities in Zimbabwe

PRESENTER: **Akim Tafadzwa Lukwa**, Health Economics Unit, University of Cape Town
AUTHORS: Siya Aggrey, Olufunke Alaba, Feyi Odunitan Wayas

Background

Even though the World Health Organization recommends women to deliver with a skilled birth attendant (SBA), several studies in the literature have continuously demonstrated the existence of large disparities in the use of SBAs by socioeconomic status (SES). The persistence of the socioeconomic disparities is problematic, as the global community is currently advocating for not leaving anyone behind in attaining Sustainable Development Goals (SDGs). However, health care facilities in developing countries have been characterized by high maternal deaths. Improved accessibility and strengthening of quality in the uptake of maternal health services (skilled birth attendance, antenatal care, and postnatal care) plays an important role in reducing maternal deaths which eventually lead to the attainment of SDG 3 Good Health and Well-being.

Methods

We used the Zimbabwe Demographic Health Survey (ZDHS) of 2015. The ZDHS survey uses the principal components analysis in estimating the economic status of households and was retained as reported. In this study, we computed binary logistic regressions on maternal health services attributes (skilled birth attendance, antenatal care, and postnatal care) against demographic characteristics. Furthermore, concentration indices were then used to measure socio-economic inequalities in the use of maternal health services, and the Erreygers decomposable concentration index was then used to identify the factors that contributed to the socio-economic inequalities in maternal health utilization in Zimbabwe.

Results

Overall maternal health utilization was skilled birth attendance (SBA), 93.63%; antenatal-care (ANC) 76.33% and postnatal-care (PNC) 84.27%. SBA and PNC utilization rates were significantly higher than the rates reported in the Demographic Health Survey. Residence status was a significant determinant for antenatal care and rural women were 2.25 (CI: 1.55–3.27) times more likely to utilize ANC. Richer women were less likely to utilize skilled birth attendance service [OR: 0.20 (CI: 0.08–0.50)] compared to women from the poorest households. While women from middle-income households [OR: 1.40 (CI: 1.03–1.90)] and richest households [OR: 2.36 (CI: 1.39–3.99)] were more likely to utilize antenatal care services compared to women from the poorest households. Maternal service utilization among women in Zimbabwe was pro-rich, meaning that maternal health utilization favored women from wealthy households [SBA (0.05), ANC (0.09), PNC (0.08)]. Wealthy women were assisted by a doctor, while midwives assisted women from poor households [Doctor (0.22), Midwife (-0.10)].

Conclusion

Decomposition analysis showed household wealth, husband's education, women's education, and residence status to be important positive contributors of the three (skilled birth attendance, antenatal care, and postnatal care) health service utilization outcomes. Educating women and their spouses on the importance of maternal health services usage is significant to increase health service utilization and consequently reduced maternal mortality.

Understanding Period Inequality: Socio-Economic Inequalities in the Access to Menstrual Hygiene Management in Seven Low-and Middle-Income Countries

PRESENTER: **Laura Rossouw**, University of Witwatersrand
AUTHOR: Hana Ross

Menstrual hygiene management and health is increasingly gaining policy importance in a bid to promote dignity, gender equality and reproductive health. Effective and adequate menstrual hygiene management requires women and girls to have access to their menstrual health materials and products of choice, but also extends into having private, clean and safe spaces for using these materials.

The paper provides empirical evidence of the inequality in menstrual hygiene management in Kinshasa (DRC), Ethiopia, Ghana, Kenya, Rajasthan (India), Indonesia, Nigeria and Uganda using concentration indices and decomposition methods. There is consistent evidence of wealth-related inequality in the conditions of menstrual hygiene management spaces as well as access to sanitary pads across all countries. Wealth, education, the rural-urban divide and infrastructural limitations of the household are major contributors to these inequalities. While wealth is identified as one of the key drivers of unequal access to menstrual hygiene management, other socioeconomic, environmental and household factors require urgent policy attention. This specifically includes the lack of safe MHM spaces which threaten the health and dignity of women and girls.

Health Shocks and Household Allocation of Time and Spending

PRESENTER: **Federico Zilio**, Melbourne Institute, University of Melbourne
AUTHORS: Yuting Zhang, Ted McDonald, Eric Sun, Ross Hickey

Economists have broadly documented the effect of poor health on employment, earnings and income. To a lower extent they have examined the impact of health shocks on spousal labour supply. However, little research has been conducted on how health affects time use and consumption spending and, to the best of our knowledge, no study has examined how spousal time use changes in response to health shocks. We fill the gap in the literature by studying how a health shock– measured as self-reported serious illness or injury – affects consumption spending and the allocation of time spent in market and home production activities by the affected person and the spouse.

Our focus on consumption spending and time use is motivated by the Beckerian model (1975) that formalized the notion of consumption as the output of a function that combines goods purchased in the market and time. In the model individuals can adjust spending in market goods and time allocations in response to changes in productivity and in the cost of time.

In our analysis we use data from the Household, Income and Labour Dynamics in Australia Survey data, a household-based longitudinal study representative of the Australian population which collects information about individual health, labour market dynamics, household consumption spending and individual time use. Given our interest on both spouse and affected person's responses, we focus on the subsample of individuals who live with the partner. To preserve the exogeneity of the health shock we further restrict our sample to individuals who have had no health shock in the two years prior to experiencing a serious illness or injury. We also require that the spouse has not experienced any health shock in the two years prior to the health shock and the two subsequent years. To estimate the effects of the health shock we apply a linear panel event-study design comparing household consumption spending and time use before and after the health shock.

We find that the health shock induces a substitution away from time in the labour market for the affected person, and an increase in time allocated to home production activities for the unaffected spouse whose partner experienced the shock. We show that caring accounts for most of the increase in home production hours of the unaffected spouse. Total consumption spending rises with the health shock driven by the increase in spending of health-related goods. Our subsample analysis suggests that the effects of the health shock vary with household income. We find that the spouse in low-income households significantly increases time in the labour market to compensate the fall in the labor supply of the affected person. We also find that time spent in caring increases more for the spouse in households on high incomes. The increase in spending of health-related goods is larger for high-income households, while low-income households cut recreational spending. The paper highlights the importance of considering behavioural responses to health shocks for both affected and unaffected persons.

The Impact of the Crisis-Induced Reduction in Air Pollution on Infant Mortality in India: A Policy Perspective

PRESENTER: **Mr. Olexiy Kyrychenko**, CERGE-EI

Credible estimates of the health effects associated with changes in air pollution exposure are of considerable importance for research and policy agenda. Such estimates could provide effective stimuli for environmental regulation and a valid means of policy evaluation. However, there is still a shortage of empirical studies linking health and air quality for most of the developing countries. Filling this niche, this paper estimates the causal impact of the sharp reduction in particulate air pollution driven by the recent Global Financial Crisis on district-level infant mortality in a sample of

284 districts across nine Indian states. Utilizing plausibly exogenous geographic variation in the crisis-induced changes in air quality and novel, rich and detailed data from the survey and satellite-based sources, I find that the infant mortality rate fell by 24 percent more in the affected districts during the post-crisis period, implying that 1338 fewer infants died than would have in the absence of the air pollution reduction episode. The analysis of the pathophysiological mechanism indicates that the effect is strongest in the postneonatal period, specific for respiratory infections, and might be related to some infectious diseases. The estimates are within the range reported in other economic studies and appear to be robust to various specifications and falsification tests. Back-of-the-envelope calculations suggest that the estimated decline in infant mortality translates into an annual average per-household monetized gain of 289 U.S. dollars or 312.5 million U.S. dollars in total. Resulting health benefits can be used as a benchmark for assessing the efficiency of the policies designed to improve air quality in India.

Transitioning to an Obese India: Demographic and Structural Determinants of the Rapid Rise in Obesity

PRESENTER: **Sunaina Dhingra**, OP Jindal Global University

AUTHORS: Anaka Aiyar, Prabhu Pingali

The rapid increase in the incidence of obesity across developing countries has alarmed experts. In this paper, we provide an integrative framework that links the income-gradient hypothesis of the obesity transition along with factors in the demographic transition that impact obesity risks. We utilize measured BMI along with individual- and household-level data of over 800,000 men and women surveyed in the Indian National Family Health Surveys of 2005-06 and 2015-16 to draw conclusions on why obesity rates have doubled within the country. A decomposition analysis of changes in obesity rates reveals that among women, changes in biological risks associated with the demographic transition, in addition to the changing obesogenic environment, explain the rapid rise in obesity. Among men, obesogenic factors explain rise in obesity, but biological risks do not. Biological risk factors vary among women. Those living in regions with lower development are impacted by reduction in reproductive stress. Inherent risks from aging impact women living in regions with greater economic development. At lower levels of regional development, obesity increase is driven by obesogenic changes among higher socio-economic status (SES) groups. At higher levels of economic development, obesogenic changes increase obesity risks among lower SES groups. Increasing access to leisure enhancing technologies moderate this transition. Our results corroborate the need for group specific nutrition policies to stem the rise of obesity in developing countries. Encouraging healthy dietary choices and encouraging physical activity are important to neutralize the impact of the changing obesogenic environment. Nutrition education programs should add dietary advice for women who have completed their fertility.

Revisiting the Schooling-Smoking Gradient: The Time-Series Evidence

PRESENTER: **Georgios Mavropoulos**

AUTHORS: Rebekka Christopoulou, Georgios Voucharas

We examine the schooling-smoking gradient using a panel dataset following five birth-cohorts of men and women over their life course in 30 countries. During the sample period, countries are at different stages of the smoking epidemic and experience differential expansions in educational attainment. We exploit this variation to determine how an extra year of schooling affects smoking participation across a cohort's life-course. Controlling for unobserved fixed-effects specific to each country and birth-cohort and a battery of temporally varying confounders, we depart from the typically asked cross-sectional question "how does smoking differ across less and more educated populations" and instead answer the time-series question "what is the smoking effect of a certain population acquiring more education". Thus, we estimate the temporal (life-course) schooling-smoking relationship which is less susceptible to endogeneity bias and is arguably more policy-relevant.

Previous research finds that the education–smoking correlation is negative in high-income countries and positive in low-income countries. In fact, in most advanced countries the negative gradient has persisted over the last forty decades. However, most of what we know about this gradient derives from cross-sectional analysis in which the education variable is treated as time-invariant. In our study we differentiate from previous literature by using individual-level survey data to construct country, gender and cohort-specific education histories and regress those on corresponding smoking histories. We apply both static and dynamic panel data models; address any remaining endogeneity issues using IV methods; and test for non-linearities. Preliminary results support the prediction of a positive gradient in developing countries and a negative gradient in the advanced world.

The Effects of Illegal Marijuana Dispensary Closures on Crime

PRESENTER: **Anna Choi**, Sejong University

AUTHOR: Pureum Kim

Marijuana is a Schedule I controlled substance at the federal level. However, an increasing number of states legalized recreational and medical use of marijuana over the past few decades. As of November 2020, 35 states and D.C. allow medical use of marijuana and 15 states and D.C. allow recreational use among adults 21 and older. California was the first state to legalize medical use of marijuana in 1996 under the Compassion Use Act of 1996. More recently from January of 2018, California legalized recreational use of marijuana for adults of age 21 and over. However, this does not mean that all cities and counties allow cultivation, use, and sale of marijuana equally. Businesses and dispensaries have to obtain proper licenses to engage in any type of cannabis retail activities. California Bureau of Cannabis Control regulates the retailers, distributors and laboratories for marijuana and related products. Illegal dispensaries and black market for cannabis in California has been increasing rapidly with changes in marijuana legalization. In September of 2019, the estimated size of black market for cannabis was at least three times that of licensed and regulated market in California. In September 2019, 873 sellers are licensed under the Bureau of Cannabis Control in California but there were about 2835 unlicensed marijuana dispensaries and delivery services operating (Queally & McGreevy, 2019).

In an effort to reduce the number of illegal dispensaries in Los Angeles, the LA City Attorney's office filed criminal cases against illegal dispensaries in 2018 and 2019. We obtained the list of illegal dispensaries in Los Angeles in 2018 and 2019 and were able to match the addresses of illegal dispensaries with the Los Angeles Police Department arrest data to estimate the closure dates of illegal dispensaries. Using this data, we examine the short-run effects of shutting down illegal marijuana dispensaries on crime.

A major contribution of this paper is that we exploit a quasi-random shutdown of illegal marijuana dispensaries and examine the short-run effects of closures on crime in the neighborhood. We examine the effect of closures on crime within a 1/4 mile to 1 mile radius of the dispensaries before and after the closure. We limit the analysis sample to 15 days before and after closure and estimate a Poisson model. We find that narcotic crimes decrease by 57.3% within a 3/4 - 1 mile interval while Part I Crimes decrease 37% within 1/2 mile radius. These results are mainly driven by the low number of crimes surrounding the illegal dispensaries. Our results show that closures of illegal dispensaries decrease narcotic crimes and Part I crimes locally, which could reflect decreased drug supply and fewer people visiting the surrounding area due to the closure.

7:45 AM –8:45 AM TUESDAY [Supply Of Health Services]

ORGANIZED SESSION: Understanding Physician Decision Making to Improve Healthcare Quality

SESSION CHAIR: **Daniel Avdic**, Erasmus University Rotterdam

ORGANIZER: **Raf Van Gestel**, Erasmus University Rotterdam

Provider Responses to Market Entry Under Competing Health Technologies

PRESENTER: **Giovanni van Empel**, Monash University

AUTHORS: Daniel Avdic, Nils Gutacker, Johan Vikstrom

We analyze supplier-induced demand as a strategic response to market entry by exploiting the relaxation of regulatory restrictions in cardiac care that led to an expansion in the number of hospitals providing catheter-based treatment (PCI) to patients in Sweden. Since patients' choice of hospital in the Swedish healthcare system is determined by their place of residence, hospital providers exert local monopoly powers with incentives to treat patients in-house rather than sending them to other hospitals. This may lead to non-optimal treatment choices. Relating observed treatments of residents in catchment areas where hospitals opened a PCI lab to residents in unaffected catchment areas in a difference-in-differences empirical design, we find that patients with clinical indications for cardiac surgery (CABG) were five percent more likely to receive a PCI after their local hospital opened a PCI lab. In contrast, we find no corresponding effect that incumbent hospitals reduced their use of PCI on their remaining patient

population to offset the reduction in CABG surgery. We conclude that the expansion of PCI labs was a likely contributor to the respective rise and decline of PCI and CABG over time in Sweden.

Do Doctors Adhere to Scientific Evidence? An Application to Percutaneous Coronary Interventions

PRESENTER: **Raf Van Gestel**, Erasmus University Rotterdam
AUTHORS: Owen O'Donnell, Daniel Avdic

Objectives

Clinical practice guidelines (CPGs) recommend uniform assignment of patients to the treatment with the largest average treatment effect. Physicians may deviate from CPGs by weighing patient-specific information on likely treatment response. Lacking such information, healthcare agencies that develop and follow up on CPGs cannot determine whether this is detrimental for patient outcomes.

Methods

This paper proposes the Boole-Fréchet probability bounds, which are calculated with evidence from clinical trials, for comparing clinical practice with the proportion of patients who benefit from treatment. When the lower bound exceeds the proportion of patients treated, this sends a very strong signal that more patients should receive treatment.

Results

For three periods of Percutaneous Coronary Intervention (PCI) technology adoption, we find a lack of attention during the first year(s) after the clinical evidence appears. In this period, average treatment shares are lower than the lower bound, and the fraction of inattentive physicians is substantial.

The Effect of Breaks on Performance: Evidence from the Medical Workforce

PRESENTER: **Laurie Rachet Jacquet**, The Health Foundation

Workers' performance on the job depends on a range of factors, such as working conditions, hours worked or work shift patterns. There is however little research on the organisation of working time and, in particular, the role of breaks. This paper explores whether time off from surgical practice impacts surgeons' performance. Using a large panel of orthopaedic
surgeons in England, I estimate the effect of surgeons' breaks, measured by the number of days since their last surgery, on the health outcomes of emergency patients admitted for a hip fracture. To identify a causal effect, I implement a surgeon fixed-effects model and exploit the quasi-exogenous variation in time breaks that arises from unanticipated emergency hip fracture admissions. Results show that short breaks of 4-6 days reduce 30-day mortality rates by around 6 percent relative to no breaks. Notably, short breaks also affect the type of surgery carried out, holding patient characteristics fixed. Overall, these findings suggest that the organisation of surgeons' activity is a possible determinant of the quality of care provided.

Who Cares (about Feedback)? Evidence from a Surgeon Report Card

PRESENTER: **Dr. Manasvini Singh**, University of Massachusetts, Amherst
AUTHOR: Jacob T Zureich

Physician quality "report cards" are popular measures used by states and insurers to, amongst other things, incentivize physicians to improve care quality by publicly evaluating them on specific clinical outcomes. However, research suggests that report cards are less effective than expected, inducing only small improvements in care quality. We argue that these lukewarm effects are driven by physicians' heterogeneous responses to formal feedback, and that this variation can be explained by their propensities to learn from informal feedback.

In the absence of formal channels for receiving feedback, individuals can learn and improve from informal sources of feedback, such as the outcomes of their own or others' everyday decisions. We argue that individuals who respond more to informal feedback (who we refer to as Learners in this study) may respond differently to formal feedback than Non-Learners. The nature of this difference is not immediately clear. On one hand, Learners may improve more from formal feedback than non-Leaners because of their innate propensities to pay attention to and incorporate all feedback. On the other hand, they may improve less because they have already plateaued, or because the formal feedback provides information that they have already acquired from informal sources.

We investigate this question using the release of a novel surgeon report card from ProPublica in 2015. This report card scored and ranked all surgeons performing any of 8 low-risk elective surgeries on the Medicare population based on 2 complication metrics: in-hospital death and 30-day readmission. We link the information from this report card to over a million inpatient surgical encounters in the state of Florida from 2012-2016. We identify Learners and Non-Learners using physicians' response to their own successful and failed clinical encounters prior to the release of the report card. We measure performance improvements in response to the report as the change in physicians' complication rates after the report card release in 2015.

We find that Learners (i.e., the physicians who learn from their own prior clinical encounters) are more likely than Non-Learners to improve their performance in response to report card grades. This effect becomes larger as the report card feedback becomes more informative to the physician, with differences in complication rates between the two types as large as 40 percentage points. Importantly and consistent with theory, Learners change their behavior in response to both negative and positive formal feedback. We then test mechanisms through which this effect manifests (e.g., is it due to physicians' differentially exploring vs. exploiting prior clinical strategies? cherry-picking of patients? etc).

Overall, our results can help explain the lukewarm effects of physician report cards, and suggest that improving their effectiveness will require interventions that engage the non-Learners, who tend to respond less to feedback than Learners. Our findings also suggest that providing formal feedback to physicians may exacerbate variation in care by further widening the performance gap between Learners and Non-Learners, rather than helping Non-Learners "catch up".

7:45 AM –8:45 AM TUESDAY [Specific Populations]

ECONOMICS OF CHILDREN'S HEALTH AND WELLBEING SIG SESSION: Economic Evaluation and Children's Health

MODERATOR: **Kim Dalziel**, The University of Melbourne

A Happiness Approach to Health State Values for Children

PRESENTER: **Li Huang**, University of Melbourne
AUTHORS: Kim Dalziel, Nancy Devlin

Estimations of population value sets for health state classification systems are used to compare health across different conditions and treatments to inform resource allocation decisions. Approaches to eliciting health state values have, to date, relied exclusively on stated preference methods based on decision utility. This paper explores the possibility of using an experienced utility approach to generate or validate values for health states. Using child self-reported happiness as an indicator of experienced utility and a generic health state instrument in children (Child Health Utility 9D Index, CHU9D), we estimate the relative value of CHU9D health dimension levels using a fixed effects model. A nationally-representative longitudinal survey is used including 5840 Australian children aged 10-18 years followed during 2012-2016. The resulting utility weights provides estimates of utility loss for children with health conditions that are generally comparable to those estimated by the established stated preference decision utility weights, despite almost two fifths of the health dimension levels being collapsed due to children appearing not to interpret the increasing levels of severity in a monotonic way. We demonstrate that using experienced utility methods is possible and has the potential to play an important role in producing or validating health state values.

Cost-Effectiveness of Day Care Approach Versus Existing Treatment for Management of Childhood Severe Pneumonia: An Economic Evaluation Alongside a Cluster Randomized Trial in Bangladesh

PRESENTER: **Marufa Sultana**, Deakin University

AUTHORS: Jennifer Watts, Nur Haque Alam, A.S.G. Faruque, George J Fuchs, Niklaus Gyr, Nausad Ali, Md. Jobayer Chisti, Tahmeed Ahmed, Lisa Gold

Background

Severe pneumonia is a major cause of death for children worldwide, with around one million deaths in under-5 year old children each year. Existing inpatient care management imposes a substantial economic burden on families in low- and middle-income countries, which prevents many families accessing care. Innovative approaches are needed, which are effective and affordable. A new day- care approach (DCA) has been trialed in Bangladesh and proven as effective as inpatient care. The objective of this study is to examine the cost-effectiveness of DCA compared to existing treatment (ET) for management of severe childhood pneumonia from a societal perspective.

Methodology

Economic evaluation was conducted alongside a cluster-randomized controlled trial in two districts (rural and urban) of Bangladesh from 2015 to 2019. 32 primary-level healthcare facilities (clusters) were randomly allocated to intervention (DCA) or control (ET). Recruited children aged 2-59 months with WHO-defined severe pneumonia received 7-7.5 hours treatment daily until discharge in DCA or 24-hour inpatient care in control. Societal costs (in 2019 US dollars) were estimated including household and provider cost from bottom-up micro-costing. Cost-effectiveness analysis was presented as cost-per case cured (clinically-determined treatment success at day 6). Sensitivity analysis (10,000 bootstrap simulation) estimated uncertainties around important cost-effectiveness parameters.

Results

3,217 children were enrolled between November 2015 and March 2019 (mean age 12.9 months, 63.4% male, 53% urban). Average length-of-stay was 4.1 and 5.0 days in intervention and control groups respectively. Societal costs of treatment were US$94 for DCA and US$186 for ET (mean difference US$-91.5, 95%CI: -96.7, -84.5; p<0.001). Clinical effectiveness of DCA was higher than ET (mean difference 4%, 95%CI 2%, 6%, P<0.001). DCA is therefore cost-saving based on dominance (high effectiveness with a lower cost) and consistent in sensitivity analysis from a societal perspective. Subgroup analysis demonstrated that DCA was cost-effective if implemented in rural health facilities but potentially not cost-effective for urban health facilities. DCA is also cost-effective from a provider perspective based on likely willingness-to-pay thresholds.

Conclusion

Day-care management approach for severe childhood pneumonia is a cost-effective treatment that could save Bangladesh families and health services US$ 91 million per 1000 childhood pneumonia episodes if implemented nationally. Reduced costs of treatment to the household also increase treatment accessibility, leading to reduced health inequalities.

Clinical Trial Registration number: NCT02669654

Cost-Effectiveness Analysis of the Dental Recur Pragmatic Randomized Controlled Trial: Evaluating a Goal-Oriented Talking Intervention to Prevent Reoccurrence of Dental Caries in Children

PRESENTER: **Victory Ezeofor**, Bangor University

AUTHORS: Rhiannon Tudor Edwards, Girvan Burnside, Pauline Adair, Cynthia Pine

Abstract

Background: Dental caries is the most common chronic disease in children. Preventable tooth extraction due to dental caries in children costs the National Health Service (NHS) £205 million per year in the UK (British Dental Association). The aim of this study was to investigate the cost-effectiveness of the Dental RECUR Brief Negotiated Interview for Oral Health (DR-BNI). This 30-minute therapeutic "talk" by a dental nurse with a parent/guardian was compared with a placebo control intervention in preventing reoccurrence of dental caries in children having a primary tooth extracted.

Methods: An economic model was developed to simulate the clinical progression of dental caries among children who have previously had a primary tooth extracted. The analysis was conducted using the UK NHS perspective. The main outcome was the incremental cost-effectiveness ratio based on the quality adjusted life years (QALYs). Estimates of costs and probabilities were obtained from the DR-BNI multicentre randomised controlled trial (RCT) while QALY values were obtained from published literature as EQ-5D. Univariate and probabilistic sensitivity analyses were conducted to assess the uncertainty of the result and robustness of the model.

Results: With an Intervention cost of £6.47, the results from the RCT showed the health care cost for the DR-BNI intervention group was £119.40 per child while the control had a health care cost of £115.13 per child. The QALYs gained for the prevention of reoccurrence of dental caries was higher in the intervention arm by 0.054 QALYs. The incremental cost-effectiveness ratio was £79.77 per QALY. The sensitivity analysis at a WTP of £5000/QALY gain had the probability of cost effectiveness at 0.90. The secondary analysis showed a cost-savings of £25.11 per participant for the prevention of at least one filling or extraction.

Conclusions: This study shows the proactive talking intervention to have a very moderate cost and to be effective in providing better health related quality of life gains. The intervention is cost-effective with an incremental cost-effectiveness ratio less than the lower limit of the NICE threshold of £20,000 per QALY even with a 200% increase in the cost of intervention. The NHS will be providing better oral health for children by adopting the DR-BNI intervention and preventing the reoccurrence of dental fillings and extractions for each participant.

Trial Registration: This trial was registered prospectively on 27th September 2013 with the trial registration number ISRCTN 24958829.

KEYWORDS: Dental caries, cost-effectiveness, sensitivity analysis, willingness-to-pay.

Incorporating Equity into a Modelled Economic Evaluation of a Sleep Intervention to Prevent Childhood Obesity

PRESENTER: **Anagha Killedar**, University of Sydney

AUTHORS: Dr. Thomas Lung, Rachael Taylor, Barry Taylor, Alison Hayes

Background

In Australia, like other high-income countries, children of lower socioeconomic position (SEP) have a higher burden of overweight and obesity that children of higher SEP. This inequality can likely be attributed to differences in social circumstances and opportunities, rather than biological inevitability, and thus is regarded as an inequity. Economic evaluations of childhood obesity interventions traditionally focus only on efficiency objectives and rarely consider these socioeconomic inequities. One barrier is that the models used to capture future health and economic benefits do not often account for differences in these outcomes by SEP. For example, a recent evaluation of the Prevention of Overweight in Infancy (POI) trial used a model (The EPOCH model) that predicted BMI into adolescence based on age, sex and starting BMI, but not SEP. The evaluation found that a sleep intervention for infants up to age 2 was highly cost-effective overall. The objective of this project was to conduct an equity informative economic evaluation of this intervention to determine whether its cost-effectiveness differed across SEP groups.

Methods

We developed a microsimulation model of annual BMI gain by age, sex and socioeconomic position in children aged 4-17 years. The training dataset was the Longitudinal Study of Australian Children (LSAC), in which height, weight and SEP measurements were collected biennially for 12 years in almost 5000 children. To evaluate the sleep intervention, we first calculated SEP-specific effect sizes from BMI measurements taken at age 5

follow-up of the trial using the New Zealand deprivation index as the measure of SEP. These effect sizes were applied to a nationally representative cohort of Australian children aged 4-5 years and the mode was used to predict BMI outcomes until age 17. We applied weight status dependent utilities, informed by evidence from a systematic review, healthcare costs using national statistics on health service usage, and intervention costs using a micro-costing approach. The BMI, QALY, and cost outcomes by age 17 (12 year time horizon) were used to calculate the cost-effectiveness and cost-utility of the sleep intervention compared to the control group in high, middle and low SEP groups.

Results

The model developed demonstrated good prediction of BMI trajectories and prevalence estimates, by SEP, in validation. The SEP-specific economic evaluation found that the ICERs were smaller in the low ($23010 per QALY gained) and middle ($18206 per QALY gained) SEP groups compared with the high SEP group ($31981 per QALY gained). Under the $50000 per QALY gained threshold used in Australia, the intervention had a 92-100% probability of being cost-effective in a low and middle SEP groups and a 79% probability in a high SEP group.

Conclusions

An infant sleep intervention is more cost-effective in the low to middle SEP groups than in the high SEP group, but has a high probability of being cost-effective in all groups. Considering the higher needs in lower SEP groups, no trade-off between cost-effectiveness and equity would need to be made in program implementation decisions.

7:45 AM –8:45 AM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Explorations of Causality: Methods and Applications

MODERATOR: **Jongsay Yong**, University of Melbourne

The Effect of Economic Shocks on Abortions and Fertility

PRESENTER: **Anna Bárdits**, Centre for Economic and Regional Studies, Hungarian Academy of Sciences

AUTHORS: Ágnes Szabó-Morvai, Andrea Weber, Anna Adamecz-Völgyi, Márta Bisztray

In this paper we study the effect of job displacement and unemployment on the probability of conception, abortion and child delivery. Though the effect of economic shocks on fertility is widely studied, the effect on abortions is scarce, even though a large ratio of pregnancies (around one third in our dataset) ends with an abortion. We use a unique administrative panel dataset containig individual level information on labor market outcomes and incidences of births and abortions of Hungarian women between 2009 and 2017. We examine job displacements from firm closures and mass layoffs and compare outcomes of women who are displaced with a control group of women working in firms without closure or mass layoff events. First, we show that job displacement leads to a large increase in unemployment, confirming findings from numerous other studies. Second, we show that job displacement also increases the probability that a woman has an abortion. This effect is concentrated around the displacement date and mainly driven by young women below the age of 25. At the same time, we do not find evidence for an effect of job displacement on the probability of getting pregnant, which suggests that abortions are an important channel of birth control for young women experiencing an economic shock. Finally, we relate the unemployment experience to the abortion probability in an IV framework where we instrument unemployment by job displacement. The results from this analysis allow us to distinguish between different channels by which a job displacement affects pregnancy outcomes and to assess the role of unemployment versus the shock of job loss.

Feeling Safe to Exercise? Perceived Neighbourhood Safety and Physical Activity: An Instrumental Variable Approach

PRESENTER: **Sabrina Lenzen**, The University of Queenland

AUTHORS: Brenda Gannon, Christiern Rose

This paper investigates how older peoples' perception of neighbourhood safety may impact their decision to be physically active, using longitudinal data from 2004 until 2014 from the United States Health and Retirement study. Physical inactivity is a leading cause of disease and disability and accounts for 5.3 million deaths each year worldwide. As people get older, physical activity reduces the risk of developing chronic conditions, such as cardiovascular diseases and diabetes, lowers the risk of falls, but also stimulates mental health and improves cognitive function. Keeping older people active is therefore a critical part of overall societal health. We hypothesize that the fear of crime and general feelings of safety in the neighbourhood may impact a person's decision to be physically active, operating through the fear of a potential adverse health shock if becoming a victim of crime. Applying an instrumental variable approach, we exploit within variation of county level violent crime rates and use this as an instrument for self-reported perceived neighbourhood safety. We control for individual, household and neighbourhood socio-economic characteristics, health measures, lifestyle factors as well as individual fixed effects. To
capture changes in policy or infrastructure at the national and regional level and over time, we include time, region and region-specific time trends. We find a significant negative effect of decreasing perceived neighbourhood safety on older people's physical activity behaviour. In addition to violent crime rates, we identify racial composition and physical disorder in a neighbourhood as the main drivers behind persons' perception of neighbourhood safety. Our results suggest, that future policies aimed at increasing physical activity levels, may include development of interventions that improve older residents' perception of their neighbourhood safety, in addition to reducing crime.

The Causal Effect of Informal Caregiving on Female Caregivers' Health in Japan

PRESENTER: **Dr. Dung Le**, Keio University

AUTHOR: Yoko Ibuka

Background and Objectives

Studies on the effects of family caregiving on caregivers' health have been of great interest in Western settings. In Japan, although more than 70% of nursing care is provided at home and mainly by women, little is known about the causal relationship between caregiving and caregivers' health. The present study aims to fill this gap by examining the health of female caregivers who provide care for their parents-in-law. Furthermore, we examine the effect of informal caregiving by socioeconomic heterogeneities such as household income, which has largely been unexplored in previous studies.

Method

We used data from a longitudinal survey of individuals aged 50 and older in Japan, the Japanese Study of Aging and Retirement, which was conducted in four waves from 2007 to 2013. The study sample was restricted to female caregivers who had living parents-in-law at their first observation and who were observed at least twice, resulting in 4511 observations. We used an instrumental variables (IVs) method to address endogenous problems posed by the potential correlation between informal caregiving and other confounding variables such as health of caregivers. Both parents-in-law's care needs were used as IVs, which strongly predicted the probability of providing informal care among female caregivers, but did not directly affect the health outcomes of caregivers.

Results

The results were robust under different IV specifications and showed a significant negative impact of informal caregiving on female caregivers' health. Specifically, providing informal care caused an increase in the probability of depression and life dissatisfaction among female caregivers by 26.1 and 17.0 percentage points, respectively. Additionally, our results revealed the heterogeneous effects of informal caregiving based on household income; that was, the effect size of informal caregiving on health was greater for caregivers with lower income. The reasons for the heterogenous effect were that caregivers with lower income were more likely to provide longer hours and parents-in-law of caregivers with lower income had worse health than those of higher-income caregivers.

Conclusion

This paper adds to the existing literature on the effect of caregiving on health by providing empirical evidence on the heterogenous effect of caregiving. We found that informal caregiving has a negative impact on caregivers' health, and the degree of the impact varies according to socioeconomic status. It is important to consider mitigating the burden of informal caregiving to prevent negative spillovers from providing care for family members. Such spillover effects include illness caused by informal caregiving and increased healthcare expenditure among caregivers. This burden falls disproportionately on lower-income individuals, thus, further research is encouraged to explore the mechanism behind it to design a more equal long-term care system.

Keywords: informal caregiving, socioeconomic heterogeneity, caregiver health, instrument variables, Japan

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7:45 AM –8:45 AM TUESDAY [Specific Populations]

ECONOMICS OF GENOMICS AND PRECISION MEDICINE SIG SESSION: Methods for Economic Evaluations in Rare Diseases

MODERATOR: **George Ruhago**, Muhimbili university of health and allied sciences

Costing Rare Diseases in Large-Scale, National Initiatives: New Evidence and Lessons for Health Economists from the 100,000 Genomes Project in England

PRESENTER: **John Buckell**, University of Oxford
AUTHORS: Patrick Fahr, James Buchanan, Sarah Wordsworth

Over the past decade, the cost of genome sequencing has fallen dramatically, from millions of pounds per genome to hundreds. As a result, the availability and use of genomic information in healthcare decision-making has expanded, and large, population-based genome sequencing studies conducted. In December 2018, Genomics England completed sequencing in the only study of this size: the 100,000 Genomes Project (100KGP). In the 100KGP, patients with suspected rare genetic diseases and selected cancers, and their relatives, underwent genome sequencing. Given the cost of genome sequencing, it is important to understand the healthcare resource use and cost consequences of any changes in the care pathways of these patients to understand if genome sequencing can become a cost-effective service. Helpfully, within the 100KGP, clinical, phenotypic, and genomic data have been linked with administrative secondary care records (NHS Hospital Episode Statistics, HES) to enable such analyses to be conducted.

We present cost analyses for two rare diseases: Intellectual Disability (ID) and Early Onset Epilepsy (EOE). Anonymised patient IDs in the 100KGP were used to link these records to HES records. This allowed us to map secondary care resource use for each patient. We then matched unit costs to these records using NHS reference costs and aggregated costs for each care episode to calculate annual patient costs.

The total cost of secondary care for patients with ID (n=6,987) and EOE (n=788) over the study timeframe was £204m and £42m, respectively. The mean annual per-patient costs were £3,486 for ID and £5,501 for EOE. Patient costs are primarily driven by inpatient care: for ID, £136m of the £204m (67%) is accounted for by inpatient costs; and for EOE, £30M of the £42m (71%) is accounted for by inpatient costs. In addition, the disease status of the participants is related to costs. The lowest costs are associated with participants with no diagnosis (mean cost per year per affected participant £3,634 (ID), £5,943 (EOE)). Next, participants for whom a diagnosis has been confirmed are significantly higher (ID average cost per year per affected participant: £4,247; EOE: £9,985).

These cost estimates are among the first for patients with rare genetic diseases in the NHS and the first of their kind in the context of rare diseases. Our findings will help researchers and healthcare decision-makers to understand how secondary care costs are related to patient and service characteristics, and will inform policymakers trying to maximize value in the commissioning of health services. Indeed, these costs can be used for critical cost-effectiveness analyses of genomic testing in these disease areas. For researchers, challenges and lessons are discussed. Key challenges relate to data storage and management, data cleaning, managing diffuse coding practices in NHS hospitals for different types of care and issues surrounding sample sizes for genetic subgroups that limit statistical inference and the generalizability of study results. presentation by discussing some of the key lessons for health economists conducting similar analyses of genomic sequencing in other settings.

What Are the Challenges of Performing Economic Evaluations of Genome Sequencing in Rare Diseases? Two Case Studies from the UK 100,000 Genomes

PRESENTER: **Patrick Fahr**, Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford
AUTHORS: James Buchanan, Andrew OM Wilkie, Andrea H Németh, Sarah Wordsworth

Following the completion of the Genomics England 100,000 Genomes Project (100KGP), the National Health Service (NHS) in England now has a Genomic Medicine Service (GMS), making the NHS the first public health care service to offer genome sequencing to people with rare genetic diseases and some cancers. Genomic information could improve diagnosis, guide prognosis, and inform treatment decisions for these patients and their families. However, no health technology assessments have been conducted to provide evidence that offering genome sequencing via the GMS is a cost-effective use of healthcare resources for the NHS.

The study aims to provide early evidence on whether the use of genome sequencing technologies for rare genetic diseases are cost-effective in England. We present cost-effectiveness analyses that evaluate the use of sequencing in two rare genetic disease cohorts from the perspective of the NHS: craniosynostosis syndromes (birth defects resulting in a premature fusion of the skull) and hereditary ataxia (a degenerative condition of the nervous system).

For craniosynostosis syndromes, we simulated a cohort of difficult-to-diagnose individuals along two diagnostic pathways (no further diagnostic testing versus genome sequencing) using decision trees (five-year time horizon). For hereditary ataxia, we used Markov modelling to simulate individuals progressing through multiple diagnostic (standard diagnostic testing versus different substitution points of genome sequencing) and treatment pathways (lifetime time horizon). The models included both diagnostic and treatment costs. Outcomes were measured using quality-adjusted life years (QALYs), which captured the impact of improved diagnostic yield and related clinical utility (e.g. reproductive planning), including the clinical outcomes of subsequent medical interventions guided by a diagnosis. Model parameters were estimated using clinical, phenotypic, molecular and genomic data from the 100KGP. These data were linked with administrative secondary care records (NHS Hospital Episode Statistics) and mortality data from the UK Office of National Statistics. Sensitivity analysis was conducted to assess the robustness of the results in both models.

The results indicate that genome sequencing is currently not cost-effective. In craniosynostosis syndromes, sequencing costs £315,067 per QALY gained compared to current practice (diagnostic yield of 11%, 20% of diagnoses had actionable clinical consequences). The sensitivity analysis showed that an increase in diagnostic yield (to 38%) and clinical utility (50% of actionable diagnoses) made genome sequencing more cost-effective (£17,268 per QALY). A key consideration is that the potential outcomes following genome sequencing can go beyond the actual patient. This is particularly the case for rare genetic diseases, where treatment options are often scarce, but having a diagnosis can have implications for the health and reproductive choices of family members.

Our analysis and results highlighted that economic evaluations of genomic technologies present health economists with several challenges that may require innovative solutions. These challenges include the uncertainty surrounding the estimation of model parameters (e.g. diagnostic yield), and the use of clinical endpoints that reflect benefits to relatives, not patients. We will conclude this presentation by discussing these challenges and potential solutions.

Welfarism and Extra-Welfarism in Rare Genetic Diseases: Who QALYfies?

PRESENTER: **Ilias Goranitis**, The University of Melbourne

Rare genetic diseases are complex and severely debilitating conditions with large diagnostic odysseys and limited treatment options that severely affect the health and wellbeing of patients and their families. The health and economic opportunities derived from an early genomic diagnosis are now driving genomic research initiatives globally, with Governments of at least 14 high income and low- and middle-income countries having

invested over US$4 billion in establishing national genomic-medicine initiatives. A challenge for us—the health economists—is how to best evaluate the cost-effectiveness of genomic testing. Health Technology Assessment (HTA) agencies commonly inform reimbursement decisions on the basis of health economic evidence generated within an extra-welfarist framework, with cost per Quality-Adjusted Life-Year (QALY) as the standard outcome.

The use of QALYs in the rare disease space can be problematic for various reasons. One reason is that rare diseases predominantly affect children under the age of five, and no preference weights yet exist for generating QALYs for this age-group. Another reason is that, in most rare diseases and regardless of the age of symptoms onset, there is currently limited opportunity to improve generic health outcomes for the patient. Most importantly though, genomic testing (and other technologies or services) encompasses substantial personal utility for the whole family, which reflects benefits from diagnostic information and other non-health and process outcomes, such as avoiding unnecessary, ineffective and invasive interventions, ending diagnostic odyssey, understanding the prognosis of the condition, enabling family planning, and accessing peer support.

Using patient and parental quality of life data, measured with the EQ-5D-5L, SF-12 or AQoL-8D, and willingness-to-pay (WTP) data from a dynamic triple-bounded dichotomous choice and a payment card contingent valuation (CV) methods collected as part of the Australian Genomics and Melbourne Genomics Health Alliances clinical projects (n = 360), we explore the relevance of different evaluative spaces in the context of rare diseases. While CV methods demonstrate significant personal utility, with WTP estimates ranging between AU$1879 to $4554 across conditions, quality of life data are not responsive to accessing genomic testing, receiving a diagnosis, or having a change in clinical management. The implications of these findings are discussed.

Costing the Diagnostic Odyssey of Patients with Rare Diseases in England: A Retrospective Analysis

PRESENTER: **James Buchanan**, Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford
AUTHORS: Brett Doble, Patrick Fahr, Georgia Chan, Damian Smedley, Mark Caulfield, Sarah Wordsworth

There are 6,000-8,000 known rare diseases, with 263-446 million people affected globally at any point in time. Examples include intellectual disability and inherited cardiac conditions. In the UK, 3.5 million people will be affected by a rare disease during their lifetime, over 80% of which have a genetic cause. Each year 6,000 children are born with a genetic condition that is likely to remain undiagnosed, despite long diagnostic journeys across multiple specialties in secondary care. New technologies such as genome sequencing could shorten such odysseys, but little is known about the costs incurred during these diagnostic journeys. This information is a key prerequisite for robust economic evaluations of genome sequencing.

In this study we evaluate the secondary care costs incurred by patients with rare diseases in England during their diagnostic journeys, and explore differences by participant characteristics. Our analyses use secondary care data (Hospital Episode Statistics; HES) from 4,875 participants, including 2,279 probands, enrolled in the pilot phase of the Genomics England 100,000 Genomes Project. HES data were available for four forms of care (inpatient, outpatient, accident and emergency, critical) from 1997-2017, linked to mortality data from the Office for National Statistics. Unit costs (National Health Service Reference Costs) were attached to this resource use data to calculate mean costs per participant and annualised costs. We summarised costs across the diagnostic odyssey for a subgroup of 2,663 participants, allocating costs to 'Initial', 'Continuing' and 'Terminal' phases of care. We also evaluated costs before and after diagnosis for diagnosed patients and compared these with the costs of unaffected relatives.

Participants experienced 238,000 episodes of secondary care across the study period, costing £108m. Most of these costs (£77m; 71%) related to inpatient care. The mean cost per participant across all forms of secondary care was £22,175 (£32,530 for affected participants, £9,668 for unaffected relatives). Significant differences in cost per episode were observed by gender, ethnicity, level of deprivation, and region of residence. Participants with intellectual disability accrued the highest costs, with an overall mean cost of £52,387 per patient. Significant differences were also observed across the diagnostic odyssey. Affected participants had a mean 14 episodes of care each year in the initial care phase (mean annual cost £13,067), falling to 6 in the continuing care phase (£2,367), then rising to 25 in the terminal care phase (£21,090). There were significant differences in costs and resource use across the diagnostic odyssey by gender and ethnicity.

The lengthy diagnostic journeys of patients with rare diseases have been long documented; we supplement this evidence base by providing robust estimates of the high secondary care costs accrued by these patients. Offering genome sequencing to patients with rare genetic diseases is potentially expensive, but if diagnostic odysseys can be shortened large cost savings are possible. Future work will extend this analysis to consider the cost-effectiveness of genome sequencing in this context. Beyond genomics, studies evaluating other conditions characterised by delayed diagnosis (e.g. mental health conditions) may find it helpful to apply our approach to costing care phases.

7:45 AM –8:45 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Infectious Disease Modelling

MODERATOR: **Andrew Briggs**, LSHTM (London School of Hygiene and Tropical Medicine)

Im*prov*ing TB Outcomes By Modifying *Life*-Style (ProLife) Behaviours in South Africa: A Cost-Effectiveness Analysis

PRESENTER: **Ms. Jinshuo Li**, University of York
AUTHORS: Astrid Turner, Steve Parrott, Goedele Maria Louwagie, Neo Morojele, Kamran Siddiqi, Noreen Dadirai Mdege, Olufemi Babatunde Omole, André van Zyl, John Tumbo, Andrew Stephen Moriarty, Max Oscar Bachmann, Mona Kanaan, Olalekan Abdulwahab Ayo-Yusuf

Background: South Africa is among the 7 highest tuberculosis (TB) burden countries. Harmful lifestyle behaviours and poor medication adherence can affect clinical outcomes. Modification of these behaviours is likely to improve TB treatment outcomes. The ProLife programme consisted of a motivational interviewing (MI) counselling strategy, delivered by lay health workers (LHW), augmented with short text messages. A prospective, multi-centre, two-arm individual randomised controlled trial was conducted to determine the effectiveness and cost-effectiveness of the ProLife programme on improving TB and lifestyle-related outcomes in 3 provinces of South Africa.

Objectives: To assess the cost-effectiveness of the ProLife intervention over and above usual care for newly diagnosed TB patients, from a public healthcare service provider perspective. Secondary objectives were to assess cost-effectiveness of the programme in achieving smoking abstinence, reducing harmful drinking and improving TB and antiretroviral therapy (ART) medication adherence.

Methodology: Analyses were performed on an intention-to-treat basis. Costs included those of the ProLife intervention, usual care, and TB-related healthcare services over a 6 months period. All costs were presented in South African Rand (ZAR) 2019 price. The outcomes were measured in terms of improvement in TB treatment outcomes, quality-adjusted life years (QALYs), abstinence from smoking, reduction of harmful drinking, and improvement of TB and ART medication adherence.

Costs were estimated based on research records and TB records, and participants' self-reports on case report forms. Secondary sources were used to value the quantities extracted or collected by the research team. QALYs were calculated using the EQ-5D-3L and, in the absence of a validated South African valuation set, the valuation set from Argentina. Missing data were dealt with using multiple imputation technique. No discounting was applied.

Results: Costs of ProLife intervention were R2601 (SD R6.21) per participant, including training and supervision of LHWs, and delivery of MI sessions and text messages. Training accounted for > 90% of the costs. Total costs were R3694 (SE R142) per participant in the intervention arm (n=283) and R1940 (SE R724) in the control arm (n=291). The adjusted difference in mean total costs was R2373 (95% CI R2117 to R2708). QALYs over six months period were 0.443 (SE 0.004) per participant in the intervention arm and 0.435 (SE 0.004) in the control arm. The adjusted difference in mean QALYs was 0.006 (95% CI -0.001 to 0.013). The ICER was R395 500 per QALY gained for the intervention over and above the control (0% probability of cost-effective from R0 to R100 000 per QALY).

No significant difference was shown for TB treatment outcome, abstinence from smoking, reduction of harmful drinking, or medication adherence between arms. There was no demonstrable cost-effectiveness of the ProLife intervention in terms of these outcomes either.

Conclusion: While the ProLife intervention was more costly and produced higher QALYs, the difference in costs were far more prominent than the difference in QALYs. Up to the willingness-to-pay at R100 000 per QALY, there was zero probability of ProLife being cost-effective. Alternative and intensified efforts are needed to realise the intended behavioural change to improve TB outcomes.

The Costs of Using Antibody Self-Tests to Diagnose Hepatitis C Virus Infection in Four Low and Middle-Income Country Settings

PRESENTER: **Josephine Walker**, University of Bristol

AUTHORS: Philippa Easterbrook, Emmanuel Fajardo, Elena Ivanova, Muhammad S Jamil, Cheryl Johnson, Niklas Luhmann, Jason Ong, Fern Terris-Prestholt, Peter Vickerman, Sonjelle Shilton

Introduction: Hepatitis C virus (HCV) infection is widespread globally. However, less than 20% of the estimated 71 million persons infected knew their diagnosis in 2017. Self-testing (HCVST) has been proposed as one approach to promote access to testing and awareness of HCV status. Potential challenges are in achieving high rates of linkage to confirmatory testing and treatment compared to standard facility-based testing. We modelled cost per HCV diagnosis with antibody-testing using HCVST compared to facility-based testing approaches to inform global and national policy towards reaching global 2030 HCV elimination targets.

Methods: We used a decision analysis model with a one-year time horizon to examine the key drivers of cost of diagnosis following introduction of HCVST in four settings: China: men who have sex with men (MSM), HCV antibody prevalence 1%; Georgia: men aged 40-49 years, prevalence 23%; Viet Nam: people who inject drugs (PWID), prevalence 60%; and Kenya: PWID, prevalence 11%. Model parameters such as unit costs, resource use, standard of care testing rates, and linkage to care were informed by data from HCV testing and treatment programs, HIV self-testing programs, expert opinion, and manufacturers (self-test unit costs). As diagnosis of HCV viremia requires nucleic acid testing (NAT) after antibody screening, we compare cost per diagnosis under scenarios where a reactive HCVST would be followed by another facility-based antibody test and NAT, or directly to NAT. We assumed HCVST is $5/unit for oral-fluid and $1.50/unit for blood-based test ($1-$14 for facility-based test); uptake of HCVST is 10% or 50% of those who do not otherwise access facility-based testing per year; and replacement of facility-based testing by HCVST is 5% or 20%. We present the economic cost from a provider's perspective for incremental cost per patient diagnosed (defined as confirmed infected by NAT) for HCVST compared to facility-based testing alone in each setting.

Results: Cost per HCV diagnosis under the standard of care (without HCVST) varied by setting from $35 in Viet Nam to $276 in Kenya. Incremental cost per person diagnosed using oral HCVST and linking to facility-based antibody testing prior to NAT, and assuming 10% uptake and 5% replacement of HCVST was approximately 1.8 times the facility-based cost per diagnosis in each setting except China (4.4 times facility-based cost). For blood-based tests direct to NAT the incremental cost per diagnosis was 0.96-1.6 times facility-based costs. Use of NAT confirmatory testing directly after a positive HCVST was cheaper per diagnosis than repeat antibody testing (5-15% lower across the case studies). Increasing uptake of HCVST to 50% reduced cost/diagnosis by 3-11%, while increasing replacement of facility-based testing to 20% increased cost/diagnosis by 12%-120%.

Conclusions: Cost per HCV diagnosis for HCVST is higher compared to standard testing in all settings, but HCVST may increase the number of people diagnosed, and therefore linked to care and treatment. Incremental cost per diagnosis with HCVST can be minimized by reducing cost per test kit, going direct to NAT testing after HCVST, and increasing uptake of HCVST while minimizing replacement of facility-based tests by HCVST.

Making the Economic Case for New Investments in Malaria: An Analysis of the Cost-Effectiveness and Affordability of Novel Long Lasting Microbial Larvicides in the Kenyan Highlands

PRESENTER: **Caroline Watts**, UNSW Sydney

AUTHORS: Guofa Zhou, Harrysone E Atieli, Alex (Ming-Chieh) Lee, Andrew K Githeko, Daibin Zhong, Chloe (Xiaoming) Wang, Yahya A Derua, Samuel C Kahindi, Guiyun Yan, Virginia Wiseman

Background: In Africa, new methods are required to control malaria where there is increasing resistance to traditional insecticides and outdoor transmission. The development of slow-release, long-lasting formulation of microbial larvicides that are not harmful to non-target organisms are another strategy with the potential to improve malaria control. Larvicides target mosquitoes in the larval stage before they become airborne, reducing the number of mosquitoes that reach maturity. While their efficacy looks promising compared to previous formulations of larvicide which were short acting and required multiple applications, the cost-effectiveness of the newer long acting larvicides is unknown.

Methods: A cost-effectiveness analysis was conducted alongside a cluster randomized trial comparing the addition of a microbial larvicide program with standard practice from a provider and societal perspective over a 1-year time horizon in the Western highlands of Kenya. The primary outcome was the number of malaria cases averted which was used to calculate the incremental cost effectiveness ratio (ICER). Program costs included all resources required to set-up, implement, and maintain the larvicide program. Treatment costs included the direct medical costs to patients and the health care system related to diagnosing and treating malaria and the indirect costs to patients including any out-of-pocket costs (e.g. transport and food) and income forgone (e.g. time off work and normal activities). The cost-effectiveness of expanding coverage of the program to similar topographical areas in the region was modelled in a scale-up scenario. A budget impact analysis was also conducted to assess affordability of the program from the payer perspective. Costs were calculated in Kenyan shillings and converted to 2019 USD.

Results: The total cost of the program was US$51,229, of which set-up costs constituted 43%. Compared to standard practice, the larvicide program led to a net saving of US$3.32 per malaria case averted. Scaling up the program to an additional 4 countries (an area of 5,593 km^2 and population density between 552-1,047 persons per km^2) was estimated to generate health system savings of US$1,603,662 or a net saving of US$3.46 per case averted. Sensitivity analysis revealed that decreasing or increasing population density had the greatest effect on the primary outcome, with the ICER ranging from US$0.71 to -US$9.53 per case averted based on 552 to 1,049 persons km^2 respectively. An investment of US$4,921,509 over three years is predicted to generate savings of US$890,278 to the Kenyan Government.

Conclusion: Long-lasting microbial larvicide is cost saving as a supplementary measure alongside the usual malarial control measures used by households in the Kenyan highlands where there is high vector insecticide resistance, outdoor transmission and larval habitat distribution is relatively congregated.

The Cost-Effectiveness and Impact of Molecular Point of Care Testing for Chlamydia and Gonorrhea on the Reproductive Health of Indigenous Women in Remote Australian Communities

PRESENTER: **Caroline Watts**, UNSW Sydney

AUTHORS: Louise Causer, Ben Hui, Virginia Wiseman, Kirsty Smith, Kelly Andrewartha, David G Regan, Basil Donovan, Christopher K Fairley, Mark Shephard, Handan Wand, Annie Tangey, Belinda Hengel, Steven Badman, Lisa Maher, Brett Walley, Catherine Carroll, Sean O'Connor, Rudie Marshall-Lang, David Whiley, Manoji Gunathilake, David Anderson, David Atkinson, Donna Mak, David Persing, Paul Armstrong, David Speers, Liliana Bulfone, James Ward, John M Kaldor, Rebecca J Guy

Background: The reproductive health outcomes of Indigenous women in Australia are markedly poorer than for non-Indigenous women, and untreated sexually transmitted infections (STIs) such as chlamydia, gonorrhea and trichomonas are major contributors. In remote Australian Indigenous communities, significant distances to centralized laboratories leads to delays in receiving results and treatment. In 2013-2015, the TTANGO randomised controlled trial found that near point-of-care (POC) molecular tests substantially improved the uptake and timeliness of treatment for STIs. However, the technology's contribution to reducing adverse reproductive outcomes and cost-effectiveness was unknown.

Methods: A micro-simulation Markov model was constructed to simulate the patient clinical pathway using POC tests for chlamydia and gonorrhea in a hypothetical remote health service, compared to sending specimens to a laboratory (standard care) to calculate an incremental cost

per quality adjusted life year (QALY) gained from the health system perspective. A10-year time horizon was used. Days to treatment were based on TTANGO trial data and probabilities related to risk of sequelae were drawn from published literature. Resources required for the diagnosis, management, and follow-up of patients with a positive test result were obtained from published clinical guidelines and government health service cost data. Interviews were also conducted with staff to understand staff time related to patient workflow and follow-up in remote health services. QALY weights related to chlamydia and gonorrhea infection and other sequelae were sourced from published estimates. Sensitivity analyses were conducted to examine uncertainties in model inputs. We also included a scale-up scenario to estimate annual savings.

Results: The mean total cost per woman tested/managed over 10 years, was AU$1,298 based on POC testing, compared to AU$1,429 for laboratory-based testing and the mean QALYs gained were 7.99 and 7.96, respectively based on current testing coverage. The main drivers of reduced costs for POC testing were decreased staff time required for follow-up of patients for treatment and decreased incidence of PID and sequalae including ectopic pregnancy (22% and 52%, respectively). We estimate scale up of POC tests to 75 remote communities in Australia in the first year will cost the Australian government an additional AU$1.27 million, above the AU$1 million that would be paid as the government (Medicare) rebate for laboratory-based testing and deliver AU$3.33 million in savings due to reductions in STI-related PID hospitalizations and associated costs including aero-evacuations. On scale up, for every additional AU$1 spent by the government on POC testing for STIs, AU$2.62 would be saved.

Conclusions: Findings from our modelling suggest that near POC molecular testing for the management of chlamydia and gonorrhoea among women in remote Indigenous communities is cost effective compared to laboratory testing and is expected to contribute to addressing reproductive health inequities in settings with poor access to or delays with to laboratory testing facilities.

7:45 AM –8:45 AM TUESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Health Financing in Devolved Contexts and Its Implications for Progress Towards Universal Health Coverage

SESSION CHAIR: **Nirmala Ravishankar**, ThinkWell

DISCUSSANT: **Andrew Mulwa**, ; **Mary Joy Castroverde**, ; **Ileana Cristina Diaconescu**, ThinkWell

How Does Devolution Affect Health Financing? A Synthesis of Findings from Seven Country Case Studies

PRESENTER: **Inke Mathauer**, World Health Organization

AUTHORS: Nirmala Ravishankar, Ms. Ileana Cristina Diaconescu, Michael Chaitkin

Background

Over the past decades, countries around the world have devolved decision-making authority to sub-national government units in various sectors including health. In parallel, countries have also initiated health financing reforms for achieving the goal of universal health coverage (UHC), such as expanding health coverage including public health insurance, eliminating user fees for selected services and/or selected population groups, and introducing output-oriented payment methods. While national governments exercise a high degree of control over the design of health financing reforms, their implementation is heavily influenced by the devolved institutional setup. Against this backdrop, the World Health Organization (WHO) and ThinkWell launched a multi-country study to explore how devolution has affected overall spending on health, equitable resource distribution and redistributive capacity, as well as local purchasers' ability to make purchasing more strategic.

Methods

A jointly developed analytical framework guided the assessment of health financing arrangements in devolved settings. Seven country case studies were developed drawing on information from (1) a desk review of academic publications, the grey literature, and government documents and (2) interviews with government officials and experts from academia, development agencies, and civil society organizations.

Findings

With respect to revenue raising, unclear revenue sharing rules between the central and sub-national governments emerged as a common theme. In general, the distribution favors the central level, resulting in resource shortage at the local level, particularly for primary healthcare. Moreover, allocation formulas to distribute funds among sub-national territories are complex and exacerbate existing inequities across sub-national territories as they are not driven by needs but by existing infrastructure and health worker numbers.

In terms of the pooling function, devolution appears to have increased fragmentation, creating multiple territorial pools as well as territorial overlap in terms of service and population coverage across different levels (e.g., regions, districts, etc.). In some countries, the health insurance system is also territorially organized, making coordination with local health authorities more difficult. All of this implies multiple packages and multiple payment methods, increasing inefficient allocation and spending as well as inequities across territories as well as urban versus rural populations.

Regarding purchasing, local health authorities have limited discretion to take purchasing decisions, as local resources – which are scarce to begin with -- are tied to personnel and medicines costs. Government health facilities can often not retain their revenues from user charges and other purchasers such as health insurance schemes. In several countries, this reduction in facility autonomy followed recent devolution processes, because of local health authorities trying to expand their (limited) resource allocation discretion space.

Conclusion:

The current practice of devolution in these seven countries has not contributed to making health financing arrangements more conducive to UHC progress. Policy options to address these shortcomings include revision of revenue sharing rules in favor of sub-national levels; revision of resource allocation formula across sub-national units; streamlining of health financing and service delivery responsibilities to reduce fragmentation and to clarify purchasing roles; and giving more managerial and financial autonomy to health facilities to make purchasing reforms effective.

Challenges and Opportunities for Health Financing Reforms in the Age of Devolution: A Perspective from Kenya

PRESENTER: **Boniface Mbuthia**, Decision Maker

AUTHOR: Nirmala Ravishankar

Introduction

Kenya's transition to a devolved system of government in 2013 fundamentally transformed the organization of health financing functions. While the national government continues to mobilize the bulk of public funds for health, over half of the funds are pooled at the county-level. Moreover, counties are the main purchasers of primary and secondary care services in the country. This case study provides a detailed analysis of how devolution has impacted the three functions of health financing of revenue raising, pooling and purchasing, and explores its implications for the country's strategy for achieving universal health coverage (UHC).

Methods

The World Health Organization and ThinkWell jointly developed an analytical framework to guide the assessment of health financing arrangements in devolved settings. Information for the Kenya case study was drawn from a purposeful review of the peer-reviewed literature, government budget documents, and other online publications. We also conducted 30 key informant interviews with national stakeholders, county officials, and health facility managers in three counties.

Findings

Counties rely on national revenue to finance the bulk of their spending. In fiscal year 2018/19, own-source revenue generated by counties accounted for 12% of their budgets, compared to 66% being financed by block grants from the national government. While counties exercise full discretion over allocation decisions, their ability to operate is hampered by frequent delays in the release of funds from the national level. The Ministry of Health (MOH) has increasingly used the conditional grant mechanism, to channel additional ear-marked resources to counties to finance activities that align with national health policies and plans. However, it is not using the "carrots" and the "sticks" that the mechanism affords to influence county government policies effectively.

Devolution has created 49 pools for public resources for health controlled by MOH, the National Hospital Insurance Fund (NHIF) and 47 county governments. The Government of Kenya (GoK) is keen to use NHIF as the vehicle for making progress towards UHC. However, NHIF coverage has plateaued at 20% for over a decade, and the politics of devolution poses a significant challenge to the national government allocating resources to subsidize coverage through NHIF as this is viewed as a backdoor way of recentralizing health funds.

For their part, county governments would be well served by testing approaches to become more strategic purchasers of health services. Presently, the bulk of county spending for health flows via budgetary allocations for salaries, commodities, and facility maintenance. County governments use resources from conditional grants to transfer funds to primary care facilities. Augmenting these transfers to facilities and linking them more explicitly to outcomes would be a step in the direction of making purchasing more strategic.

Conclusion

Devolution has complicated the process of UHC reforms in that key decisions can no longer be driven from the center; counties control most health funds and derive independent decision-making powers from the Constitution. Implementation of current plans call for greater coordination between national and county governments, timely and transparent intergovernmental transfers, and improved county-level purchasing policy and practice.

How Devolution Has Shaped Health Financing Arrangements: A Case Study of the Philippines

PRESENTER: **Maria Eufemia Chan Yap**, ThinkWell
AUTHORS: Dr. Pura Angela Wee Co, Jemar Anne Sigua, Christian Nuevo, Mary Camille Samson

Background

The Local Government Code of 1991 reshaped the centralized health system of the Philippines into a highly decentralized system. Several major policy reforms have since been enacted to better facilitate the flow of money for health across the different levels of governance. Even with these changes, financing of health services continues to face considerable challenges brought about by the devolved structure. Against this backdrop, we explore how devolution has affected overall spending on health, equitable resource distribution and redistributive capacity, as well as strategic purchasing in the country as part of a World Health Organization (WHO) and ThinkWell multi-country study.

Methods

An analytical framework jointly developed by WHO and ThinkWell was used to guide the assessment of health financing arrangements in the Philippines. Data were collected through a desk review of academic publications, grey literature, and government documents, and key informant interviews with local experts in two provinces.

Findings

Revenues for health have seen a large increase in recent years. Most of these are observed at national level, with revenue generation plateauing at the local level. LGUs continue to exhibit high dependency on the internal revenue allotment (IRA) as an intergovernmental fiscal transfer from the national government. National level resources are predominantly within the Department of Health and the National Health Insurance Program (NHIP). At the subnational level, moneys via the various sources of revenues are pooled at each individual tier of LGU, including the IRA. This setup is observably regressive because not all LGUs have the same economic capacity. Furthermore, the IRA only allocates funds based on population, density, and geographic size, and does not account for inter-LGU inequities.

With respect to purchasing, LGUs and DOH pay for inputs at public facilities via line-item budgets. The Philippine Health Insurance Corporation (PhilHealth), a social health insurance government agency established in 1995 to run NHIP, also has benefit packages for primary, inpatient, and catastrophic health care services. Since these packages tend to cover for the same inputs already funded by LGUs and DOH, efficiency in government spending as well as effectiveness in PhilHealth's strategic purchasing role is hampered. Public facilities under LGU control do not have the authority to retain funds they receive from PhilHealth, which further dampens any strategic purchasing "signals" sent by the national purchaser.

Conclusion:

Devolution continues to affect public financing of health services in the Philippines. Soon after the full implementation of the Local Government Code in 1991, the consequences of inadequate preparation for a devolved system became apparent in the areas of health financing and service delivery at the local level. While revenue for the health sector has increased in recent years, challenges related to intergovernmental transfers, pooling, purchasing, and accountability persist. There is continued need to strengthen health financing and public financing management (PFM) systems for health, leveraging the window offered by the Universal Health Care (UHC) Law implementation.

7:45 AM–8:45 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Health Outcome Measurement

MODERATOR: **Lei Lei**, Research Institute of Economics and Management, Southwestern University of Finance and Economics

Burdens and Capabilities: "Option Freedom" As a Health-Related Outcome Measure

PRESENTER: **Jasper Tobias Ubels**
AUTHORS: Karla Hernández-Villafuerte, Michael Schlander

Introduction:

Proponents of the capability approach argue that the value of health technologies should be assessed beyond their effect on health, since they affect a person's capabilities. A capability is commonly understood as "... that what an individual can do." This definition has formed the conceptual basis for the development of tools to measure individuals' capabilities. An alternative conceptualization of capability is that of "option freedom". An option freedom consists of options, which are the alternatives from which an individual can choose, and access to those options, which can be blocked or burdened. Creating a measure based on "option freedom" would theoretically result in a broader assessment of capabilities, since there is an additional focus on the burdens that people experience whilst achieving capabilities. We aim to operationalize the concept "option freedom".

Methods:

First, a "best-fit framework synthesis" was conducted with seven qualitative papers that explain the development of capability measures. A-priori themes were elicited from the concept "option freedom". Data from the papers that did not fit a-priori themes were thematically analysed. Newly emerging themes were used to analyse the data again. This process was repeated until no new themes emerged. This analysis resulted in a framework of capability wellbeing based on the concept "option freedom".

Then, the framework was used to create a scale with items from the Multi Instrument Comparison (MIC) database. The MIC database consists of a collection of quality of life measures completed by 8,022 participants. This database was split into a training and a test dataset. Items were

selected by comparing themes and related quotes from the framework with items from the MIC database. With these items, a measurement model was estimated with a robust maximum likelihood estimator. Explorative adjustments were made by studying residual correlations and modification indices. Model fit was evaluated with the robust Root Mean Square Error of Approximation (RMSEA) and the robust Comparative Fit Index (CFI).

Results:

A scale with three domains consisting of 22 items was developed (training dataset: RMSEA: 0.059, CFI: 0.952). The three domains are: (1) Perceived Access to Options, which represents the measurement of health related capability, (2) Reflective Wellbeing, which represents cognitive aspects of wellbeing and (3) Affective Wellbeing, which represents emotional aspects of wellbeing.

Conclusions:

This study uses the concept "option freedom" for capability measure development. This concept has proven to be useful "lens" to interpret qualitative data. The scale produced in this study assesses the value of health technologies by evaluating its effect on capabilities and burdens in capability achievement, which results in a broad assessment of health related capability. The scale also includes content representing the subjective experience of those capabilities. Further studies are warranted to develop the use of "option freedom" for measure development.

References

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Defining Worse-Than-Death Health States: An Unavoidable Necessity for the QALY Approach?

PRESENTER: **Afschin Gandjour**, Frankfurt School of Finance & Management

Introduction: Severe conditions can lead to health states perceived to be worse than death/being dead. In the conventional approach of calculating quality-adjusted life years (QALYs) states worse than death are assessed by methods such as the time trade-off or the visual analogue scale. Yet, the ability to discriminate states worse than death has been questioned. In addition, as preference weights can extend to minus infinity, the bottom of the valuation scale is usually arbitrarily fixed. The purpose of this study was to re-analyze the necessity of eliciting preference scores for states worse than death.

Methods: This study analyzes three distinct scenarios of providing treatment for health states considered to be worse than death. The scenarios differ by whether the average treatment outcome and the lower bound of its 95% confidence interval (CI) are better or worse than death. For outcomes worse than death, a distinction is made with regard to the existence of a preference for continuous living.

Results: Given the availability of effective and cheap interventions such as palliative sedation, average treatment outcomes worse than death require an ethical justification, i.e., a preference for continuous living despite a health state considered to be worse than death. Fulfilling this criterion allows assigning a preference score above zero, representing a preference for living, and capturing changes in-between states worse than death above the zero line. In agreement, a zero score would be assigned to a state of indifference to living. For treatments with an average outcome better than death but a lower CI bound signifying a preference for death, probabilistic sensitivity analysis could rank disease trajectories with a preference for death based on the degree of suicidal wish (because tradeoffs between costs and degrees of suicidal wish are ethically questionable).

Conclusions: It is possible to define the zero point of the valuation scale as a state of indifference to living and still capture relevant differences between worse-than-death states above the zero when conducting an economic evaluation based on the QALY method. Discrimination between degrees of preference for death appears to be only necessary for the purpose of rank-ordering alternatives in a probabilistic sensitivity analysis and can be captured by the degree of suicidal wish.

Responsiveness and Convergent Validity of QLU-C10D and EQ-5D-3L in Assessing Short-Term Quality of Life Following Esophagectomy

PRESENTER: **Norma Brenda Bulamu**, Flinders University

AUTHORS: Ravi Vissapragada, Gang Chen, Julie Ratcliffe, David I Watson

Aim: This study assessed the responsiveness and convergent validity of two preference-based measures; the newly developed cancer specific EORTC Quality of Life Utility Measure-Core 10 dimensions (QLU-C10D) relative to the generic three level version of the EuroQol 5 dimensions (EQ-5D-3L) in evaluating short-term quality of life outcomes/utilities after esophagectomy.

Methods: Participants were involved in a multicentre 2×2 factorial randomised controlled trial conducted to determine the impact of preoperative and postoperative immunonutrition versus standard nutrition in patients with oesophageal cancer. Quality of life was measured seven days before and 42 days after esophagectomy. Standardized Response Mean and Effect Size were calculated to assess responsiveness. Ceiling effects for each dimension were calculated as the proportion of the best level responses for that dimension. Convergent validity was assessed using Spearman's correlation and the level of agreement between the instruments was further explored using Bland–Altman plots. Regression analysis was performed to identify which demographic and clinical factors influenced quality of life outcomes.

Results: There were 164 respondents, predominantly male (81%) with mean age of 63 years. Quality of life on both measures was significantly reduced with large effect sizes (>80), although the mean difference was greater with QLU-C10D. Ceiling effects after esophagectomy ranged from 12% (usual activities) to 86% (social care) for EQ-5D-3L and 5% (role) to 53% (emotion) for QLU-C10D. A strong correlation (r=0.71) was observed between anxiety on the EQ-5D-3L and emotional function on the QLU-C10D, but weak correlations (r< 0.4) with the symptom domains of QLU-C10D. Good agreement (3.7% observations outside the limits of agreement) was observed between the utility scores. Changes in the symptom scores were stronger predictors of follow-up quality of life than changes in the functional scores.

Conclusion: Although there is strong agreement between utility scores, QLU-C10D was more sensitive to short term changes in quality-of-life following esophagectomy. Cognisant of requirements by policy makers to apply generic utility instruments in cost effectiveness studies, condition specific utility instruments should be used alongside the generic instrument.

Valuing Depression Using the Well-Being Valuation Approach

PRESENTER: **Daniela Andren**, Örebro University

The continuously dramatic increase of the number of people suffering from depression attracts an increasing demand for effective ways of preventing depression. Without the need for new interventions, there is also a continuous call for a more robust framework for economic evaluation of public interventions. Taking in account people's preferences for public goods is not straightforward to quantify, and therefore, without the importance of designing new technique for valuing non-market goods and services, it is equally important to use methods that are not yet established as traditional. One less used method to assess the cost of depression in monetary terms is the well-being valuation method or the life satisfaction approach, which requires answers to questions that are significantly less time demanding for the respondents than more traditional approaches to valuation.

We use, to our knowledge, for the first time Swedish data to value the individual experience of depression in monetary terms by using the well-being valuation method; i.e., we estimate how much money would be needed to compensate people to return their well-being level without having depression. In order to do this, we asked well-being questions to 500 respondents that were randomly selected from a Swedish representative web-panel during the fall 2017 and answered a web-contingent valuation survey that includes a detailed description of an intervention aimed to decrease

depression and the hypothetical change regarding the intervention, questions about willingness to pay for the intervention and questions about respondents' characteristics.

Next to using a fairly new valuation method to value the experience of depression, our empirical analysis is also innovative on that it distinguishes between two types of situations, depending on whether the respondents themselves or someone that they knew well has experienced depression and also considered if the respondents were worried for becoming depressed.

The estimated "well-being" cost of the respondents than knew well someone has experienced depression (Euro 5000) is less than one third part of the well-being cost for those who experienced depression themselves (Euro 17000). Given that we did not have access to any alternative measurements of both well-being and experience of depression, our results are only a relative reference point when no other information is available.

Keywords: depression, subjective well-being, well-being valuation method (WVM), life satisfaction approach (LSA).

JEL Classification: A12; D60; I31.

7:45 AM –8:45 AM TUESDAY [Health Care Financing And Expenditures]

FINANCING FOR UNIVERSAL HEALTH COVERAGE SIG SESSION: Burden of Different Financing Mechanisms across Socio-Economic Groups

MODERATOR: **Virginia Wiseman**, London School of Hygiene & Tropical Medicine

Who Pays for Health Care in Indonesia? A Financing Incidence Analysis

PRESENTER: **Qinglu Cheng**

AUTHORS: Augustine Asante, Nicola Man, Hasbullah Thabrany, Aryana Satrya, Manon Haemmerli, Dwie Susilo, Rifqi Abdul Fattah, Danty Novitasari, Gemala Chairunnisa Puteri, Eviati Adawiyah, Virginia Wiseman

Background

Indonesia is an upper middle-income country that is implementing significant financing reforms to achieve Universal Health Coverage (UHC). In 2014, it launched a single payer national health insurance scheme, Jaminan Kesehatan Nasional (JKN) with the aim of covering the entire population by the end of 2019. This target date has since been moved back to 2024. One key principle underlying UHC is equity in health system financing, commonly defined a system that ensures people with greater ability-to-pay (ATP) make higher levels of contribution towards financing healthcare. The objective of this study is to assess the equity of healthcare financing in Indonesia following the implementation of the JKN.

Methods

We conducted a financing incidence analysis (FIA) to measure how the burden of healthcare financing is distributed across socio-economic groups, using multiple datasets. The National Socioeconomic Survey of Indonesia (2018) and the Indonesian Family Life Survey Wave 5 were used to measure ATP, out-of-pocket (OOP) payments, indirect taxes, income tax payments of households, social health insurance (SHI), company healthcare benefits and private health insurance (PHI) contributions. The proportional contributions of all sources of taxation revenue were derived from budget reports produced by the Indonesian Ministry of Finance (2018). National Health Accounts (NHA) data from Ministry of Health (2018) were used to weight each source of health financing. Summary indices (concentration and Kakwani indices) were obtained for the different sources of healthcare financing and for the health financing system as a whole.

Results

In 2018, OOP payments were the largest contributor to health financing, accounting for about a third of total health expenditure. SHI contributed to 23% of total health expenditure. Indirect taxes, company healthcare benefits, SHI and PHI were found to be regressive, while direct taxes and OOP were progressive (Kakwani indices were 0.007 and 0.049 respectively). The overall health financing system was slightly regressive in 2018, with a Kakwani index of -0.040.

Conclusion

The marginally regressive nature of the overall health financing system including SHI contributions, suggests that Indonesia still has a way to go in developing a fair and equitable health financing system. The good news is that OOP payments were found to be progressive, although this warrants a closer examination to ensure that the poor are not simply forgoing health care and people are receiving quality health care.

Socioeconomic Inequality in Household Willingness to Pay for Social Health Insurance in Zambia

PRESENTER: **Kabaso Mulenga**, University of Witwatersrand

Abstract

Background

Zambia is in the process of introducing and implementing a social health insurance scheme to achieve the goal of universal health insurance. This study aims to analyze the socioeconomic inequalities in household willingness to pay for social health insurance in Zambia. Specifically, this study first aims to examine the association between socioeconomic status and household willingness to pay. Then, this study documents the extent of socioeconomic inequality in household willingness to pay. And lastly, this study examines factors that contribute to socioeconomic inequalities in household willingness to pay.

Methods

The study used data from the Zambia Household Health Expenditure and Utilization Survey 2014, a nationally representative survey of 1200 households and 59500 individuals. Contingent valuation was used to elicit willingness to pay using bidding game technique. Interval, Tobit and Logistic regressions were conducted to examine the relationship between socioeconomic status and willingness to pay. Concentration indices and curves were used to measure inequalities in willingness to pay. Oaxaca-Blinder and Wagstaff decompositions were used to determine factors that contribute to these willingness-to-pay inequalities. Both absolute willingness to pay amount (continuous variable) and dichotomous willingness to pay (discrete or binary variable) were used as outcome variables.

Results

More than 80% of Zambians were willing to pay for social health insurance for their household, which came to an average of K90.76 ($4.31) per month per household. Interval, Tobit and Logistic regressions identified age, gender, household size, marital status, religion, location, monthly expenditure, education level, employment status and insurance experience as the key determinants of willingness to pay. The concentration indices for socioeconomic inequality in willingness to pay are estimated at 0.389 for absolute outcome variable and 0.196 for dichotomous outcome variable. This suggests that the wealthy are more willing to pay for social health insurance compared to the less wealthy Zambians. In all the decompositions, the most important contributor to socioeconomic inequality in willingness to pay is monthly expenditure. Other notable variables that make large contributions to the inequalities in willingness to pay include education, employment status and household insurance experience.

Conclusion

The results of this study imply that the contributions to the social health insurance scheme by households needs to be adjusted for wealth and use of exemptions or subsidies to help the poor. Thus, to attain greater equity in health, government should consider a policy of varying contributions

according to wealth or exemptions and subsidies. In addition, given that wealth (monthly expenditure) is the main contributor to the socioeconomic inequalities to willingness to pay, policy makers should target reductions in this positive contributing factor via implementation of programs that improve general social welfare. Government should create employment and income generating activities that absorb everyone regardless of their socioeconomic status. Interventions that promote, especially the poor, in healthcare, education, employment and income generating activities are vital for a less developed country like Zambia. Access to insurance should also be extended to the uninsured.

Exemption for the Poor or the Rich? An Assessment of Socioeconomic Inequalities in Ghana's National Health Insurance Exemption Policies

PRESENTER: **Jacob Novignon**, Kwame Nkrumah University of Science and Technology

Out of pocket payments for health is considered a major limitation to universal health coverage. Policymakers across the globe are committed to achieving UHC through the removal of financial barriers to health care. In Ghana, a national and public-funded health insurance scheme was established for this purpose. A unique feature of the scheme is its premium exemption policies for vulnerable groups. In this paper, we access the nature of socioeconomic inequality in these exemption policies. We used data from the Ghana Living Standards Survey (GLSS) rounds six and seven. Socioeconomic inequality was assessed using concentration curves and indices. Real household annual total consumption expenditure adjusted by adult equivalence scale was used as wealth indicator. Four categories of exemption were used as outcome variables. These were exemption for indigents, individuals under 18 years, the aged and free maternal service. The analysis was also disaggregated by rural and urban location of individuals. We found that while socioeconomic inequality in overall NHIS coverage favoured the wealthy, inequality in all categories of premium exemption favoured the poor. There was also evidence of a general decline in the magnitude of inequality over the survey periods. With the specific exemptions, inequalities in exemption for indigents and maternal services were most relevant in rural locations while inequalities in exemption for individuals under 18 years and the aged were significant in urban areas. The findings suggest that the exemption policies under the NHIS are generally progressive and achieving the objective of inclusion for the under-privileged. However, it also provides lessons for better targeting and effective implementation. There may be need for separate efforts to better target individuals in rural and urban locations to improve enrolment.

Equity in Public Health Spending in Ethiopia: Benefit Incidence Analysis

PRESENTER: **Dr. Alemayehu Hailu**, University of Bergen

AUTHORS: Roman Gebreyes, Ole F. Norheim

Inequality in access and utilization of health services because of socioeconomic status is unfair, and it should be monitored and corrected with appropriate remedial action. Therefore, this study aimed to estimate the distribution of benefits from public spending on health care across socioeconomic groups in Ethiopia using a benefit incidence analysis (BIA). We employed health service utilization data from the Living Standard Measurement Survey, recurrent government expenditure data from the Ministry of Finance and health services delivery data from the Ministry of Health's Health Management Information System. We calculated unit subsidy as the ratio of recurrent government health expenditure on a particular service type to the corresponding number of health services visits. The concentration index (CI) was applied to measure inequality in health care utilization and the distribution of the subsidy across socioeconomic groups. We conducted a disaggregated analysis comparing health delivery levels and service types. Furthermore, we used decomposition analysis to measure the percentage contribution of various factors to the overall inequalities. We found that 61% of recurrent government spending on health goes to health centres, and 74% was spent on outpatient services. Besides, we found a slightly pro-poor public spending on health, with a CI of -0.039, yet the picture was more nuanced when disaggregated by health delivery levels and service types. The subsidy at the hospital level and for inpatient services benefited the wealthier quintiles most. However, at the health centre level and for outpatient services, the subsidies were slightly pro-poor. Therefore, an effort is needed in making inpatient and hospital services more equitable by improving the health service utilization of those in the lower quintiles and those in rural areas. Besides, policymakers in Ethiopia should use this evidence to monitor inequity in government spending on health, thereby improving government resources allocation to target the disadvantaged better.

9:15 AM – 10:15 AM TUESDAY [Cross-Cutting Themes And Other Issues]

COVID Health Outcomes and Inequalities II

MODERATOR: **Joanna Coast**, University of Bristol

How Can We Keep Schools and Universities Open? Differentiating Closures By Economic Sector to Optimize Social and Economic Activity While Containing SARS-CoV-2 Transmission

PRESENTER: **Katharina Hauck**, Imperial College London

AUTHORS: Peter C Smith, David Haw, Giovanni Forchini, Paula Christen, Azra Ghani, Neil Ferguson

Closures of schools, universities, and workplaces are a key non-pharmaceutical intervention (NPI) in the control of the COVID-19 pandemic. However, they are associated with high economic and social costs. To stem the rise in transmissions, countries need to tighten NPIs in other areas of society, most notably closure of businesses deemed non-essential for day-to-day life. However, business closures are also associated with high economic and social costs, and a crude lever if implemented as a blanket policy across the whole economy.

Here we integrate a Susceptible-Exposed-Infectious-Removed model of SARS-CoV-2 transmission with a 63-sector economic model for the United Kingdom reflecting sectoral heterogeneity in transmission and economic interdependence between sectors. Our optimization model considers that contact-light sectors which employ fewer workers carry fewer infections back into the community when they are open compared to more contact-intensive sectors with more workers. Partial or full closing of sectors gives rise to proportionate changes in the sector's active workforce, worker-to-worker, customer-to-worker, and community transmission, and the associated impact on disease transmission.

Our model does not necessarily prioritize the sectors of the economy that contribute most to GDP relative to the spread of infection. Instead, it respects interdependencies in production between sectors; a sector that is nominally opened may not be able to function properly if its supply chain is interrupted. We use the most recent UK Input-Output table for 2016 to characterize interdependencies. We calibrate the model via a least-squares fit by comparison with English hospital occupancy data from 20th March to 30th June 2020 by varying four parameters: basic reproductive number R0; effectiveness of the UK's first lockdown; epidemic start time and first lockdown onset. Transmissibility is calculated from the fitted R0 and pre-lockdown contact patterns using the next-generation eigenvalue method.

We use the model to identify the set of sector closures over 6 months that maximizes GDP, whilst keeping the education sector operational, containing daily hospital occupancy of COVID-19 patients within the maximum spare emergency hospital capacity, and keeping the reproductive number below unity at the end of the intervention period. If a differentiated sectoral closure strategy is followed, whereby certain economic sectors are partially closed over a six-month period, a GDP gain of between £163bn (24%) and £205bn (31%) over six months can be secured (depending on spare hospital capacity) compared to a blanket lockdown of all non-essential services. Differentiated sectoral closures that keep hospital occupancy at a set maximum (between 12,000 and 24,000 beds) throughout the period are compared with a fully open economy that is projected to cause about 68,000 COVID-19 patients requiring hospital care at its peak. Activities that require partial closure in various months over autumn and winter 2020/21 are accommodation & food services including restaurants and bars, retail, creative and arts, entertainment, sports, amusement, recreation, and activities of membership organizations. To achieve the same outcomes, sectoral closures need to be much stricter if adherence to other NPIs such as social distancing is weak. Our model informs control strategies in the UK and other countries.

Valuing Indirect Impacts of the Covid-19 Response in England: The Case of Excess Cancer Deaths

PRESENTER: **Adrian Gheorghe**

AUTHORS: Camille Maringe, Ajay Aggarwal, Bernard Rachet, Kalipso Chalkidou, Richard Sullivan

Introduction: Growing evidence from many countries points to sharp decreases in cancer diagnoses during the initial policy response to the Covid-19 pandemic, particularly the "lockdowns" during the first half of 2020, with accompanying estimated increases in cancer mortality in the following years. In this study we quantify the economic impacts of the anticipated mortality increases by building on a previous cancer mortality modelling analysis for England conducted by some of us (Maringe et al, 2020).

Methods: We estimated the societal losses associated with the estimated additional excess deaths due to disruptions in diagnosis pathways for four cancer types - breast, colorectal, lung and oesophagus, which represent approximately 40% of all cancer deaths. Building on age-gender-cancer specific crude probabilities of death at 1, 3 and 5 years post-diagnosis derived from 500 bootstrap simulations of cancer registry patients with modified diagnosis pathways during the Covid-19 response, we valued health and economic losses in the pre- and post-pandemic patient cohort using quality-adjusted life years (QALYs), the human capital (HC) approach and the friction cost (FC) approach, respectively. We also estimated the impact of stage shifting i.e. more cases detected in stage 3-4 rather than 1-2, on direct costs of care. Furthermore, we compared the burden of additional excess cancer deaths with that of an equal estimated number of Covid-19 deaths, based on 500 random samples, stratified by age, drawn from the total number of Covid-19 deaths. We used age-gender specific earnings, labour participation and distribution of occupations from the Office for National Statistics as well as UK-specific average friction periods by occupational levels pooled by Kigozi et al (2017).

Results: Considering the four considered cancer sites combined, additional excess deaths would amount to approximately 32,700 QALYs lost relative to pre-pandemic deaths. Excess productivity losses amount to 103.8 (95% CI 73.2 to 132.2) million GBP under the HC approach, and 10.9 (9.2 to 12.6) million GBP under the FC approach. Uncertainty around the point estimates is highest for productivity losses calculated under the HC approach, particularly for lung and oesophageal cancer. There are important differences among the four considered cancer types in terms of the magnitude and rate of accumulation post-diagnoses of these losses, with the highest and quickest losses for additional excess deaths due to lung cancer and the lowest and more gradual losses for breast cancer. Additional excess cancer deaths are likely to generate more QALYs and economic output lost compared to the same number of COVID-19 deaths, primarily because of differences in age at death.

Conclusion: Disruptions in cancer diagnostic pathways are likely to translate in tangible losses to society in terms of livelihood and economic activity. A nuanced, risk-based approach is needed to address this backlog of cancer diagnoses over the coming years, potentially prioritising patients whose mortality risks are likely to materialise soonest, such as lung and oesophagus. A review of excess deaths beyond Covid-19 is essential for a high-resolution picture of the wider impacts of the Covid-19 response and the preparation for future service disruptions of comparable magnitude.

What Has Been the Impact of COVID-19 Pandemic on Health Inequalities? Findings from the COVID-19 Vaccine Preference and Opinion Survey (CANDOUR) Study

PRESENTER: **Philip Clarke**, Health Economics Research Centre, University of Oxford and Centre for Health Policy, University of M

AUTHORS: Raymond Duch, Guido Erreygers, Laurence Roope, Dr. Mara Violato, Fiorella Parra Mujica, Jack Pollard

What impact has COVID-19 pandemic and control measures such as lock-downs had on global health inequalities? The CONDOUR study is based on representative international surveys involving 15,000 adults from 13 countries (Australia, Brazil, Canada, Chile, China, Colombia, France, India, Italy, Spain, Uganda, the U.S. and the U.K). Collectively these countries account for around half the global population and represent very diverse social and economic contexts. The survey was conducted in late 2020 and collected information on the perceived change in health status and income. Health status was measured using a modified version of the EQ5D (to measure perceived changes in health since the start of the pandemic). The impact of the pandemic on income-related health inequalities will be quantified using bivariate inequality measures using both rank-dependent and level-dependent indexes. Given the bounded nature of the health variables, the primary emphasis will be on absolute inequality measures. We will primarily focus on the pre-pandemic and current reported health across equivalent income to determine if the pandemic has impacted adversely on health inequalities. In addition to reporting comparisons across countries, we will undertake sub-group decomposition to understand the changes within countries (for factors including age, sex, education, major health conditions).

Explaining the Ethnic Gaps in COVID-19 Health-Related Outcomes in Mexico

PRESENTER: **Andrea Salas Ortiz**, University of York. Department of Economics and Related Studies. York, England

Ethnic groups have been one of the most socially vulnerable groups among societies. Since the beginning of the Covid-19 pandemic, the World Health Organisation (WHO) warned that this pandemic could potentially affect these populations in a disproportionate manner. In a recent article, concerns were raised about the possibility to observe even higher health disparities among vulnerable populations when the Covid-19 epidemic interacts with non-communicable diseases (NCDs) in contexts of high socioeconomic inequalities. [1] Mexico is a relevant case on this matter, with a burden of disease mainly driven by NCDs accompanied with high socioeconomic inequality across ethnic groups and ranking the top-five worst countries to manage the Covid-19 pandemic. Thus, using national Covid-19 data from January to November 2020, this study investigates what are the most relevant factors that explain the differences in Covid 19-related health outcomes (hospitalisations, admission to intensive care unit (ICU), and mortality due to Covid-19) between indigenous and non-indigenous groups in Mexico. This analysis uses an adaptation of the Oaxaca decomposition method to account for a nonlinear response and identifies whether the difference between groups is due to differences in individual characteristics or in the link between characteristics and outcomes. The model accounts for the effect of individual's health conditions, including comorbidities (chronic obstructive pulmonary disease, pneumonia, hypertension, diabetes, asthma, and renal or cardiovascular diseases) and risky behaviours (obesity and smoking), as well as household deprivation circumstances and the geographical economic characteristics where people live, as all these are important factors associated with the risk of acquiring Covid-19, need hospitalisation or die. Results indicate that relevant differences between indigenous and non-indigenous exist, being the former group the one showing worse health outcomes. The differences in Covid-related hospitalisations; ICU admissions and mortality is 13.4%, 1.31% and 6.3% respectively. These differences are mainly attributable to differences in people's characteristics. This effect represents 91%, 54% and 92% of the ethnic differential in Covid-related hospitalisations; ICU admissions and mortality, respectively. When disentangling the contribution of individual and contextual circumstances to groups differences, results show that in all three health outcomes underlying health conditions is the main driver behind ethnic health inequalities. The second contributor is the geographical economic circumstances where people live. Individual's household conditions is a factor only relevant for Covid-related hospitalisations. One potential explanation of these results is that indigenous people in Mexico tend to observe poorer health and socioeconomic conditions which have led to poorer health outcomes. Consequently, this analysis would evidence that Covid-19 has exacerbated the pre-existing and longstanding health inequalities between indigenous and non-indigenous people in Mexico. These findings highlight the imperative need to create policies that mitigate the further disproportionate impact of Covid-19.

[1] Horton, R. (2020). "Offline: COVID-19 is not a pandemic". In: *The Lancet*. Vol.396; p.874. doi:10.1016/S0140-6736(20)32000-6

9:15 AM –10:15 AM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ECONOMICS OF OBESITY SIG SESSION: Issues in the Economics of Obesity

MODERATOR: **John Buckell**, University of Oxford

Resource Utilization and Disaggregated Cost Analysis of Bariatric Surgery in the Australian Public Healthcare System

PRESENTER: **Qing Xia**, Menzies Institute for Medical Research, University of Tasmania

AUTHORS: Julie A Campbell, Hasnat Ahmad, Lei Si, Barbara de Graaff, Kevin Ratcliffe, Julie Turtle, John Marrone, Mohammed Huque, Barry Hagan, Matthew Green, Petr Otahal, Andrew J Palmer

Objectives: The detailed healthcare costs of bariatric surgery in the Australian public healthcare setting are not well reported. This study aims to present a real-world micro-costing analysis of bariatric surgery in the Australian public healthcare system.

Methods: We conducted a retrospective cohort study identifying patients who were waitlisted for primary bariatric surgery (gastric banding [GB], gastric bypass [GBP] and sleeve gastrectomy [SG]) between 1st-July-2013/14 to 30th-June-2018/19 from the Tasmanian Department of Health (DoH)'s administrative databases. Disaggregated, average-per-patient, and overall costs were presented (2019 Australian dollars) from the payer's perspective (Tasmanian Government). Overall, fourteen cost buckets were considered, namely: operating theatre, medical supplies (including prostheses and ward supplies), salaries (including ward medical, ward nursing and allied health services), labour on-costs, critical care unit (CCU), pharmacy, pathology, imaging, non-clinical costs, hotel services, and depreciation costs. All costs were expressed as mean costs with 95%

confidence intervals. Subgroup analyses by bariatric surgical type and CCU utilization type were conducted. Annual population-based costs were calculated to capture longitudinal trends. A generalized linear model was performed to predict the total medical costs for a base case scenario.

Results: 240 patients were included. Mean direct hospital costs for all three surgery types were $11,269 (US$7799) per person. Average age of the included patients (72.1% female) was 44.8±11.8 years, and the mean BMI was 49.1±7.3 kg/m^2. The operating theatre cost component (referred to as a cost bucket) constituted the largest component of bariatric surgery-related average costs (41.7%, $4,702). Medical supplies contributed 21.9% ($2,465), and salaries account for 14.9% ($4,702) of average costs. Costs for CCU services accounted for 5.9% of average costs. Labour staff on-costs were responsible for 5.9% of average costs. Other cost buckets were low (9.6% in combination). Average costs for SG ($12,632) and GBP ($15,041) were higher than those for GB ($10,049). Operating theatre-related costs accounted for the largest cost component for SG and GBP, whilst medical supplies were the largest for GB (included GB appliance costs). In line with worldwide technical change, we observed an increase of SG/GBP and a decrease of GB procedures over time. Correspondingly, the main cost driver changed from medical supplies in 2014-2015 for GB procedures to operating theatre after 2014-2015 for SG/GBP procedures. In addition to surgery type, CCU utilization, number of comorbidities and the presence of complications were also associated with bariatric expenditures. GLM modelling of these parameters showed that the average cost for a representative cohort scenario (selected groups of female patients aged 46–54years with BMI $\leq$ 50 kg/m^2) ranged from $7,580 to $36,633.

Conclusions: This nationally representative study (with latest available data to generate the disaggregated estimates of direct medical costs) investigated a critical period in the bariatric surgery landscape in an Australian public hospital setting where surgical management of obesity changed substantially. Patterns of resource utilization and costs for bariatric surgery in these public hospitals changed as surgery type evolved from GB to SG. Understanding these patterns and forecasting of future changes are critical for healthcare resources allocation and sustainable budgetary planning.

Investigating the Association and Costs of Obesity and School Absenteeism Amongst Australian Children and Adolescents

PRESENTER: **Joseph Carrello**, University of Sydney School of Public Health

Background: Unlimited needs for scarce healthcare dollars has led to the increasing use of modelled health economic evaluations to assist decision making for many health problems including childhood obesity. Including indirect costs such as productivity losses is recommended to capture the full breadth of costs associated with obesity on societies. In children this can be done through measuring and valuing school absenteeism. Our aim was to investigate if there is an association between weight status and school absenteeism among Australian children and adolescents aged 6-17 years. Additionally, we plan to quantify the costs of this for children aged 6-13 years (through parent/caregiver missed work).

Methods: We used data from a nationally representative sample of just under 9000 Australian children in the Longitudinal study of Australian Children (LSAC) between 2006 and 2018. Generalised estimating equations (GEE's) in STATA were used to investigate the relationship between school absenteeism and weight status, adjusting for covariates including age, sex, socioeconomic position, rural/remote status, Aboriginal and Torres Straight Islander status and long term medical conditions (including mental health). National estimates of annual extra days of school absenteeism for children with overweight and obesity compared to their classmates of a healthy weight were calculated using 2018 Australian population data. We valued this extra school absenteeism in monetary terms by using 2018 Australian average daily earnings (for children aged 6-13 years only).

Results: There were small but significant associations between children (6-13 years) and adolescents (14-17 years) with overweight and obesity and increased school absenteeism compared to their classmates of a healthy weight. We estimate Australian children with overweight and obesity aged 6-13 years missed on average an extra 1.24 days of school in 2018 (95%CI 1.05, 4.40 days), at a national cost of $237,762,305 or $393 per child (95% CI $20131960, 844839151 or $333,$1398 per child).

Conclusions: Our results demonstrate a small but significant association between overweight and obesity and increased school absenteeism amongst school children in Australia. Our valuation of this increased absenteeism through productivity losses from parent/caregiver missed work will assist health economists undertaking modelled economic evaluations of childhood obesity capture the full extent of the associated costs with this condition.

Implications of Self-Reported Body Weight and Height for Measurement Error in BMI

PRESENTER: **Apostolos Davillas**, University of East Anglia
AUTHOR: Andrew Jones

Background: Obesity is associated with increased risks of morbidity and mortality, placing significant burden on health care systems. This has led to a plethora of studies on the socio-economic consequences of obesity, such as labour market outcomes, and healthcare costs. Because of the absence of measured anthropometric data in many large-scale datasets, many existing studies are based on self-reports. The reliability of these measures in social science datasets is therefore of critical importance for obesity research.

Objectives: We aim to explore the extent of measurement error in body mass index (BMI), when based on self-reported body weight and height, in the context of a large, multi-purpose survey. We also explore whether the implied measurement error in BMI is systematically associated with socio-economic variables used in health inequalities research. This is typically relevant for studies that use BMI as an outcome. In addition, we explore whether the measurement error in BMI is non-classical, i.e., systematically associated with the measured values, and whether this association varies depending on the BMI of other household members.

Methods: We designed a survey experiment to explore the extent of measurement error in BMI. Our study design allows us to collect information on self-reported body weight and height data immediately before the relevant physical measurements were taken. Respondents did not know that the measurement of weight and height would follow their responses. Absolute reporting error is modelled by linear regression. Regression models are first estimated using the set of demographics and socio-economic status. To explore whether measurement error is non-classical, we add an individual's own BMI based on their measured data. This specification is augmented by adding BMI information for the other household members. As an extension, we test whether the conventional method of using corrective equations for self-reports of body weight/height is sufficient to mitigate reporting error and, more, importantly its systematic association with covariates.

Results: Evidence from our preliminary data show that there is a systematic age gradient in the reporting error in BMI, while there is limited evidence of systematic associations with gender, education and income. This is reassuring evidence for the use of self-reported BMI in studies that use it as an outcome, for example, to analyse socioeconomic gradients in obesity. However, our results suggest a complex structure of non-classical measurement error in BMI, depending on both individuals' and within-household peers' true BMI. This may bias studies that use BMI based on self-reported data as a regressor. Common methods to mitigate reporting error in BMI using predictions from corrective equations do not fully eliminate reporting heterogeneity associated with individual and within-household true BMI.

Conclusion: Measurement error in anthropometrics is non-classical and, thus, it may result in biases that can be of either direction when BMI is used as a regressor. Our results highlight the importance of collecting measured body weight and height data in large social science datasets.

Acknowledgement: This study makes use of a preliminary/draft version of the Understanding Society Innovation Panel data administered by ISER, UoEssex, and funded by ESRC.

Application of Small Area Estimation Techniques in Translating National Survey Data into Evidence for Local Policy: A Case of Fruit and Vegetable Intake in Birmingham, UK

PRESENTER: **Mr. Siyabonga Ndwandwe**, Clinton Health Access Initiative (CHAI) Inc.
AUTHORS: Patrick Moore, Rebecca McDonald, Emma Frew

Adequate fruit and vegetable consumption is associated with lower risk of diet-related noncommunicable diseases (NCDs) such as diabetes, cardiovascular diseases, and some cancers[1]. NCDs are increasing in both high-and low-income countries and lead to considerable economic and health burdens, for example, in the UK, type II diabetes costs £35.9 billion annually, from a societal perspective[2]. Understanding nutritional

behavioural patterns of local populations is an important step towards designing local-level policy interventions that tackle the underlying sociodemographic and economic factors that influence local eating behaviours. However, nutritional data are usually sampled at the national level and are therefore not appropriate to guide local action. This analysis presents an econometric approach for translating national data to better understand fruit and vegetable intake amongst a local population. It uses 5 to 24-year olds in Birmingham (UK), as a case study.

8,834 Health Survey for England (HSE) observations alongside Birmingham 2017 mid-year population census data were used for the analysis. First, the probability of meeting the recommended daily fruit and vegetable intake (FVI) in the HSE sample was estimated using a multinomial logistic regression. These results were also compared to ordered logistic and logistic models. Second, iterative proportional fitting (IPF) was applied to reweight HSE observations to match the Birmingham mid-year population estimates of 5-to-24-year olds, based on age, sex, and ethnicity. The model's internal validity and robustness were evaluated using total absolute errors (TAE) and different specification of FVI levels, age groups, and ethnicity.

The Multinomial model explained significant variance in probability to meet recommended FVI—BIC=26818.7, Chi-square = 1971 with p=0.000—only 3/9 categories were not significant at 95% significance level. The marginal effect of the various sex-ethnicity combination varied with age. The reweighted data underestimated Birmingham population by 89 people—only 3/30 age-sex-ethnicity combination had TAE >0. Generated weights were right skewed and ranged between 2 and 748 (mean = 26 vs median = 14, sd = 45). The reweighted data suggested that (19%) of Birmingham's 5-24-year olds meet the recommended FVI, which aligns with local authority estimates[3]. Black females (5-7-year old) had the highest proportion (33%) of meeting FVI guidelines in contrast to Black males and females aged 16-24 years who had the lowest portion (7%).The results were robust on exclusion of 'Other' ethnic category and different specification of FVI levels and age groups.

This paper presents an econometric approach for re-weighting nationally collected data to better understand local lifestyle behaviours. This information can help guide local action to ensure that policy targets those in society who are most in need of intervention. The model is internally and externally robust.

[1] Ervin, K., Dalle Nogare, N., Orr, J., et al. (2015) Fruit and Vegetable Consumption in Rural Victorian School Children.

[2] Hex, N., Bartlett, C., Wright, D., et al. (2012) Estimating the current and future costs of Type 1 and Type 2 diabetes in the UK, including direct health costs and indirect societal and productivity costs.

[3] Birmingham City Council (2015) *Birmingham Lifestyles Consultation Health Needs Assessment.*

9:15 AM –10:15 AM TUESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Digital Technologies for Health Financing: What Are the Benefits and Risks?

SESSION CHAIR: **Inke Mathauer**, World Health Organization

DISCUSSANT: **Olivier Basenya**, The World Bank; **Wilm Quentin**, Berlin Univesity of Technology

An Overview of Digital Technologies for Health Financing: What Are the Potential Benefits and Challenges – Some Reflections

PRESENTER: **Inke Mathauer**, World Health Organization

Purpose:

This presentation serves to provide an introduction into the session. A key premise of this paper is that digital technologies for health financing should contribute to the Universal Health Coverage (UHC) intermediate and final objectives of efficiency, equitable distribution of resources, accountability and transparency, as well as equity in access, fair financing and financial protection and quality of care. Likewise, the widely agreed upon health financing principles underlying progress towards UHC – i.e. largely relying on public finance, enlarging prepaid and pooled funding, and making purchasing more strategic - should remain valid.

However, digital technologies may also be accompanied by potential risks that may undermine the contribution to UHC. These include gaps in data security and protection to ensure privacy and confidentiality. When big data analysis including machine learning and Artificial Intelligence are included, potential risks relate to inadequate data accuracy and comprehensiveness, or biased algorithm outcomes, including discrimination of specific population groups as well as erroneous prediction. This comes along with numerous ethical and legal questions.

Methods:

A scoping review of published and grey literature was undertaken to identify the range and types of digital technologies in place within the three health financing functions of revenue raising, pooling and purchasing, with a focus on low- and middle-income countries. These digital technologies were then assessed with respect to contributing to the health financing principles listed above and the UHC objectives to explore and derive the potential benefits or detect potential risks. Likewise, we identified the range of challenges reported.

Results:

The identified digital technologies in use suggest that there are various benefits for purchasers, providers and patients/citizens. These include enhanced transparency, accountability and trust, reduced administration costs and increased efficiency. However, there are also various actual or potential risks undermining health financing principles. For example, mobile wallet applications to collect payment could contribute to increasing the share of voluntary financing over public finance, or to setting up individual medical saving accounts, thus affecting prepaid and pooled public finance. Enhanced claims analysis and big data analytics using artificial intelligence make it easier to identify and predict high-risk /high-cost individuals, who may be pushed into different risk pools with higher premiums, also increasing pool fragmentation. This puts equitable access to health services or financial protection under question.

Moreover, digital technologies are accompanied by various (implementation) challenges, including digital divides across regions and population groups, underdeveloped digital ecosystems, insufficient skills in designing, implementing or using digital technologies, or lack of trust and acceptability by health workers and patients.

Conclusion:

Overall, many of the applications found consist in small initiatives and pilots, but there are no systematic evaluations of their benefits and risks. More research is thus needed.

Health financing policy needs to receive much more attention in countries' digital health strategies. Such strategies need to clarify the policy directions and responsibilities as well as investment decisions. Related thereto, governments require stronger technical and regulatory capacities in digital technologies to address the respective legal and ethical challenges.

Digital Technologies and Health Financing for Primary Health Care: A Success Story?

PRESENTER: **Nouria Brikci**, LSHTM (London School of Hygiene and Tropical Medicine)

AUTHOR: Darius Erlangga

Background: The role of Digital technologies (DT) in supporting the delivery of health services has been the focus of much documented evidence. DT have also emerged as potential facilitators in the financing of health systems in HIC and LMICs. Understanding the extent to which digital innovations directly strengthen health financing functions is fundamental to fully harness the DT potential: facilitation in resource mobilization of resources, in pooling of risks and resources, and purchasing of services, particularly primary health care (PHC). Review of existing DT applications

on financing PHC is needed but identifying the right sources is important as DT are more pervasive and ubiquitous than is reflected in the peer-reviewed literature. Further, identifying how the purchasing of PHC services would need to be adapted to cover digitally provided services is increasingly important.

Objective: We aim to respond to two questions: firstly, how have DT facilitated the mobilization of revenue for the health sector, pooling of resources and risks, and purchasing of PHC services in LMICs? Secondly, what adjustments have been undertaken to enable purchasing of digitally provided PHC / health services, and have these enabled more accessible and affordable services?

Methods: A systematic review of the literature was undertaken to answer both these questions. This was followed by a panel discussion of experts in the fields of DT and health financing. The panel developed a theory of change framework on how DT can support health financing functions in PHC. This panel discussion also elicited examples of DT projects that have transformative potential in PHC context and supported by a whole of government approach. Following the identification of successful and transformative DT projects, key informant interviews and focused review of literature were undertaken to gather evidence of purchasing adjustments and underlying conditions facilitating these achievements.

Results: Based on the evidence gathered, this study provides an overarching perspective on the transformative potential of DT for health financing of PHC in LMICs and consider how to ensure that these DT innovations align with UHC principles. We will also provide specific in-depth new country level evidence as to successes or failures in the use of DT for financing PHC.

Claims Management Using Artificial Intelligence: Experiences from PhilHealth in the Philippines

PRESENTER: **Benjamin Pague**, Philippine Health Insurance Corporation
AUTHOR: Arturo C Alcantara

Background:

PhilHealth, the national health insurance scheme in the Philippines, covers about 94% of the population. It is using artificial intelligence, machine learning, and emerging technologies to combat fraud and improve overall efficiency. Healthcare fraud global estimate ranges from 3% to 10%. Yearly loss for PhilHealth because of fraud or abuse could be calculated around Php 3 to Php 14 billion. Training models to detect fraud is very hard because of the combination of the lack of successfully prosecuted fraud cases to label training sets and the changing nature of fraud as provider behavior adapt to domain changes.

Methods:

We adopted a scoring method, where behavioral metrics were determined through research and machine learning (ML). To improve and hasten analytical and ML processes to identify behavioral metric candidates, we created the Machine Learning Identification, Detection, and Analysis System (MIDAS) in 2018. It was built on top of PhilHealth's business intelligence stack which utilized state-of-the art data curation and data warehouse technologies. We used open source software to create a visual analytic tool where analysts or investigators can perform advanced analytical or machine learning techniques without writing code. Examples of these techniques are: regression analysis, peer group analysis, cluster analysis, boxplot analysis, social network analysis, time-series anomaly detection, natural language processing, and image classification using deep convoluted neural networks (CNNs).

Results:

The system made hypotheses testing faster and helped analysts or investigators recognize suspicious patterns that were hard to see using conventional means. MIDAS was used to select eight behavioral metrics and were consequently used in the scoring method with their applicable outlier detection techniques. The scoring method showed promising results on initial test set. Recognition of suspicious patterns using MIDAS was also instrumental to the cases filed to erring providers. To date, not less than Php 14 million is due for direct recovery while Php 3.1 billion worth of anomalous claims are being investigated by PhilHealth and the National Bureau of Investigation. From 2017 to 2019, a 14% reduction was observed in the count of claims for Diabetic Ketoacidosis (DKA)- a highly abused disease group amounting to Php 110 million. Similarly, modest reductions were also observed from other disease groups, thus the amount of savings can be estimated to reach the billion-peso mark.

Discussion:

The scoring method showed promising initial results and will be crucial in moving PhilHealth away from the "Pay-Chase Model" as claims can be classified prior to payment. MIDAS, using machine learning and advanced analytical techniques was instrumental in the discovery of claim abuses and suspected providers. Challenges relate to data quality and the lack of labelled training sets. Moving forward, PhilHealth is actively expanding its data sources and simultaneously improving data quality. Both are important requirements for successful implementations of artificial intelligence, machine learning and other emerging technologies.

Governance and oversight are important: The algorithms are researched, designed, and implemented by scientists and analysts of the Task Force Informatics. The team also monitors the performance and selection. For oversight and guidance, a joint committee was created.

The Role of Digital Technologies in Promoting Access to Health Services: Insight from Indonesia's Health Insurance Scheme

PRESENTER: **Dinna Prapto Raharja**, Synergy Policies
AUTHORS: Retna Hanani, Fransiscus S Joyoadisumarta

Background:

Digital technology (DTs) is adopted in Indonesia's national health insurance (JKN) which is critical to improve access to health services and enjoy financial protection. JKN started in 2014 and covers 82% of Indonesia's population that is approximately 220 million people. In this paper, we look at two DTs adopted by the government of Indonesia: In 2009 the central government adopted *Lapor.go.id,* a web-based platform to handle complaints from citizens on the quality of public services including those provided through JKN and in 2017 BPJS Kesehatan, as operator of JKN, launched Mobile JKN, a mobile application that allows people to register, view billing information, pay monthly contributions, select or change the primary healthcare provider, set appointments with healthcare providers, and file complaints.

Objective:

In this paper, we examine whether the DTs improve health financing, i.e. do they improve access to health services and financial protection? What are the benefits and risks of these DTs for health financing? Why or why not? What people's experiences in using the DTs.

Methods:

Data is collected through in-depth interviews and focus group discussions with users/patients, policy makers at national level, and policy implementors at hospital and five local BPJS Kesehatan offices. Primary data collection on utilisation of the technologies are collected from reports from Ministry of Administrative and Bureaucratic Reform (for Lapor) and BPJS Kesehatan (Mobile JKN). We use purposive sampling covering 8 districts in 4 provinces.

Results:

We find that in JKN, these DTs have limited reach to Indonesian JKN members and they are low in effectiveness too. There are structural barriers that the DTs cannot solve because the design of the features and the implementation does not consider the high cost of accessing technologies, there is absence of linkages between online and offline services, the user-friendliness of the DTs is low, and there is low acceptance and trust among the poor patients for using the DTs. We find that Lapor.go.id is not designed to ensure all incoming inputs and questions (tickets) are followed up, it is understaffed, under budget, the staff is not trained to provide equity service, the shelving rate is 40%, and only the agencies listed as worst

performers would get summoned for explanation. BPJS Kesehatan as operator is not among the agencies getting high rate of tickets. If there's any gaps in implementation the Ministry handling Labor.go.id cannot fix it. Meanwhile Mobile JKN is downloaded by only 11.3 million citizens and they complained about non-updated information on hospital beds availability, poor gadget that it takes time to process certain features, and if one has administrative problem the access would cease. Mobile JKN is for helping the operator rather than the citizens and cannot solve real time problems.

Discussion:

In low-middle-income countries the adoption of DTs in NHIs requires inclusive policy instruments to enhance transition from conventional to digital system. The poor tends to have greater challenges in accessing and trusting DTs, and the offline problems may be different than what the features provide.

9:15 AM –10:15 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

COVID-19 Resource Use and CEA

MODERATOR: **Paul Mitchell**, University of Bristol

Acute Care Costs and Lost Earnings Associated with the COVID-19 Outbreak across Europe

PRESENTER: **Dr. Filipa Landeiro**, University of Oxford

Background

The COVID-19 pandemic has affected all aspects of society. In Europe, most countries have aimed to halt the spread of the virus by restricting social interactions, resulting in nationwide lockdowns, with significant decreases in nations' gross domestic product measured in billions of Euros. However, the direct healthcare costs and individuals' lost earnings associated with SARS CoV-2 have received less interest both from the research community and media outlets. To deliver affordable and effective care systems during the current pandemic, we need a comprehensive estimation of the costs of care associated with the pandemic.

Aim

Our study aims to estimate the acute care costs and lost earnings due to absence from work and premature death associated with the first wave of SARS-CoV-2 across 31 European countries including the European Union, Iceland, Norway, Switzerland and the United Kingdom (UK).

Methods

We conducted a population-based cost analysis to evaluate the costs of the first wave of SARS-CoV-2, taking into account all recorded cases between the 1st March and the 31st July 2020.

We adopt a societal perspective including hospitalization costs and productivity losses.

COVID-19 patients receive healthcare mostly in hospitals and we estimated the costs of hospitalisation, including the additional costs associated with intensive care and mechanical ventilation.

Mortality costs were estimated as the lost earnings from premature death. These were estimated by using the age- and gender-specific number of COVID-19 deaths to predict the working years lost at the time of death, adjusted for the 2019 age and gender-specific probability of being employed. As these costs would have been incurred in future years, all future lost earnings were discounted to present values using a 3.5% annual rate. A sensitivity analysis was conducted including excess death estimated as the difference between mortality in the period under analysis and the average mortality in the same months in the 5 previous years.

Morbidity costs were estimated as temporary absence from work due to the illness. The respective number of days of quarantine recommended in each country was considered in terms of temporary absence from work due COVID-19, and was multiplied by daily earnings.

Results

Focusing on UK, 56 thousand COVID-19 registered deaths were registered between weeks 13 and 31, leading to an estimated £1,137 million of mortality losses. This value increases to £1,632 million when excess deaths are taken into account. Productivity losses were estimated to be £100 million.

Furthermore, about 132 thousand patients were hospitalised with COVID during this time totalling 1 million bed nights in hospital with 139 thousand of these bed nights being in intensive care units. Hospitalisation costs amounted to £661 million during this period with medical ward stay accounting for 65.6% of the total. Intensive care costs amounted to £206 million and accident and emergency costs were £22 million.

Conclusion

Our study captures the direct costs of SARS-CoV-2 across Europe using the same methodological framework. It highlights the significant impact on healthcare services and lost earnings directly associated with the outbreak.

Correcting for Computational Problems in EQ-5D Studies in Times of the COVID-19 Pandemic Using Indirect Inference and Likelihood-Free Approaches

PRESENTER: **Andrej Srakar**, Institute for Economic Research

AUTHORS: Valentina Prevolnik Rupel, Dr. Aleks Jakulin

The quality-adjusted life year (QALY) is one of the most widely used health benefit measures in economic evaluations of interventions, services or programmes designed to improve health. The QALY reflects concerns for both quality and length of life and allows health care decision makers to use a consistent approach across a broad range of disease areas, treatments, and patients. QALY estimation is based on patient-reported outcome measures (PROMs), of which EQ-5D is a leading example. EQ-5D is used in cost-effectiveness studies underlying many important health policy decisions and comprises a survey instrument describing health states across five domains, and a system of utility values for each state. The original 3-level version of EQ-5D is being replaced with a more sensitive 5-level version but the consequences of this change are still uncertain. Several studies have reported better measurement properties in moving from the EQ-5D-3L to EQ-5D-5L in both specific patient and general population samples. Also, use of EQ-5D during the COVID-19 pandemic situation has been divided between both types of questionnaires (Nguyen, Rencz and Brodszky, 2020). It is well know that direct approach to response mapping has several drawbacks: irregular empirical distributions, insufficient informational coverage and dependence upon the scoring system used. Using correlated copula model with mixture marginals to model the switch from EQ-5D-3L to EQ-5D-5L in evaluating drug therapies for rheumatoid arthritis, Hernández-Alava and Pudney (2017) report that high-dimensional ordinal-variable applications of similar nature present major computational problems. To resolve this problem, we provide likely the first attempt of the usage of likelihood free methods to response mapping in EQ-5D studies and apply it to the evaluation of health-related quality of life during the COVID-19 pandemic. We provide a simulation study of the usage of three simulation approaches, common in likelihood free methods literature: econometric indirect inference (with a statistical counterpart of Bayesian Indirect Likelihood of Drovandi, 2018); approximate Bayesian computation (ABC) based on sequential Monte Carlo; and variational Bayes approach as a complement to ABC. To account for the high-dimensional nature of the problem we extend conditional density estimation (ABC-CDE) framework of Izbicki et al. (2018) using functional Bregman divergence, a generalized Bayesian model diagnostic tool nesting many divergence measures such as Kullback-Leibler and Jensen-Shannon (Goh and Dey, 2014). The results enable to correct for distributional, computational and high-dimensional nature of the problem and enable a

reliable model for future evaluation of health utilities. We apply the approach to the evaluation of health-related quality of life using EQ-5D in China and Slovenia during the COVID-19 pandemic.

An Economic Evaluation of Influenza and COVID -19 Pandemic Prevention and Control Interventions: A Systematic Review

PRESENTER: **Mr. Amanuel Lulu Yigezu**, Ethiopian Public Health Institute

Background: COVID-19 causes more 1.3 million deaths globally in just nine months. Influenza is a virus with respiratory symptoms, fever, and systemic symptoms very similar to COVID 19. Various public health measures have been taken by governments and health authorities to prevent and control the pandemics. This study aimed to review the economic evaluation of public health measures against COVID-19 and influenza pandemics.

Methods: We performed a systematic review of the literature to identify full economic evaluation studies on Influenza and COVID-19 pandemic published from 1998-2020. We built an exhaustive database search strategy. The search was done in Pubmed, Web of Science, EMBASE databases, and grey literature. We extracted data from selected studies using a structured data collection form after conducting a risk of bias assessment. Narrative summary tables were used to present the result and characteristics of eligible studies. Furthermore, we converted findings of studies that reported their outcome in costs per case averted and death averted into costs per life-year gained. All cost and Cost-effectiveness ratios were converted to 2019 US dollars using the exchange rate and GDP deflator. The study was registered in PROSPERO with registration No. CRD42020192384.

Results: The review revealed that most of the studies were conducted in high-income countries, and only few of the studies were on non-pharmaceutical interventions. Stockpiling drugs for the treatment of sick patients was found cost-effective in most of the studies. Treatment with antiviral drugs and vaccination were found very cost-effective. The addition of school closure to other interventions was considered cost-effective only for a pandemic with a high case fatality ratio. Almost all interventions were sensitive to the infectivity and severity of the pandemic. Most of the studies were also cost-effective from the societal perspective indicating a higher net societal benefit from the pandemic prevention and control strategies.

Conclusion: In conclusion, most of the interventions were cost-effective under various scenarios while school closure was cost-effective under a 'high case-fatality 'ratio' scenario only. Furthermore, the level of the pandemic's infectivity and severity were the key drivers of the cost-effectiveness of both pharmaceutical and non-pharmaceutical interventions.

Keywords: Pandemic, COVID-19, Influenza, economic evaluation, Prevention and control strategies

The Cost-Effectiveness of Three Interventions for COVID-19 Inpatient Care in South Africa: Implications for Health Technology Assessment and Universal Health Coverage

PRESENTER: **Susan Cleary**, University of Cape Town

AUTHORS: Geetesh Solanki, Cynthia Tamandjou, Sumaiyah Docrat, Thomas Wilkinson

Health technology assessment (HTA) aims to enable the prioritization of efficient and equitable services and enhance responsiveness to population preferences. As a fundamental component of a universal health coverage (UHC) system, an accountable and transparent HTA process rests on foundations of distributive and procedural justice - with the former requiring consideration of evidence on health outcomes and the opportunity cost of investment decisions, and the latter requiring transparent deliberation in decision-making. This paper summarizes our research on the cost-effectiveness of three inpatient care interventions for COVID-19 in South Africa and draws lessons for HTA under UHC.

Under the MOSAIC collaborative, we conducted three rapid economic evaluations of inpatient treatment interventions for COVID-19: 1) intensive care (ICU) patient management at private facilities , 2) dexamethasone, and 3) remdesivir, with comparison to a relevant comparator and specified indication. Using Markov modelling and a combination of local (e.g. on costs and utilisation) and international data (e.g. on trial outcomes), we assessed costs per admission from the health systems perspective and health outcomes, with final outcomes presented in deaths and disability adjusted life years averted and 2020 South African Rands. Given uncertainties in many aspects of COVID-19 care, the rapidly changing context and evidence base and the need to make rapid decisions, open access models with a user guide were published online to encourage transparency, user driven sensitivity analysis and policy translation. Incremental cost-effectiveness ratios were compared to the estimated marginal productivity of the South African public health system (ZAR 38,000 per DALY averted) to gauge cost-effectiveness.

At the time of initial model finalization for the three evaluations, expanding public sector patient access to private sector ICU care was not cost-effective (ZAR 73,000 per DALY averted), dexamethasone was cost-effective (ZAR 526 per DALY averted) and remdesivir was cost saving. Corresponding national policy included a signed service level agreement to enable purchase of private ICU beds for public patients; recommendations in favour of dexamethasone; and recommendations against remdesivir. The emergent nature of the COVID-19 pandemic meant that cost-effectiveness findings were subject to change, e.g. ICU became more effective over time, but not sufficiently so compared to the marginal productivity of the South African health system, while later trial findings indicated that remdesivir did not demonstrate significant effect on either clinical outcomes or length of stay, and did not represent a cost-effective investment.

South Africa's universal health coverage reform promises horizontal equity as a legal entitlement. Such an approach requires an affordable benefit package to be developed and modified through institutionalized HTA. In South Africa, economic evidence is considered in priority setting, but this is not done in a systematic or transparent manner, including in relation to COVID-19. This has serious implications for the extent to which national treatment and essential medicines guidelines can be implemented on an equitable basis.

Our experience illustrates the feasibility and value of developing rapid, transparent, open-access and tailorable economic models to guide priority setting. This approach can inform guidelines for HTA in South Africa going forward.

9:15 AM –10:15 AM TUESDAY [Supply Of Health Services]

ORGANIZED SESSION: Informal Care: Determinants, Value and Interactions with Formal Care Options

SESSION CHAIR: **Julien Forder**,

ORGANIZER: **Quitterie Roquebert**,

DISCUSSANT: **Ricardo Rodrigues**, European Centre for Social Welfare Policy Research; **Jannis Stöckel**, Erasmus School of Health Policy & Management; **Fabrizio Mazzonna**, Universit&#65533; della Svizzera italiana

Informal Care Support at Old Age at Home and in Nursing Homes: Determinants and Economic Value

PRESENTER: **Marianne Tenand**, CPB Netherlands Bureau for Economic Policy Analysis

AUTHOR: Quitterie Roquebert

This paper aims at providing a comprehensive analysis of informal care receipt by old-age people in France. The literature has focused on the community, leaving informal care in institutions in the shadow. We leverage data from a French representative survey (CARE) conducted in 2015-2016 on both community-dwelling individuals and nursing home residents and focus on the 60+ with activity restrictions. We use the proxy good method to evaluate the monetary equivalent of informal care. We adopt a conservative approach in order to derive a lower bound estimate. We then implement an Oaxaca-type approach to analyse the differences in the importance of informal care provided in both settings. We disentangle between two mechanisms explaining differences observed across settings, namely the differences in population composition (endowments) and the differences in the association of individual characteristics with informal care (coefficients).

We show that 76% of nursing home residents receive help with the activities of daily living from relatives, against 55% in the community. The number of hours conditional on receipt is yet 3.5 times higher in the community. Informal care represents 207 million hours per month and a value

equivalent to 1.5% of Gross Domestic Product (GDP). Informal care in the community represent 95% of the total.

Regarding the determinants of informal care receipt, we focus on the extensive margin (i.e. whether individuals receive informal care or not). We show that endowment and coefficient differences have a similar contribution. Would there be only differences in the characteristics of nursing home residents and the at-home population, we would expect nursing home residents to be 22 percentage points more likely to receive informal care than the at-home population. Would there be no such differences, we would still expect nursing home residents to be 20 percentage points more likely to receive informal care, given that the association between several individual and family characteristics and informal care receipt differs across the two residential settings.

Our results highlight that informal care is extremely common for nursing home residents, contrary to what is often implicitly assumed in the health economics literature and policy discussions. While a large literature has analyzed the determinants of informal care receipt in the community, the results from our decomposition analysis indicates that such evidence has limited relevance to understand informal care behaviors for nursing home residents. Informal care receipt appears primarily demand-driven at home and more supply-driven for nursing home residents.

At the policy level, our results call both for a careful examination of the additional weight that aging in place policies place on informal caregivers and for making informal caregiver support schemes also accessible to relatives of nursing home residents. Once informal care is taken into account, private costs make up for the majority (80%) of the costs associated with long-term care provision, which questions the degree of public coverage against old-age disability risks offered in France.

The Impact of Formal Care Provision on Informal Care Receipt for People over 75 in England

PRESENTER: **Eirini-Christina Saloniki**, University of Kent
AUTHORS: Olena Nizalova, Gintare Malisauskaite, Julien Forder

Informal (unpaid) care by family and friends is the mainstay of care provided for people with long-term care needs. There has been a long-standing debate over the relationship between informal care and the provision of formal care. An increase in formal care services can lead to a decline in informal care provision, with implications for the (opportunity) costs to be (publicly) funded.

In this study, we examine the relationship between formal care provision and informal care receipt from within the household for people over 75 years old using data from the English Longitudinal Study of Ageing (ELSA) between 2002 and 2017. We focus on those aged 75 and above as they are more likely to use both types of care. We account for the discrete nature of both formal and informal care indicators while addressing potential concerns about endogeneity of formal care using a 'spatial lag' instrumental variable. We control for several socio-demographic and socio-economic characteristics such as age, gender, qualifications, marital status, self-assessed health, specific health conditions, activities of daily living (ADLs), home ownership and household income. We consider different specifications to account for the distinct influence of household size on the within household informal care receipt. Further, we explore the possibility of a gender differential effect in the relationship between informal and formal care receipt to account for potential early female exposure to informal caregiving.

We find a negative and statistically significant effect of formal care provision on informal care receipt, suggesting a substantial degree of substitutability between these two modes of care. Our findings are inconclusive with regards to a gender differential effect. We identify that an estimated substitution effect of 0.169 translates to a reduction in the cost of informal care of £0.07 for a £1 spent on long-term care per week on average.

These findings support timely discussions and development of policies towards the implementation of an integrated care system, whereby services are designed to meet the individuals' needs and individuals have control and access over these services. Such coordination and increased accessibility of services is likely to reduce the demand for informal care or at least minimise the negative impact of increased informal care on carers.

Does Informal Care Delay Nursing Home Entry? Evidence from Dutch Linked Survey and Administrative Data

PRESENTER: **Julien Bergeot**
AUTHOR: Marianne Tenand

Nursing homes are costly. To contain long-term care public spending, governments encourage the provision of care by relatives. Informal care receipt is often seen as a way to keep individuals in old age out of nursing homes and is expected to contribute to aging in place. The extent to which informal care is effective at postponing nursing home entry is unclear though. On one hand, informal support may slow down the depreciation of cognitive and functional capabilities. On the other hand, relatives involved in caregiving may be better aware of the frailty of their parent and altruistically push for an institutionalization. A few empirical studies have concluded that informal care receipt can lower nursing home use. However, evidence derives from the United States and relates to a broad definition of nursing home care, including the temporary use of rehabilitative care. Its validity for other institutional contexts and for permanent nursing home admissions, which make most of long-term care costs, is debatable.

In this paper, we assess whether being provided informal care affects the probability of transitioning to a nursing home for the 65+ in the Netherlands. We exploit a large survey, representative of the non-institutionalized population, which we link with administrative data on care use and population registers. We use a bivariate probit model to estimate the average treatment effect (ATE) of informal care receipt on the probability of a nursing home admission within two years We focus on individuals with at least one child alive (N=182,718) and use children's characteristics (number, gender, distance) to retrieve plausibly exogenous variation in informal care receipt. In order to minimize the risk of endogeneous relocation of children, we use lagged distance to their parents (rather than contemporaneous location), retrieved from the population registers.

Our results indicate that being provided informal care by children does not causally affect nursing home entry for the average individual of the study population. However, for individuals reporting a poor health or severe functional limitations, the probability of admission is enhanced by informal care receipt. Further analyses show that higher chances of admission do not come at the cost of higher mortality and that informal care receipt is associated with a lower chance of post-acute care use. We do not find any difference by marital status but document different patterns across genders.

Our findings suggest that policy makers should therefore not merely expect that promoting informal care will result in a lower nursing home admission rate. Support from relatives may even hasten institutionalization for the old-age individuals with a bad health condition. Should the total costs of home-based care exceed that of institutional care for the marginal nursing home entrant, delayed nursing home admission would be an unexpected yet desirable effect of the involvement of relatives into care support in old age.

9:15 AM –10:15 AM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

HEALTH SYSTEMS' EFFICIENCY SIG SESSION: Drug Procurement, Drug Markets and Prices

MODERATOR: **Katharina Blankart**, University Duisburg-Essen

Global Drug Diffusion and Innovation with the Medicines Patent Pool

PRESENTER: **Dr. Lucy Xiaolu Wang**, Max Planck Institute for Innovation and Competition

This paper studies the impact of the first joint licensing platform for patented drugs, the Medicines Patent Pool, on global drug diffusion and innovation. The pool allows generic firms worldwide to license drug bundles cheaply and conveniently for sales in a set of developing countries. I construct a novel dataset from licensing contracts, public procurement, clinical trials, and drug approvals. Using difference-in-differences methods, I find that the pool leads to substantial increases in the generic supply of drugs purchased. In addition, R&D inputs and outputs respond positively overall. The estimated benefits to consumers and firms far exceed the operating costs.

The full paper is available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3426554

Uncovering Competitive Forces in Prescription Drug Markets - Evidence from Statins

PRESENTER: **Carolina Borges da Cunha Santos**

AUTHORS: Eduardo Costa, Sara R Machado

This paper investigates competitive dynamics of pharmaceutical firms using the Portuguese statins market as a case-study. We provide an overview on multiple channels through which firms' market power is likely to be affected. We analyze how the presence in different market segments and repeated interaction with rivals affect the competitive environment and we investigate the role of ownership structure on such dynamics. Finally, we explore the effect of generic entry in a new off-patent statin (Rosuvastatin) on the generic price competition in older off-patent statins.

We combine information from three datasets. The first contains quarterly sales for pharmacies by product across regions. The second is a pricing database containing retail, reference, and price caps for all drugs sold in the Portuguese Reference Pricing System. The third compiles data on ownership structure and global ultimate owner for each of the companies active in any statin market, in Portugal.

Results indicate that while multimarket presence is relevant for firms' pricing decisions – firms active in more statins charge lower prices (relative to their price caps) than firms specializing in one statin -, repeated interactions of firms in different statins markets does not allow these firms to sustain higher prices. The same results hold when we perform the analyses at the level of the global ultimate owner instead of the selling firm. Lastly, results from synthetic control analyses show that entry of generics in Rosuvastatin softens price competition between generics in Atorvastatin – a close substitute of Rosuvastatin. On the other hand, generic price competition in Simvastatin – a weaker substitute of Rosuvastatin – is not affected by the expansion in the off-patent statins market. Overall, these findings suggest low levels of price competition in the off-patent statins market, with price caps being the main determinant of firms' pricing decisions.

Does Centralized Bulk Drug Procurement Reduce Catastrophic Medical Spending? Evidence from Crowdfunding and Administrative Records

PRESENTER: **Dingding Li**, Peking University

AUTHORS: Ye Yuan, Ling Li

Extensive evidence has shown that catastrophic medical spending may lead to long-lasting financial turmoil and significantly impair the household's physical and mental well-beings. While catastrophic medical spending is often covered by public health insurance in many developed countries, such coverage is generally unavailable or capped in developing countries, which presents an important reason for bankruptcy and poverty. We study whether a centralized bulk drug procurement policy in China may reduce the likelihood of catastrophic medical spending and lead to better health outcomes.

We exploit the pilot implementation of the centralized bulk drug procurement policy in 11 mega-cities of China in March 2019 as a natural experiment. This pilot reform led to price reduction of drugs for several common diseases, but especially for chronic granulocytic leukemia (CGL) and non-small cell lung cancer (NSCLC), which often lead to catastrophic spending and medical bankruptcy. We adopt both the difference-in-differences (DID) and triple-DID methods to estimate the effect of the reform on medical spending and treatment outcomes. Our empirical analyses draw from three datasets: the fundraising data from one of largest medical crowdfund platforms that cover more than 95% of all medical crowdfunding in China, administrative medical records from all hospitals in Guangzhou, and monthly hospital usage data for drugs from the WIND databases.

Our results are three-folds. First, we find the reform has led to a significant reduction in monthly crowdfunding cases, requested fund, and actual fund raised for CGL, as compared to the crowdfunding for other types of cancers, or other medical emergencies such as traffic accidents. Second, based on administrative medical records in Guangdong, we find a large reduction of drug spending for CGL, a smaller reduction in total medical spending and non-drug spending. Third, we find suggestive evidence that doctors would tend to use cheaper drugs rather than for profit-driven incentives. Overall, our findings substantiate that centralized price regulation can significantly reduce medical spending and improve patients' welfare, especially for patients with potentially catastrophic spending.

9:15 AM –10:15 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Reference Unit Cost Development in Six Countries for Multi-National, Multi-Sectoral Economic Evaluations: Experiences from the PECUNIA Project

SESSION CHAIR: **Judit Simon**, Medical University of Vienna

ORGANIZER: **Susanne Mayer**, Department of Health Economics, Center for Public Health, Medical University of Austria

DISCUSSANT: **Christian Brettschneider**, University Medical Center Hamburg-Eppendorf

Harmonized Calculation and Cross-Country Comparison of Reference Unit Costs of Health and Social Care Services Based on the PECUNIA Service Costing Tools

PRESENTER: **Susanne Mayer**, Department of Health Economics, Center for Public Health, Medical University of Austria

AUTHORS: Michael Berger, Dr. Alexander Konnopka, Dr. Valentin Brodszky, Silvia Evers, Leona Hakkaart-van Roijen, Luis Salvador-Carulla, A-La Park, William Hollingworth, Judit Simon

Background: Previous research has shown that depending on the methodology applied in the unit cost development, staggering differences in unit costs may arise. Beyond impairing the comparability of economic evaluations, such conceptual and methodological differences in unit costs may also limit the acceptance and uptake of health economic evidence by policy-makers. In light of this, the EU-funded H2020 ProgrammE in Costing, resource use measurement and outcome valuation for Use in multi-sectoral National and International health economic evaluAtions (PECUNIA; 2018-2021) aimed to i.a. harmonize the unit costing methodology and calculate standardized unit costs across sectors and countries. This study details the harmonized development and validation process of reference unit costs for health and social care services in five European countries.

Methods: Using the PECUNIA reference unit costing templates for services, unit costs for five health and social care services in Austria, Germany, Hungary, The Netherlands and England were calculated: general practitioner (per consultation), dental care (per consultation), nursing home (per night), health-related day-care centre (per day; mental health-specific or general), help-line (per contact; mental health-specific or general). DESDE-LTC (Description and Evaluation of Services and Directories in Europe) prototype codes were assigned to each unit cost for standardized service descriptions. Unit costs were calculated in Euro for year 2019 for state/social-insurance-funded services, privately-funded services or as a weighted mixed estimate. All unit costs underwent external validation including the comparative evaluation against existing unit cost estimates, expert or data provider feedback.

Results: A total of 28 unit costs were developed and relevant DESDE codes assigned. According to preliminary analyses, the majority of unit costs (n=26) are representative on the national level. Unit costs were based on own calculations drawing on available secondary data (n=14), on own calculations based on specifically collected primary data or (n=5) or existing unit cost estimates from available sources in line with the PECUNIA methodology (n=9). Unit costs were calculated adopting the PECUNIA top-down gross-costing approach (n=16) or PECUNIA top-down micro-costing approach (n=6) or following a proxy/mixed approach (n=6). State/social-insurance unit costs (n=15), privately-funded unit costs (n=2) and mixed estimates (n=11) were calculated and their applicability in a national economic evaluation setting for joint use with the PECUNIA resource-use measurement instrument (PECUNIA RUM) indicated. The external validation process confirmed the validity of the majority of the unit cost estimates. Unit costs were found to be largely homogenous across countries, with differences e.g. related to mental health-specific services and data-related divergence from key costing harmonization parameters.

Discussion: This is the first research to present reference unit cost estimates for selected health and social care core services in several European countries using the PECUNIA service costing templates. These tools adopt a harmonized and transparent costing methodology with DESDE codes assigned for increased comparability of service unit costs, both filling gaps in the international health economics toolbox. The unit costs will be

included in the PECUNIA reference unit cost compendium and are expected to significantly improve the quality and feasibility of future economic evaluations and their transferability across countries.

Challenges of Standardized Cross-Country Reference Unit Cost Calculation of Education and Criminal Justice Services

PRESENTER: **Irina Pokhilenko**, Maastricht University

AUTHORS: Luca Janssen, Ruben Drost, Aggie T. G. Paulus, Dr. Alexander Konnopka, Dr. Valentin Brodszky, Leona Hakkaart-van Roijen, Luis Salvador-Carulla, A-La Park, William Hollingworth, Judit Simon, Susanne Mayer, Silvia Evers

Background: Mental disorders have a broad societal impact leading to costs in the healthcare sector but also in other sectors including the education and criminal justice sectors. Inclusion of costs in the education and criminal justice sectors in economic evaluations of mental health intervention is crucial for informing policy decision-making and optimal resource allocation. Nevertheless, these costs are rarely included in economic evaluations in the mental health domain. This could be attributed to the lack of standardized unit costs of education and criminal justice services, among other factors. The aim of this study was to apply a standardized unit cost calculation tool developed in the ProgrammE in Costing, resource use measurement and outcome valuation for Use in multi-sectoral National and International health economic evaluAtions (PECUNIA) for the calculation and comparison of the reference unit costs of selected education and criminal justice services in six European countries (Austria, Germany, Hungary, Spain, the Netherlands, and the United Kingdom).

Methods: Three education items and three criminal justice items were selected based on previous studies. Items were standardized using the DESDE (Description and Evaluation of Services and Directories in Europe) PECUNIA coding system to facilitate harmonized terminology of items. Templates for the standardized reference unit cost calculation of services developed by the multidisciplinary team of the PECUNIA consortium were used to calculate the unit costs of the selected services per country. One template was designed for unit cost calculation of services, one template was designed for unit cost calculation of tangible consequences (e.g. material damage). A cross-country comparison was conducted to compare the unit costs and the methods of calculating them (e.g. type of input data used, costing approach).

Results: A total of eighteen methodologically harmonized unit costs including relevant DESDE PECUNIA codes were developed for the education sector. A total of twenty-one methodologically harmonized unit costs including relevant DESDE PECUNIA codes were developed for the criminal justice sector. Derived unit costs were relatively comparable across six countries. However, variation was observed in regards to the valuation methods that was applied.

Discussion: The results of this study facilitate the inclusion of costs in the education and criminal justice sectors in economic evaluations in Europe by providing comparable unit costs of common education services in the context of mental health. Furthermore, this study provides insights into the applicability of the novel valuation methods for unit cost calculation of intersectoral costs as the results highlight the existing lack of high quality, comparable input data for the standardized unit cost calculation. Further research is needed to improve the comparability of the estimates.

Harmonized Calculation and Cross-Country Comparison of Reference Unit Costs of Productivity Loss of Paid and Unpaid Work Based on the PECUNIA Employment and Productivity Costing Tools

PRESENTER: **Kimberley Hubens**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam

AUTHORS: Leona Hakkaart-van Roijen, Susanne Mayer, Dr. Alexander Konnopka, Dr. Valentin Brodszky, Silvia Evers, Luis Salvador-Carulla, A-La Park, William Hollingworth, Judit Simon

Background: Although many authors have advocated a societal perspective for health economic evaluations, productivity costs are not always included yet. Moreover, when these costs are included, different valuation methods and types of unit costs are applied which can limit between-study comparability. The EU-funded H2020 ProgrammE in Costing, resource use measurement and outcome valuation for Use in multi-sectoral National and International health economic evaluAtions (PECUNIA) aims to i.a. harmonize the unit cost development and calculate standardized reference unit costs.

Methods: Using the PECUNIA unit costing templates, reference unit costs for productivity loss of paid and unpaid work were calculated and externally validated by PECUNIA partners in six countries (Austria, Germany, Hungary, The Netherlands, 17 regions in Spain, and England). Estimates were derived from national-level secondary data (e.g. from national statistics offices), existing estimates or collected primary data. These unit costs included estimates for paid work loss (absenteeism and presenteeism) using the human capital method and friction cost method, and for unpaid work loss. Unit costs were calculated in Euro for the year 2019.

Results: Preliminary results included a total of 45 unit costs. Most estimates were derived on available secondary data. For paid work, non-validated mean gross wage estimates per hour ranged from 6.44 Euro in Hungary to 37.84 Euro in Germany. In order to value productivity loss with the human capital method and the friction cost method, retirement age (63.5-67 years of age) and friction period estimates (34.37-136 calendar days) were reported. For unpaid work, the non-validated median estimate was 12.31 Euro.

Discussion: This study has resulted in harmonised and validated unit cost estimates necessary for the valuation of productivity loss in health economic evaluations. The application of the PECUNIA unit costing templates can promote comparability and transferability of outcomes between studies.

Validation of the PECUNIA Costing Tools in Spain

PRESENTER: **Lidia García-Pérez**, SESCS

AUTHORS: Renata Linertová, Jhoner Perdomo-Vielma, Pedro Serrano-Aguilar

Background: The EU-funded H2020 ProgrammE in Costing, resource use measurement and outcome valuation for Use in multi-sectoral National and International health economic evaluAtions (PECUNIA) aimed to harmonize the unit cost development and calculate standardized reference unit costs in Europe. The objective of this presentation is to show the results of the validation process of the unit costing tools developed by PECUNIA. Between-country and within-country transferability was assessed using Spain as a study case.

Methods: A set of indicators was developed to assess the usability, feasibility and transferability of the unit costing templates. They were tested and used for the estimation of costs for a selection of services in Spain and in four Spanish regions: Andalusia, Basque Country, Canary Islands, and Catalonia. Key contacts in each sector and each region or at national level were identified and asked to complete the templates with the relevant data to estimate the cost of each service. Finally, qualitative research was conducted to know the experts' opinions about the PECUNIA tools.

Results: It was possible to estimate the unit cost of GP per consultation and health-related day-care centre (per day) in some regions, and the cost of car vandalism and the productivity loss in all Spanish regions and at national level. It was not possible to estimate the unit cost for other services such as dental care, nursing home, special education, jail and police contacts. The main difficulty to complete the estimations was the lack of detailed data required to complete the PECUNIA unit costing templates and the COVID pandemic that prevented many contacts from full collaboration with the PECUNIA project.

Discussion: The lack of data needed to complete the unit costing templates hampered the testing process. This lack of data is related to the characteristic of the data systems (at the national level or at the regional level), the fact that services provision competences for most of the selected services are transferred to regions (preventing the estimation of a national unit cost), and ultimately the size of the country and the organization of the health and social care and education services among others. Nevertheless, the unit costing templates could serve as a tool to design a homogeneous system for systematic data collection by researchers and by public providers at the regional and national administrations.

9:15 AM –10:15 AM TUESDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: Decolonising Health Economics: Where Are We and What Will It Take?

SESSION CHAIR: **Ama Fenny**, Institute of Statistical, Social and Economic Research

ORGANIZER: **Meghan Kumar**,

DISCUSSANT: **Wei Han**,

Overview of Decolonizing Global Health and Health Economics: Where Are We and Where Do We Go from Here?

PRESENTER: **John Ataguba**, University of Cape Town

There are renewed interests in shaping the future of global public health research, teaching and advocacy. Like global public health, the development and growth of health economics is traceable to many "founding fathers" located in the global North. The gendered dimension is gradually changing but the dominance of the global North is ubiquitous. Policy advice, journal publication and teaching are ways to contribute significantly to the growth of global public health and health economics. Most teaching materials, the editorial board members, and indeed the lead authors of papers in health economics leading journals, for example, are predominantly from the global North—an indication of those who have shaped and continue to shape the growth of the discipline, wield the most significant influence in agenda-setting and the extent of a lack of transformation. In this presentation, I argue what I consider as the origin of the colonization of health economics and indeed global health. I also discuss what should undergird the contributions of the global South and North to health economics to make claims for the urgency of the need for transformation and decolonizing health economics. I conclude with a detailed discussion on the conscious and deliberate efforts needed to redress inequities for decolonization and transformation, including iHEA's recent efforts in bringing back "international" into the discourse.

Process and Implications of Decolonizing Curricula and Research Partnerships

PRESENTER: **Kara Hanson**, London School of Hygiene & Tropical Medicine

Many British universities are reflecting on their colonial origins, the inequalities underpinning the field of global health, and the implications for research and education. The London School of Hygiene and Tropical Medicine was established in 1895, with initial funding that was directed by colonial interests and realities. A staff network at LSHTM initiated discussions in 2019 about decolonizing global health, and these reflections intensified following the murder of George Floyd in the US which gave focus and expression to concerns about racism in our own institution. Since the summer of 2020, LSHTM has begun to develop a more structured institutional process of change to respond to the challenge of decolonization. While there has been some short term progress, and heightened awareness across the institution of the need to redress inequalities, there is a recognition that this is a long term, whole-institutional endeavour, and that sharing of good practice across institutions is essential. In this presentation I will reflect on the imperative to address structural inequalities in career progression for academic staff, teaching and research partnerships, and the measures that have been taken thus far. I will also consider how these challenges apply to the field of health economics research, particularly around funding streams and equitable partnerships, providing some examples of good practice.

Reflecting on Economic Evaluations in Low-and-Middle Income Countries: What Can We Do Differently?

PRESENTER: **Linda Sande**, Malawi-Liverpool-Wellcome Trust

AUTHORS: Ms. Sedona Sweeney, Gesine Meyer-Rath

Economic evaluations aim to achieve efficient allocation of scarce resources. The extent with which such outcomes are being utilised in health sector decision making is unfortunately different between high income countries and low-and middle-income countries (LMICs). There is also a variation of economic evaluation methods by income country. This presentation will focus on some key aspects of economic evaluation practices with the hope of initiating a conversation on what can be done better in LMICs.

First, it is important to consider whether economic evaluation research in LMICs falls within national priorities. Whose question are we answering? Whose priorities are we supporting with our findings? Is it the funders' interests or is this specific disease, intervention or public health issue of interest to the local context? It is important to consider the agenda we are pushing forward in resource-limited settings and to ensure we are within the countries' key priorities.

Secondly, it is crucial to consider applicability/usability of the findings to the local context. Are we packaging our results in a way that can be easily usable by local policy makers and implementers? Are our recommendations even within the remit of the local government? Given the multidisciplinary nature of public health research, ensuring that health economics findings are easy to grasp is likely to encourage evidence-based decision making.

Thirdly, data availability is a persistent obstacle for economic evaluation in LMICs. In the absence of tariffs and payment classification systems such as Diagnosis-Related Groups, costs data in LMICs are often collected painstakingly through bottom-up approaches at the level where resources are used, sometimes combined with top-down data. There are well known methodological challenges with this approach, including possible underestimation of costs, but it is also very labour intensive. Can we do better in terms of data availability for LMICs? Can we ensure that implementers incorporate some form of standardised and easily extractable cost tracking as part of their routine data collection? How can Ministries of Health in LMICs be better equipped for routine cost data collection, and to what extent can existing data be appropriately extrapolated from one country to another?

Finally, LMICs constantly face the challenge of limited capacity for economic evaluation work. There is a need for strategic capacity building for academic and research institutions conducting economic evaluations in LMICs. The answer cannot be more overseas consultants flying in for short periods of time to supervise small armadas of local data collectors-we must train a sustainable workforce and, where requested, help establish local data collection and analysis systems that can be locally maintained and expanded. This may include supporting postgraduate education for junior staff, with a long-term view of devolving global health economic practice and theory to the countries of the Global South. Ultimately, we should aim to institutionalise the capacity by building local institutions that offer technical advice and work hand-in-hand with local Ministries of Health and Finance.

Context Appropriateness of Health Financing Reforms in Africa

PRESENTER: **Edwine Barasa**, KEMRI-Wellcome Trust Research Programme

It is generally accepted that for African countries to make progress towards Universal Health Coverage (UHC), they will need to reform their health financing systems. Informed by this realization, several health system reform processes have, and continue to be undertaken in African countries, targeted at the way country health systems are financed. These include for instance user fee removal, performance-based financing, and health insurance reforms, as well as broader governance reforms that include decentralization and its attendant public finance management reforms. For health reforms to have a chance at being successful, they need to have a proven theory of change that demonstrates that expected outcomes are aligned to broader health system goals (increased coverage and access to quality services, financial risk protection) while promoting equity and efficiency and health system responsiveness. However, it is equality important that the reforms are context appropriate, informed by local conditions to guarantee the validity of the reform's theory of change in specific contexts and promote intended outcomes. Assumptions about the transferability of reforms and their effects from the conceptual west to the south very often do not hold. Reforms that are conceived and developed outside of the context of application, and without the input and appreciation of local realities often result in unintended outcomes that compromise health system development. In this paper, using examples of recent health financing reforms by African countries, I will highlight the discordance between the underlying assumptions of the reforms and the contextual realities of the settings of implementation, and observed unintended outcomes. This paper will highlight the need for health financing reforms in Africa to be "home grown" and context appropriate for African countries to have a chance at making meaningful progress towards UHC.

Physician Behaviour and Decisions

MODERATOR: **Judit Vall Castello**, University of Barcelona

Physicians' Altruism and Behavior Under the Change from Pure Payment System to Mixed Payment Systems: Experimental Evidence

PRESENTER: **Yue Zhang**, Capital Medical University

AUTHORS: Ms. LI Xing, Xinyuan Zhang, Youli Han

In response to the rapid increase in health expenditure, mixed payment schemes have become a prominent alternative for paying physicians. It is important to understand how altruism and behavior of physicians change in switching from a pure payment system to mixed payment schemes. Altruism, as an important component of medical professionalism, may influence physicians' behavioral response to payment systems. However, few studies have examined this topic due to the difficulty in quantifying altruism. We used a controlled laboratory experiment to explore the effect of exogenous change in payment systems on physicians' behavior, ceteris paribus. Behavioral data were further used to quantify altruism and study the effect of altruism on physicians' behavior. A total of 210 medical students playing the role of physicians participated in the experiment, and they were randomly divided into seven experimental conditions. Each condition consisted of a pure payment system (diagnosis-related groups or fee-for-service) and a corresponding mixed payment scheme. The results showed that mixed payment schemes improved physicians' behavior compared with the pure payment system, such as reduced deviation in quantity of medical service, increased patients' benefit, and increased optimal decision ratio ($p < 0.001$). The individual altruism was relatively stable and the mean was 0.78. The effect of altruism on the increase of patients' benefit was weaker in mixed payment schemes than in the pure payment system. For each unit increase in altruism, the increase in patients' benefit was 3.63 - 5.88 units less in mixed payment schemes than in the pure payment system ($p < 0.001$). The altruism increased with the increase of the trade-off range. The implication is that the payment systems can be designed with different trade-off ranges based on physicians' altruism.

Risk and Inequality Preferences in Medical Decisions: An Experimental Approach

PRESENTER: **Dr. Ariadna Garcia-Prado**

AUTHORS: Paula Gonzalez, Alicia Perez Alonso

The analysis of inequality and risk has much in common as recognized in the pioneer works of Harsanyi (1953) and Atkinson (1970). These concepts have received substantial theoretical treatment but while there are many studies that elicit risk attitudes and preferences little effort has been made to quantify individuals' views on inequality. Some of the few studies that focus on the relation between risk and inequality preferences have found that decreased risk aversion is associated with decreased inequality aversion (Amiel et al 1999, Carlsson 2005). However, there are other empirical studies that have not found this association (Kroll and Davidovitz, 1999). In the health domain the relation between risk and inequality preferences is also scarcely studied, especially from the perspective of a medical decision-maker. Studies have mainly focused on how to allocate resources when health outcomes are uncertain and the distribution of health outcomes differs across individuals (i.e. when there is risk and inequality) (Hoel 2003, Bui et al 2005, Courbage and Rey, 2012, Echazu and Nocetti, 2013). However, the relationship between risk and inequality aversion also takes on relevance when the medical decision involves choosing which treatment should be provided to patients that have the same type of condition but may react to treatments differently.

The aim of this paper is to investigate whether a medical decision maker behaves differently when he makes treatment prescriptions for one patient or for a group of patients. We compare the decision maker's risk attitude in both types of decisions and analyze the inequality aversion towards disparate health outcomes when the decision is made for a group of patients.

For this purpose, we conduct a lab experiment and elicit the risk attitudes of 257 medical and non-medical students by assigning them the role of a medical decision maker who must decide treatments for a single patient and for a group of patients. In order to elicit preferences, we used a multiple price list (MPL) method, using the test developed by Holt and Laury, 2002. An interval regression model is used to estimate individual coefficients of relative risk aversion, and an estimation model is used to test for the effect of experimental design characteristics on elicited risk aversion. In addition, non-parametric tests are used to test differences between decisions made for a patient versus a group of patients.

Preliminary results show that: (i) risk aversion is pervasive across all the individuals in the sample, both when medical decisions are made for a single patient and when they are made for a group of patients, ii) risk aversion is significantly higher when medical decisions are made for a group of patients, and iii) the higher the risk aversion when the decision is made for an individual patient, the higher the risk aversion (and inequality aversion) when the medical decision is made for a group of patients.

Tell Me Who You Consult with and I'll Tell You How Compliant You Are: Can Physicians Affect Patient Primary Adherence?

PRESENTER: **Ms. Joana Gomes da Costa**, Faculty of Economics - University of Porto

Adherence is a dynamic, complex and multidimensional healthcare issue especially when dealing with chronic conditions management.

Patients are primary actors towards adherence to a therapeutic regimen and advices provided by the physician. They are subject to medical goods, such as prescription drugs that are requested on the patient's behalf by a physician.

Physicians play a central and supportive role in meeting the patients' objectives. They maximize their utility function, which may coincide partly with the utility function of the patient, while promoting medication or screening adherence as well as suggesting lifestyle changes.

We propose to assess the effect of the agency relationship on patient's primary adherence with antidiabetic drugs.

We rely on a large longitudinal matched physician-prescription-patient dataset for all Portuguese e-prescriptions collected from *Serviços Partilhados do Ministério da Saúde* between January 2015 and October 2019. For this study we are considering a sample of 27.125 physicians, 121.727 patients, 1.363.778 e-prescriptions and 28 different oral anti-diabetic pharmaceuticals, for all regions in Portugal.

We answer our question building on the framework of a physician-patient agency relationship and using two econometric approaches: (i) we start by running a probit regression model, followed by a (ii) fractional regression model. The main variable of interest is the main physician associated to the patient, considered as the patient that the physician sees more often, while controlling for patient-, healthcare system- and treatment-level characteristics.

The average value of primary adherence is approximately 70 percent (17.66 percent never fill up their prescription and 53.59 percent fills the entire prescription).

physicians are mainly located on public sector, prescribe a higher number of prescriptions and their primary adherence levels are higher (70.43 percent vs. 66.37 percent with non- main physicians). Our findings suggest that the main physician has a positive effect on primary adherence, especially when located at the private sector. In fact, when the prescription is written by the main physician, a patient's primary adherence increases by 1.57 percent. When the patient visits the public sector, the adherence rate decreases by 5.51 percent and when the main physician is publicly located, the primary adherence decreases by 1.61 percent.

Although the variation may be small, it is statistically significant, and it can provide increments on adherence on the long-term. These results call for coordinated strategies to enhance adherence, promoting the interaction among patients and physicians as well as the healthcare system.

HEALTH SYSTEMS' EFFICIENCY SIG SESSION: Primary Care Efficiency

MODERATOR: **Pavitra PAUL**,

Investigating the Association between Primary Care Efficiency and Health System Characteristics across European Countries

PRESENTER: **Dr. Valerie Moran**, Luxembourg Institute of Socio-Economic Research (LISER)

Introduction

Efficiency, whether allocative or technical, is a challenge for health systems. We focus on technical efficiency - the ability to produce maximum output from a given level of inputs. While a health system may be judged inefficient, sub-sectors within that system may perform efficiently. This motivates sector-level efficiency analyses. Sector-level cross-country studies have primarily concentrated on hospitals. There has been less focus on primary care (PC) despite cross-country data suggesting potential to improve efficiency. To date, one study (1) has demonstrated variability in PC efficiency across European countries but did not examine factors driving variations. We address this research gap by investigating the relationship between PC efficiency and health system characteristics across European countries. We focus on diabetes, which can be managed optimally by PC.

Methods

We measure efficiency using Data Envelopment Analysis, which estimates an efficiency frontier using observations with the highest output-input ratio. We use an output orientation and variable returns to scale and adjust efficiency estimates for sampling bias using bootstrapping.

Data sources include OECD Health Statistics 2020 and the 2016 OECD Health Systems Characteristics Survey. We estimate efficiency for 18 European OECD member countries for 2010 to 2016. We include diabetes hospital admissions and lower extremity amputation as outputs and generalist medical practitioners as an input.

We control for 'external' variables that may influence efficiency: diabetes prevalence, smoking, obesity and alcohol consumption. We include these variables as: 1) 'uncontrollable' inputs; and 2) independent variables in a truncated regression with the bias-adjusted efficiency scores as the dependent variable. Health system characteristics include curative care beds, pay-for-performance (P4P), gatekeeping, organisation of out-of-hours (OOH) PC and availability and use of e-health. We regress these variables against the bias-adjusted efficiency scores in a truncated regression.

Results

We find evidence of inefficiency across countries. Diabetes prevalence and deprivation are positively associated with efficiency and smoking negatively associated. Health system characteristics associated with higher efficiency include P4P, registration with a PC provider, obligatory referral to specialist care (gatekeeping) and routine checks of patients with chronic illness by nurses or assistants. Characteristics associated with lower efficiency include a higher rate of curative care beds.

Conclusion

We contribute to the scarce literature comparing the efficiency of PC systems across European countries by exploring the relationship between PC efficiency and health system characteristics. Potential topics for discussion include:

- Choice of methods to incorporate 'external' variables.
- Consideration of additional 'external' or health system characteristics variables.
- Insights into the relationship between PC efficiency and health system characteristics.

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A Descriptive Analysis of Indonesia's Primary Care E-Referral Data: How Did the Horizontal Referral Policy Affect Hospital Outpatient Visits and Make Cost Savings?

PRESENTER: **Mr. Aditya Darmasurya**, BPJS Kesehatan
AUTHORS: Mcandra ikhda Nurrohman, Rahma Anindita

Background: In the Indonesian National Health Security Program, Jaminan Kesehatan Nasional (JKN), the referral ratio is high. In 2018, more than 15% of patients visiting primary care providers were referred to hospitals, while 4,4% of the total referrals were non-specialty referral suggesting that a high proportion of patients at the secondary care could be treated at primary health care. As of September 2019, Indonesia's Social Security Administering Body for Health Sector (BPJS Kesehatan) enacted a horizontal referral policy to the existing electronic referral system. Primary care providers will refer patients to other primary care providers with more resourced facilities. Two main questions arose regarding this policy. How were the impacts of the horizontal referral policy on hospital outpatient visits? Furthermore, would horizontal referral make cost savings?

Objectives: To assess the impact of horizontal referral on hospital outpatient visits and how cost savings were made.

Methods: This study is a non-experimental big-data analysis by observational descriptive method. Quantitative data were obtained from BPJS Kesehatan national electronic referral database generated from health care services recorded by 21.746 primary care providers through P-Care application program with 223.470.668 JKN registered members. Data series from September 2019 to October 2020 were then analysed, including primary care visits, primary care referrals and hospital outpatient visits. Data results were classified into two groups in order to separate data analysis affected by external COVID-19 pandemic factors. Group I consisted of data from September 2019 to December 2019 and group II consisted of data from January 2020 to October 2020.

Results: Data results were synthesized from 118.716.139 primary care visits in group I and 123.260.813 primary care visits in group II. Group I data analysis revealed an increase in horizontal referral among primary care providers caused a reduction of hospital outpatient visits. A total of 8.140 cases were referred horizontally and not referred to hospitals. This led to a reduction of hospital outpatient visits with cost savings reaching up to 3.074.103.560 rupiahs during four months of implementation. Referral ratio decreased from 16,50% prior the policy enactment to 15,71% in December 2019, showing an improvement in primary care performances. Group II data was analyzed in terms of COVID-19 pandemic as an external factor that may influence the number of horizontal referrals. However, even during the COVID-19 pandemic, horizontal referral showed an increasing trend from January to October 2020 with 56.875 total cases being referred among primary care providers. Cost savings from January to October 2020 reached 23.230.081.875 rupiahs.

Conclusions: Big-data analysis showed the horizontal referral policy in Indonesia reduced the number of patients referred to hospitals, hence creating cost savings even during the COVID-19 pandemic. Horizontal referral proposes collaboration among primary care providers, thus controlling unnecessary referrals to hospitals. It is expected that further interventions to extend the numbers of PCPs implementing horizontal referral and their nation-wide distribution will take place.

Keywords: horizontal referral, outpatient visit, cost saving

Measuring Efficiency in the Primary Care Management of Patients with Chronic Diseases, Maternal and Child Health Care Services

PRESENTER: **Joana Pestana**, Nova School of Business and Economics

AUTHOR: Pedro Pita Barros

Objectives: The objective of this paper is to assess the variation in the cost of the primary care units that can be attributed to differences in their production technology and inefficiencies taking into consideration more than the volume outputs but also the quality of care provided. We study the differences across organizational and payment types of practices that resulted from the reform in Portugal: practices with salaried staff, and team-based practices, called Family Health Units (FHU), with a tiered performance incentives scheme. Amid a scenario of rising health care costs, our interest was to establish the extent to which the management and configuration of team's, the levels of activity and quality of care achieved, leveraged potential wasteful allocation of resources, i.e. inefficiencies, that could contribute to the discrepancies in costs between practices.

Methodology: Administrative data from 928 practices was collected and linked with financial data to capture the health care services provided and physician induced costs from 2015 to 2018. We estimate the cost functions using stochastic frontier models for panel data on total cost adjusted for practice characteristics, casemix and other cost drivers. The estimations considered both the number of visits, patients seen and the quality of services provided through an extensive set of quality indicators. The inefficiency estimates are interpreted as relative measures of cost containment effort.

Results: Our results suggest that even after adjusting for the patient characteristics and underlying conditions in which the practices operated, there are substantial differences in the technology between FHU and non-team-based practices in providing health care services to the population. The practice cost is associated negatively with the average size of the physician-patient list size and the number of unlisted patients using the services but increases in urban areas.

The evidence supports the premise that the creation of team-based units (FHU) has helped improve cost efficiency in primary care albeit only for practices with a relatively higher scale of production (more than 60 000 yearly visits). Smaller practices despite the organizational changes and performance incentives may still suffer from the maladies of scale, such as coordination difficulties or low peer pressure. The overall efficiency predicted is on average 89%. Team-based units score the highest but we observe a convergent trajectory of efficiency levels across practices. The maturity of the team and the ratio of nurses to physicians do not lead to significant improvement in their relative cost performance.

Conclusions: Despite heavily regulated, the composition and management of practices reveal the existence of scale economies that need to be considered in the discussions regarding the payment systems with effective incentives and the efficiency in health care provision.

10:45 AM –11:45 AM TUESDAY [Demand And Utilization Of Health Services]

ORGANIZED SESSION: Formal Long-Term Care: Price Sensitivity, Health Effects and Quality Measurement

SESSION CHAIR: **Ana Llena-Nozal**, OECD

ORGANIZER: **Marianne Tenand**, CPB Netherlands Bureau for Economic Policy Analysis

DISCUSSANT: **Judite Gonçalves**, Nova School of Business and Economics, Lisbon; **Ana Moura**, Tilburg University; **Cristina Vilaplana-Prieto**, University of Murcia

Do Co-Payments Affect Nursing Home Entry? Quasi-Experimental Evidence Using Dutch Administrative Data

PRESENTER: **Marianne Tenand**, CPB Netherlands Bureau for Economic Policy Analysis

AUTHORS: Pieter Bakx, Bram Wouterse

Most developed countries use co-payments to limit nursing home stays. However, as nursing homes are generally a last resort, there may be less moral hazard than with other types of care. Hence, it is not clear whether co-payments affect nursing home care use and whether the cost savings are worth the increased financial risk faced by potential users.

This paper assesses the impact of the co-payments for permanent nursing home residents by exploiting quasi-experimental variation. A co-payment reform implemented in 2013 in the Netherlands led to a sizeable increase in the co-payments for nursing home care, but only for individuals with high wealth. We estimate the impact of the co-payment increase on nursing home entry by performing a difference-in-differences analysis on administrative data for the Dutch 65+ population from 2009 to 2014.

We find that the increased co-payments only led to a small decrease in the use of nursing home care. Furthermore, we find that the cost reduction was limited, that it was not offset by cost increases elsewhere and that it only led to a mortality increase for specific subgroups. However, the co-payment increase did have a substantial impact on the financial risk borne by all elderly who are at risk of needing nursing home care at some point during their life.

Contrary to what is often conjectured, demand-side financial incentives do play a role in the timing of permanent nursing home stays, even in a country like the Netherlands that ensures their financial accessibility. However, co-payments increase the financial risk of all potential users substantially and this increase is much larger than the cost saving it achieves by limiting use.

Does Subsidized Long-Term Care at Home Improve Psychological Wellbeing? New Evidence on Causal Effects from the Survey of Health, Ageing and Retirement in Europe

PRESENTER: **Ludovico Carrino**, King's College London

AUTHORS: Mauricio Avendano, Erica Reinhard

This study provides novel evidence on the causal effect of public home-care on users' mental health and wellbeing. We implement an instrumental variable model using an individual-level variable identifying respondents eligibility for public home-care as instrument for formal home-care use. This approach exploits the interaction between individual health characteristics and country-specific legislation for causal identification. Eligibility rules are nonlinear aggregation of functional and cognitive health limitations and differ substantially across countries. While the probability of receiving care increases as health status worsens, LTC-eligibility is only triggered by country-specific combinations of health characteristics. Using longitudinal data from the Survey of Health, Ageing & Retirement in Europe (SHARE, 2004-2017), we match respondents' self-reported characteristics on relevant outcomes with the local prevailing LTC legislation in Belgium, France, Germany and Spain, where eligibility rules are unambiguous. We focus on depressive symptoms measured with the Euro-D scale, Quality of life (CASP scale) and loneliness (R-UCLA scale). Our results show that receiving formal home-care significantly reduces depressive symptom scores by 2.2 points (large Cohen *d* effect-size) and the risk-of-depression by 14 percentage points. The effect is accompanied by a 5.5 p.p. reduction in the risk of perceived loneliness, and a 16 p.p. increase in the probability of reporting higher than average CASP scores. Our results have important public policy implications. First, they suggest that the net effect of home-based LTC on mental health and wellbeing is positive and large. Second, they support calls for more inclusive eligibility criteria for home-based LTC and suggest that budget cuts to LTC services should factor in possible welfare losses for older people. Third, they suggest that formal care might be an effective tool to complement existing treatments for mental health in older age.

Estimating Nursing Home Performance on Health Outcomes: Is Using Big Data Enough?

PRESENTER: **Ms. Marlies Bar**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam

AUTHORS: Pieter Bakx, Bram Wouterse, Dr. Eddy Van Doorslaer

Objectives:

Policy makers and researchers are increasingly acknowledging the importance of measuring the quality of residential nursing homes care, based on their residents' outcomes. These measures are essential as they can be implemented in pay-for-performance or bench-marking schemes to improve

nursing home quality. However, measuring care quality with residents' outcomes is complicated due to a lack of good data on outcomes, small sample sizes and systematic differences in residents' characteristics across nursing homes. The aim of this study is to measure care quality of residential homes, using outcomes such as mortality and avoidable hospitalizations, by applying methods that have recently been introduced in studies on teacher value added and quality of hospitals, but are novel to LTC context.

Data & methods:

We use rich administrative data of 111,205 nursing home residents to estimate and compare the performance of the largest 804 nursing homes in The Netherlands. We apply a value-added framework to estimate the 180-day mortality and avoidable hospitalization rate for each nursing home. In order to compare outcomes across residential facilities, we include an extensive set of covariates, such as proxies for residents' socioeconomic status and health prior to nursing home admission, to control for observable case-mix differences. To test and correct for remaining selection bias from unobservables, we predict individual's nursing home choice using geographical distance from the exact location of the resident's prior home to all nursing homes within her choice set as instrumental variables (IV). Since the estimates from the IV approach are expected to be surrounded with uncertainty, we shrink them by applying empirical Bayes. We attempt to extend this analysis by linking the performance estimates to nursing home quality measurements such as staffing ratios and online reported ratings.

Results:

Our first results show large mortality and hospitalization differences (15 percentage points) between the 20 percent best and worst performing homes after extensive case-mix differences based on observable characteristics. This variation across nursing homes increases even further when using the IV analysis including the empirical Bayes application. Our preliminary results suggest that the distance instruments strongly predict nursing home admission for a large share of the nursing homes. In fact, we find that 75 percent of the Dutch nursing home residents choose a nursing home within 8 kilometers from their prior home, and almost 30 percent chooses the nursing home that is the closest. Moreover

Discussion:

These results suggest that, even in a high long-term care expenditure context like The Netherlands, nursing homes show substantial variation regarding health outcomes. Furthermore, this paper contributes to a growing literature that highlights the importance of controlling for selection on unobservables when evaluating quality of care based on outcome variables.

10:45 AM –11:45 AM TUESDAY [Supply Of Health Services]

Physicians' Payment

MODERATOR: **Anne Sophie Oxholm**, University of Southern Denmark

Gone with the Wind: The Impact of the 2016 National Contract Reform on Junior Doctors' Retention within the English NHS

PRESENTER: **Marco Mello**, University of Surrey
AUTHORS: Dr. Giuseppe Moscelli, Melisa Sayli, Ioannis Laliotis

Background and Objective.

The haemorrhage of healthcare workers has been posing a serious threat to the provision of hospital care in the English NHS during the last decade. Of particular importance is the loss of in-training Junior Doctors, as they are the future of the NHS medical workforce.

In August 2016, the UK government imposed a new contract on NHS Junior Doctors, affecting both their working conditions and their levels of pay. This contract involved an increase in the basic salary, but also more weekend working hours paid at the standard weekday rate. This resulted in a growing discontent among doctors in training, who considered these terms detrimental to both their economic return and their well-being.

This study investigates the impact of the 2016 Junior Doctor Contract (JDC) on Junior Doctors' retention in the NHS, by means of a Difference-in-Difference (DiD) analysis with heterogeneous treatment intensity.

Methods.

We construct a monthly employee level panel by using NHS workforce administrative data (Electronic Staff Records (ESR)) from 2009 to 2019. The ESR data allow us to observe the employment history of Junior Doctors and whether they leave the NHS for longer than 6 months, which is our primary outcome of interest.

Because the new contract was imposed to all Junior Doctors employed in the NHS, we examine the retention of trainee doctors as a function of their exposure to pre-reform pay variables later affected by the new contract. We define a continuous treatment intensity variable that quantifies the amount of unsocial work at Trust level that each Junior Doctor was exposed to until August 2016. This measure is based on the share of basic salary received by training peers (within the same hospital Trust and at the same career level) as remuneration for anti-social work. Intuitively, this approach identifies Junior Doctors that were more used to weekend working and therefore were reasonably more penalized by the new contractual terms.

Results.

We find that the 2016 JDC significantly reduced the retention of Junior Doctors who rotated across Trusts where unsocial work was more common. On average, a 10% increase in the ratio between the anti-social supplement pay and the basic salary is associated with a 0.13% increase in the monthly probability of leaving the NHS and with a 0.16 increase in the number of monthly employment absences. Furthermore, we show how specialties in which weekend working is ordinary (e.g. A&E, Gynaecology) experienced a greater loss of trainees compared to specialties in which much of the work takes place over a 5-day week (e.g. Psychiatry).

Conclusions.

These findings highlight the relevance of working conditions for the progression in the medical career and the retention of healthcare workers. They are also important for designing future policy interventions and contractual agreements aimed at improving the retention of human capital in the English NHS and other publicly funded healthcare systems.

Incentive Design and Quality of Care Under Brazil's National Pay-for-Performance Programme for Primary Care

PRESENTER: **Nasser Fardousi**
AUTHORS: Josephine Borghi, Søren Rud Kristensen, Roxanne J. Kovacs, Helena Eri Shimizu, Leticia Xander Russo, Luciano Gomes, Juliana Sampaio, Garibaldi Dantas Gurgel Junior, Everton Silva, Timothy Powell-Jackson

Introduction: Pay-for-performance (P4P) is widely used to incentivise health providers to improve quality of care in health systems around the world. While there is consensus that the design of incentives schemes is important for scheme effectiveness, the empirical evidence on how scheme design affects outcomes is scarce, with the majority of evaluations comparing P4P against the absence of P4P. Under Brazil's Improving Primary Care Access and Quality (PMAQ) scheme, local municipalities have autonomy in how they design the scheme with implications for the outcomes and types of incentives facing primary care providers (family health teams). This study examines how variation in local incentive designs are associated with quality of care and equity of health care delivery in Brazil.

Method: We combine administrative and survey data on the quality of care delivered by 13,525 family health teams participating in PMAQ between 2011 and 2019, with a survey on municipality incentive design. The main outcome is the percentage achieved of the maximum performance score obtainable by family health teams (the PMAQ score). The score is calculated on the basis of several hundred indicators of quality of care . To identify variation in incentive design, we examine whether funds are given to teams as ; the amount given; and the basis for payment. We then associate variation in scheme design with changes in the PMAQ score and socioeconomic inequality in the score using census data on local area income.

Results: Family health team performance improved over the study period. The improvement was greater amongst municipalities incentivising providers than those that invested the money in infrastructure. Moreover, incentivised family health teams located in areas in the poorest decile saw an improvement of 8.3 percentage points in the PMAQ score compared to 3.1 percentage points for their non-incentivised counterparts. Further, increasing the size of incentive was associated with greater improvement in PMAQ score. The performance of teams receiving incentives corresponding to less than 10% of their salary decreased by 0.6 percentage points whereas teams receiving 10% to 29% and 30% or more of their salary increased performance by 2.5 percentage points and 6.8 percentage points, respectively.

Conclusion: Findings show that the use of PMAQ funds to incentivise family health teams is associated with a modest but significant improvement in quality of care compared to those who did not pass incentives to the teams. This improvement is more pronounced amongst providers located in poorer areas. We discuss the implications for the future design of incentive schemes to improve the quality of care.

Informal Payments for Healthcare in Europe: Institutions and Social Norms

PRESENTER: **Iva Parvanova**, London School of Economics and Political Science

Informal, or under-the-table, payments and gifts are a prominent practice in the health care systems within low- and middle-income countries. These exchanges have been especially prominent in transitioning countries in Eastern Europe and Central Asia. Informal payments and gifts can create social networks and in-group dynamics which in turn deter access to timely and high-quality health care in countries where these issues are already present due to high out-of-pocket expenses. The health economics literature has often assumed that such payments are rooted in health system characteristics, such as lack of adequate financing, physician remuneration and access to healthcare. We challenge this assumption by considering the role of social norms rather than financing inefficiencies as a driver of informal payments. The paper reconciles findings from the health economics literature on the socioeconomic determinants of the informal practice while introducing a novel measure of social norms.

This study utilizes multilevel analysis of the third round of the Life in Transition Survey (2016) to examine country-specific trends in perceptions about and incidence of informal payments. The data and study design allow us to examine 29 Eastern European and Central Asian countries. A novelty in this paper comes from the adoption of a latent variable approach which will be used to model social descriptive norms related to informal payments and gift giving. Preliminary results have showed that social descriptive norms are a driver of informal payments across Eastern and Central Europe and increase the individual-level likelihood in participating in the practice even after controlling for health-system characteristics. The conceptual framework presented here will be used to explain the ineffectiveness of previous policy recommendations which have focused primarily on strengthening laws and authorities without taking into account the importance of social norms and expectations.

10:45 AM –11:45 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Valuing Health in Children Using Stated Preference Methods

SESSION CHAIR: **Koonal Shah**, NICE

DISCUSSANT: **Kim Dalziel**, The University of Melbourne

Self Vs. Other, Child Vs. Adult: An Experimental Comparison of Perspectives for Valuation of EQ-5D-Y

PRESENTER: **Stefan Lipman**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam

AUTHORS: Vivian Reckers-Droog, Milad Karimi, Michal Jakubczyk, Dr. Arthur Attema

Objectives: EQ-5D-Y-3L health states are valued by adults taking the perspective of a 10-year-old child. Compared to valuation of adult EQ-5D instruments, this approach entails two changes to the perspective: i) child health states are valued instead of adult health states and: ii) health states are valued for someone else instead of for oneself. Although earlier work has shown that these combined changes yield different values for child and adult EQ-5D health states that are otherwise equal, it currently remains unclear why. Hence, we aimed to disentangle the effects of both changes.

Methods: A sample of 205 students was surveyed. Each respondent completed visual analogue scale (VAS) and time trade-off (TTO) tasks for five EQ-5D-Y-3L states, using four randomly-ordered perspectives: i) self-adult (themselves), ii) other-adult (someone their age), ii) self-child (themselves as 10-year-olds), iv) other-child (a child of 10-years old). We compared how each perspective impacted the outcomes, precision, and quality of EQ-5D-Y-3L valuation.

Results: Overall, differences between perspectives were consistent, with their direction being dependent on the health states and respondents. For VAS, the effect on outcomes depended on the health-state severity and variance was higher in valuation with child perspectives. For TTO, we observed that EQ-5D-Y-3L states valued for others (i.e. children or adults) received higher valuations and lower variances.

Conclusion: The use of a different perspective appears to yield systematic differences in EQ-5D-Y-3L health state valuation, with considerable heterogeneity between health states and respondents. This may explain mixed findings in earlier work.

Exploration of the Reasons Why Health State Valuation Differs for Children Compared to Adults: A Mixed Methods Approach

PRESENTER: **Sarah Dewilde**, SHE

INTRODUCTION: Evidence comparing adult versus child stated preferences consistently report higher utility values for children, using VAS, composite-TTO (cTTO), DCE-with-death, DCE-with-duration, lag-time-TTO, and location-of-dead-approach, than for adult health states. Explanations for these findings have been proposed but not verified.

AIM: To confirm the higher valuation for child health states; and to investigate the reasons why respondents value child health states differently.

METHODS: Eighty general public adults from the UK, Belgium and the Netherlands were invited for a 1.5-hour face-to-face interview. Respondents valued four health states from two perspectives (8-year-old child, 40-year-old adult) using VAS and cTTO. Thirty-two respondents also participated in think-aloud interviewing. Quantitative analyses were performed in SAS; audio-recorded interviews were transcribed and qualitative thematic analysis was conducted in NVIVO. Interviews were coded by two researchers using presumption-focused coding. Statements, nodes and themes were reviewed cyclically until consensus was reached within the research team. We aimed to obtain a framework with a limited number of nodes and uniform statements within each node. Diagrams were developed depicting the relationships between themes. Qualitative statements made by respondents were contrasted with their quantitative responses.

RESULTS:

Quantitative results: Significantly higher VAS ratings were observed for children for severe HS. Statistically significant differences were found between child and adult cTTO values: 0.026, 0.112, 0.377 and 0.294 higher utilities for mild, moderate, severe and worst health states (all $p<0.01$).

Qualitative results: 1,221 pages of transcripts were reviewed, resulting in 303 coded statements. Fragments were categorised in 5 themes that were present both in child and adult valuation, though with a different interpretation. Two themes encompassed General principles on the value of life: Inter-generational responsibility and dependency (All lives are precious: childhood is a crucial time for forming life skills based on new experiences; adulthood is an important time to take care of the family) and Staying alive is important (Life is worth living even with impaired HRQoL, for

children and adults). Three themes were identified as Factors contributing to dealing with impaired HRQoL: Awareness of poor HRQoL and ability to make decisions (children have difficulties comprehending poor HRQoL and their parents are making choices for them, whereas adults are able to assess their HRQoL and decide for themselves); Coping ability (children being flexible and resilient; adults having experience with dealing with difficulties); and the Practical organisation of care (children being unconditionally cared for by their parents; adults being able to organise and pay for care).

Mixed methods: Comparing statements on the value of childhood as a time for new experiences and adults' roles in life to prepare their children for adulthood, with the same respondents' cTTO values, confirmed the concordance between qualitative and quantitative results.

CONCLUSION: Adult respondents showed a lower willingness-to-trade life-years for achieving higher HRQoL in children. This finding may have unintended consequences when making reimbursement decisions on interventions that mainly improve HRQoL in children, as due to utility compression there is less cope for improvement. The currently used willingness-to-pay threshold for cost-per-QALY calculations may have to be revisited when evaluating paediatric treatments.

Understanding Adult Preferences in the Valuation of EQ-5D-Y Health States for Children and Adolescents: A Think-Aloud Study

PRESENTER: **Vivian Reckers-Droog**, Erasmus University Rotterdam

Introduction: The EQ-5D-Y is used to measure health-related quality-of-life (QOL) in children and adolescents aged 8−15 years. The EQ-5D-Y valuation protocol prescribes discrete choice experiment (DCE) and composite time trade-off (cTTO) tasks for valuation of health states for a 10-year-old child. Results from the first valuation studies indicate that adult respondents trade-off differently between QOL domains in DCE tasks and between QOL and life-years in cTTO tasks when completing the tasks for a child, compared to completing the same tasks for themselves. Results further indicate that child health state values may be associated with more preference uncertainty. This raises questions about adults' reasoning while valuing EQ-5D-Y health states and how considerations that are (not) directly related to the health state under valuation (e.g. characteristics of the imagined child, extrinsic life goals, and maximum endurable time) affect preferences. Moreover, it raises questions about how adults trade-off for adolescents (i.e. children in transition to adulthood), for whom the EQ-5D-Y is also used.

Aim: To examine (differences in) adults' reasoning when valuing health states for themselves, a 10-year-old child, and a 15-year-old adolescent and how (un)related considerations affect preferences.

Methods: We conducted face-to-face interviews using a think-aloud protocol with 25 participants, purposively sampled based on age, sex, education, having children, and QOL. Participants first completed five DCE tasks and three cTTO tasks for themselves and subsequently for a 10-year-old child and 15-year-old adolescent. The verbatim transcripts were subjected to inductive thematic content analysis.

Results: Preliminary results indicate that preferences for adult health states were driven by preferences relating to pain/discomfort and anxiety/depression and for child health states by mobility and anxiety/depression. Self-care and usual activities were considered less important for children; however, these domains were considered most important for adolescents. Results further indicate differences in trade-offs between QOL and life-years for adults, children, and adolescents. The value of life-years was dependent on achieving life goals, e.g. "making memories" for adults, finishing primary school for children, and having a first boy/girlfriend for adolescents. Participants were relatively more reluctant about giving up life-years for children/adolescents, mainly because they had no insight into the preferences of children/adolescents themselves, nor of their parents. Some claimed their preferences were, therefore, a compromise between their own and the (perceived) preferences of these actors. Other reasons for being reluctant, in particular about giving up life-years for children, were self-related (e.g. "I want to keep my child with me for as long as possible"), related to expectations about children's coping abilities (e.g. "children are more resilient than adolescents and adults"), and hope about healthcare innovations (e.g. "a new treatment may become available that prevents the child from dying").

Conclusions: Adults trade-off differently between QOL domains and between QOL and life-years for themselves, children, and adolescents, resulting in different values for identical health states. The findings indicate that value sets based on preferences for 10-year-olds may not be representative for 15-year-olds. They further indicate that value sets may be influenced by preferences that are not directly related to the health states assessed.

10:45 AM – 11:45 AM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Pricing and Policy Impacts for Alcohol and Tobacco

MODERATOR: **Francesca Cornaglia**,

Minimum Unit Pricing for Alcohol: Unintended Consequences for Food Expenditure?

PRESENTER: **Daniel Kopasker**, University of Glasgow

AUTHORS: Paul McNamee, Anne Ludbrook, Lynda McKenzie, Stephen Whybrow

On the 1st of May 2018 Scotland became the first country to introduce minimum unit pricing (MUP) for alcohol sales in an attempt to reduce the negative health consequences of alcohol misuse. Given the novel nature of this policy, the legislation required that the effect of this intervention should be independently reviewed after 5 years. Prior to the introduction of MUP, modelling predicted that, on average, households will buy less but spend more on alcohol. Assuming fixed and constrained household budgets, the change in household expenditure on alcohol resulting from MUP would reduce the budget available for other expenditure, such as purchasing healthy food. Such a change could offset some of the health gains from reduced alcohol consumption. This study tests for the existence of unintended effects: whether a change in household spending decisions for food occurred in Scotland following the policy.

The introduction of MUP for alcohol by the devolved government in Scotland, without equivalent legislation in England, creates the conditions for a natural experiment. We analyse the effect of MUP on weekly household food expenditure, and the composition of that expenditure, in Scotland and the north of England (where MUP does not apply). The analysis uses household purchase microdata, collected by Kantar Worldpanel, to compare household food expenditure before and after MUP. Analysis is conducted within a difference-in-differences (DID) framework. The main hypothesis tested is that MUP for alcohol will have a small but meaningful effect on household food purchasing.

The initial results indicate that MUP for alcohol in Scotland had a small but statistically significant effect on household food purchasing. This reduction in food expenditure has not been spread equally across food categories, and the pattern of changes in food categories appears to be undesirable. Statistically significant reductions in spending following the introduction of MUP in Scotland are observed for dairy, cereals, and fruit and vegetables. A statistically significant increase is observed for crisps and snacks only. This combination of changes could contribute to negative health outcomes. We are currently evaluating the impact of volume reductions within food categories and the substitution of products, which may vary in nutritional benefit, within category. This analysis will indicate whether or not the observed reduction in food expenditure is meaningful for health.

Do Cost Reminders Lead to Healthier Decisions? Experimental Evidence of Using Nudges to Reduce Tobacco Intake in Rural Bangladesh

PRESENTER: **Adnan Fakir**, University of Western Australia

We conduct a field experiment to compare the impacts of two demand-side interventions that nudge a rural-poor population in Bangladesh to reduce their tobacco intake. The first intervention takes inspiration from financial cost-saving incentives and provides participants with a daily record-keeping logbook to remind participants of their cumulative monetary costs spent behind tobacco. The second intervention, on the other hand, provides household-level visual posters that remind the participants of the negative health effects of tobacco intake on oneself, their children, and others.

Results find that the two treatments had different effects on male and female participants. Both the logbook and poster treatments significantly lowered overall tobacco consumption expenditure for male smokers, a result also supported by breath carbon monoxide measures. However, male participants in the logbook treatment group substituted away from more expensive cigarettes to the much cheaper smokeless tobacco (SLT) products, with a corresponding increase in the latter. This indicates that while the logbook treatment was able to make the males mindful of their cumulative expenditure on tobacco, they did not internalize associated health costs of smoking and made the switch to cheaper SLT products. This is an unintended consequence of the logbook treatment showing that cost-saving incentives may not incentivize healthy decision-making in the presence of cheaper substitutes. We do not find any such substitution for the poster treatment suggesting that the treatment made the message of negative health effects more salient. This is reiterated for female participants. While the poster treatment lowered female SLT consumption, the logbook treatment had no significant effect.

Heterogeneity analysis further reveals that, for the logbook treatment arm, male participants with greater risk-averse attitude, who faced lower repeated lifetime shocks, and those who spent higher proportions of total household expenditure behind tobacco significantly lowered their tobacco intake but with the substitution to cheaper SLT products. This suggests that individual low-risk preference and becoming less inured to shocks may make it easier for individuals to curb tobacco addiction. On the other hand, for the poster treatment arm, male participants with children less than five years of age in their household, who are more educated, and felt higher degrees of guilt from the treatment, significantly lowered their tobacco intake. This indicates that intrinsic altruism might be a key motivating factor that can contribute to curbing tobacco intake.

Broadly, our work contributes to the growing literature on the causal impact of behavioral change interventions to promote healthy behavior. The specific contribution of this study is that the impact of behavioral policy interventions, intended to remind participants of the costly financial impacts of their behavior, should be designed keeping in mind the range of substitutes available on the market. When cheaper alternatives to addictive goods are available, nudge-based interventions founded on financial costs alone might not be as effective as interventions focused on intrinsic danger.

Crowding out in an Environment of Increasing Tobacco Taxes

PRESENTER: **Zunda Chisha**, University of Cape Town

Tobacco taxation, particularly specific excise tax, is often cited as one of the most effective policy tools available to curb tobacco consumption. The advantage of course is that the effect of a tax (in terms of impact on prices and government revenue) is predictable as cigarette producers often pass on the full burden (or more) on to the consumer by raising the price of cigarettes resulting in reduced consumption. Despite the public health gains from this, a common criticism against this approach is the potential regressivity of the tax.

From the Literature we know two things - First, tobacco consumption crowds-out expenditure on other household goods and services including several important categories such as education, food and healthcare. This is true for a variety of methods used across different geographic settings. Second, the literature suggests that the decline in tobacco consumption resulting from a tax increase, is driven equally by both prevalence and intensity effects. Thus, following a tobacco tax increase, some poor smokers may continue smoking, potentially contributing to an even larger financial burden on the household through the crowding-out of other household expenditures.

This paper will focus on the paradoxical question of what happens to tobacco-induced crowding-out in an environment of increasing tobacco taxes over time. Taking advantage of more than a decade of sustained tobacco tax increases in South Africa between 1994 and 2010, the chapter will use data from Income and Expenditure Surveys (IESs) conducted during this period. The study will estimate the change in crowding-out by adopting a difference in difference approach while accounting for potential violations of the parallel trend assumption.

10:45 AM –11:45 AM TUESDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: Impact of the COVID-19 Pandemic on the Use of Health Services: Evidence from Four Country Case Studies

SESSION CHAIR: **Karen Grépin**, The University of Hong Kong

Impact of COVID-19 Outbreak on Hospital Admissions and Quality of Inpatient Care for Acute Ischemic Stroke Patients in China

PRESENTER: **Terence C Cheng**, Harvard T.H. Chan School of Public Health

Coronavirus Disease 2019 (COVID-19) has spread throughout the world, but its impact on hospital admissions and quality of inpatient care for acute ischemic stroke (AIS) is unclear. In this multicenter, observational registry study, we used data from the Chinese Stroke Center Alliance (CSCA). Two groups of AIS cases were identified: those hospitalized between October 22, 2018 and March 10, 2019, and those hospitalized between October 22, 2019 and March 9, 2020. The primary outcomes were hospital admission numbers and adherence to the predefined evidence-based stroke care measures in AIS patients. Using the difference-in-differences (DID) method, we assessed changes in outcomes in the 2019-2020 group before and after the indicator date of December 31, 2019, which was when the Chinese government announced the first COVID-19 case. We assessed whether this change was significantly different from any changes observed in the control group, which consisted of cases identified over the corresponding period in 2018-2019. A total of 77895 eligible patients were recruited across 185 stroke centers in 27 provinces in China. In-hospital admissions for minor stroke patients (NHISS ≤ 3) decreased significantly from 60·1% to 55·6% ($p<0·0001$). Fortnight hospitalizations in the 2019-2020 group declined by 19·9% (4376 vs. 3503), 27·3% (4405 vs. 3203), 32·0% (4664 vs. 3173), and 23·9% (4513 vs. 3435), respectively, after the pandemic, compared to the same periods in the 2018-2019 group. Stroke care measures did not present significant or progressive declines after the start of the COVID-19 epidemic. During these unprecedented times, hospitals should admit AIS patients to the fullest extent of their abilities and provide tailored treatment strategies, especially for patients with minor strokes who may be more reluctant to seek care. Hospitals and communities should also help mitigate residents' fear of medical contact by enhancing stroke care awareness.

Impact of the COVID-19 Pandemic on Routine Child Immunization Services in Ghana

PRESENTER: **Kathrin Durizzo**, ETHZ

Background: Over the last decades, the immunization of children has contributed to a decrease in the number of vaccine-preventable illnesses, reducing child morbidity and mortality. The COVID-19 pandemic has interrupted or delayed national routine immunization programs globally but especially in Low- and Middle-Income Countries (LMICs), where health care resources are limited.

Methods: To understand the impact of the COVID-19 pandemic on routine child immunization in LMICs, this study investigates the administration of 18 different child vaccines from January 2018 to December 2020 based on monthly administrative data of all 260 Ghanaian districts. The detailed monthly data allows us to estimate the impact of the COVID-19 pandemic while controlling for seasonal trends and to analyze a potential catch-up effect up to eight months after a lockdown. Additionally, due to regional variations in implementing a lockdown in April 2020, Ghana provides a special case to analyze the impact of the lockdown on routine immunization services.

Findings: We do not find any significant decrease in routine child immunization from 2019 to 2020. However, investigating the temporal and spatial variation, we find that during the partial lockdown in April 2020 districts experience on average a substantial drop in total vaccination doses of around -5% compared to April 2019. However, two months after, in June 2020, the numbers substantially increased again by 6%. A second, but not as strong drop can be found in October (-2%), followed by a second substantial drop in December (6%). As a result, we do not find for yearly number of doses of any routine child vaccines a statistically significant negative effect. This is especially the case for yellow fever vaccination, where we witnessed the largest interruption of up to -20% in April. For the time-critical vaccinations, such as Polio 0 and BCG, we do not find any significant interruption. Moreover, we find that districts affected by the lockdown in April 2020 had a substantially larger decrease in the number of routine immunization services and a slower catch-up effect compared to non-affected districts. That result suggests that although essential health services, such as routine childhood immunization services, were maintained during the lockdown, supply and/or demand decreased in the short-term for non-time-critical vaccinations.

Conclusion: We conclude that not only the partial lockdown but also the overall COVID-19 pandemic had a substantial impact on routine child immunization services in Ghana. However, the interruptions in immunization services seem to recover and be compensated already a few months later, indicating a rather temporary negative effect. The results imply a substantially lower drop in routine child immunization and a faster catch-up effect than the current literature assumes for their models. The results on the district level will help policymakers to target the most vulnerable population with effective and supportive policies.

Estimating the Impact of the COVID-19 Pandemic on Childhood Immunization Using Subnational Exposure in Bangladesh

PRESENTER: **Atonu Rabbani**, University of Dhaka

The COVID-19 pandemic has already imposed significant mortality and morbidity burdens globally and non–COVID-related adverse health outcomes are increasingly receiving attention. In this study, using variations in subnational-level exposure to COVID-19, we explore how the pandemic has affected immunization and vaccine deliveries in Bangladesh. We adopt an exposure index based on the number of migrants who returned from abroad before the lockdown was announced in Bangladesh. We link the upazila-level variations in migrant-induced exposure to the immunization gaps (the difference between the number of sessions planned and held) and deliveries of five vaccines, namely, BCG, PCV, Pentavalent, and the two doses of MMR. We construct a balanced panel of 447 upazilas for five months (January to May 2020) and use fixed-effects models to identify the impacts of pandemic exposure on immunization gaps and vaccine deliveries. The immunization gap increased by 16.3 per cent (95% confidence interval [CI]: 14.4 to 18.3) in April and by 20.8 per cent (95% CI: 18.9 to 22.7) in May. Moreover, the regions with higher exposures recorded larger gaps; one-SD-higher exposure was associated with higher immunization gaps by 2.4 percentage points [pp] in April (95% CI: 0.5 to 4.3 pp) and 5.1 pp in May (95% CI: 3.3 to 7.0 pp). All five vaccines included in the analyses also registered additional declines in the worst-affected areas after the outbreak, which persisted for two months after the pandemic broke out in Bangladesh. A higher level of exposure to the pandemic can substantially increase immunization gaps and reduce deliveries of different types of vaccines. Such disruptions can impose a considerable non–COVID-19 disease burden affecting children and reverse some of the recent significant public health achievements in low- and middle-income countries, requiring careful policy interventions.

Early Impact of the COVID-19 Pandemic and Response on the Utilization of Health Services in Kinshasa, the Democratic Republic of the Congo

PRESENTER: **Karen Grépin**, The University of Hong Kong

Background: Health service use among the public can decline during outbreaks and had been predicted among low and middle-income countries during the COVID-19 pandemic. In March 2020, the government of the Democratic Republic of the Congo (DRC) started implementing public health measures across Kinshasa, including strict lockdown measures in the Gombe health zone.

Methods: Using monthly time series data from the DRC Health Management Information System (January 2018 - December 2020) and interrupted time series with mixed effects segmented Poisson regression models, we evaluated the impact of the pandemic on the use of essential health services (outpatient visits, maternal health, vaccinations, visits for common infectious diseases and non-communicable diseases) during the first wave of the pandemic in Kinshasa. Analyses were stratified by age, sex, health facility, and lockdown policy (i.e., Gombe vs. other health zones).

Findings: Health service use dropped rapidly following the start of the pandemic and ranged from 16% for visits for hypertension to 39% for visits for diabetes. However, reductions were highly concentrated in Gombe (81% decline in outpatient visits) relative to other health zones. When the lockdown was lifted, total visits, visits for infectious diseases and for non-communicable diseases increased approximately two-fold. Hospitals were more affected than health centres. Overall, the use of maternal health services and vaccinations was not significantly affected.

Interpretation: The COVID-19 pandemic resulted in important reductions in health service utilisation in Kinshasa, particularly Gombe. Lifting of lockdown led to a rebound in the level of health service use but it remained lower than pre-pandemic levels.

10:45 AM –11:45 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Economics of Maternal and Infant Health

MODERATOR: **Rachael Maree Hunter**, University College London

Characteristics and Economic Evaluation of an Optimum Smoking Cessation Intervention for Pregnant Women: A Household Model

PRESENTER: **Tuba Saygın Avşar**, University College London

AUTHORS: Louise Jackson, Pelham Barton, Matthew Jones, Hugh McLeod

Background and Aims: Smoking during pregnancy is associated with significant health risks, and is closely linked to health inequalities. In the United Kingdom, National Health Service (NHS) Stop Smoking Services for pregnant women have limited uptake and limited impact due to high relapse rates. Previous economic evaluations of smoking cessation interventions for pregnant women are limited to single components, which do not in isolation offer sufficient potential to address smoking cessation targets. To inform development of more appropriate complex interventions, we (1) identify the characteristics of a hypothetical 'optimum' smoking cessation intervention, (2) describe the Economics of Smoking in Pregnancy: Household (ESIP.H) model for estimating the life-time cost-effectiveness of such an intervention, and (3) use the model to assess the hypothetical intervention.

Methods: The hypothetical intervention was based on current evidence relating to component elements, which include intensive behaviour change support, partner smoking, financial incentives, cigarette consumption, and duration of support to 12 months post-partum. ESIP.H was developed to assess the life-time health and cost impact of multi-component interventions compared to standard NHS care in England. ESIP.H is the first model to incorporate the number of cigarettes consumed, partner smoking and some health conditions (e.g. obesity) not included in previous models. The Markov model structure used allows interaction between women, partners and offspring. The model's development was informed by a systematic review of health outcomes and the parameters were estimated from published literature. Probabilistic sensitivity analysis (PSA) was undertaken to reflect the uncertainty of the model estimates. A base-case and a cautious scenario was designed to explore the impact of the model's assumptions on the effectiveness of the hypothetical intervention.

Results: The hypothetical intervention comprised intensive behavioural support for mother and partner plus financial incentives, from 12 weeks gestation through to 12 months postpartum. It was associated with an incremental gain in quitters (mother and partner) at 12 months postpartum of 237 (PSA 249, 95% CIs 195 to 304) per 1000 pregnant smokers in the base-case analysis, and 104 (PSA 105, CIs 84 to 108) per 1000 pregnant smokers in the cautious-case analysis. Over the long-term, the intervention was cost-effective both in the base-case and cautious scenarios. In the base-case it had an incremental negative cost (saving) of £186 (PSA £193, CIs -£779 to £344). The intervention also improved health, with a 0.50 (PSA 0.50 CIs 0.36 to 0.69) increase in incremental quality-adjusted life-years (QALYs) for mothers, partners and offspring, with an 80% probability of being dominant over the comparator. In the cautious-case it had an incremental cost of £243 (PSA £223, CIs -68 to £538) and a 0.30 (PSA 0.29, CIs 0.20 to 0.41) increase in incremental QALYs, with a 100% probability of being viewed cost-effective.

Conclusions: The economic modelling found that the hypothetical cessation intervention would greatly extend reach, reduce smoking, and be cost-effective. By taking a household perspective and seeking to model the impact of a novel 'optimum' multi-component intensive support intervention, the analysis could inform development of such an intervention, and subsequent piloting and evaluation.

Cost-Effectiveness of Conditional Cash Transfers to Retain Women in the Continuum of Care during Pregnancy, Birth and the Postnatal Period: An Economic Evaluation of the Afya Trial in Kenya

PRESENTER: **Tom Palmer**

AUTHORS: Neha Batura, Jolene Skordis, Oliver Stirrup, Andrew Copas, Sarah Dickin, Alie Eleveld, Alex Mwaki, Aloyce Odhiambo, Fedra Vanhuyse, Hassan Haghparast Bidgoli

Objectives: To assess the costs, cost-effectiveness and equity impact of a demand-side financing intervention that promotes utilisation of maternal health services in rural Kenya (the Afya study), compared to current practice.

Methods: The Afya study is a demand-side financing intervention implemented in 48 public primary Health facilities of Siaya County, Kenya that aimed to retain women in the continuum of care, from their first antenatal care (ANC) visit until their child reached 1 year of age. The intervention provided a conditional cash transfer incentive of 450 Kenyan Shillings (~4 USD) for each verified facility appointment attended for ANC, delivery, postnatal care (PNC) and child immunisation. A cost and cost-effectiveness analysis was conducted within the framework of a cluster-randomised trial from a provider perspective, measuring both programme and healthcare provider costs. Incremental cost-effectiveness ratios were calculated for the intervention compared with current practice. Based on the main trial impact analysis, incremental cost-effectiveness ratios (ICERs) are cautiously presented per additional facility visit, both for each ANC visit with eligibility criteria applied, and for a composite count of all visit types without eligibility criteria. All costs were adjusted for inflation, discounted at 3% per year and converted to 2020 international dollars (INT$). Sensitivity analyses were conducted to assess the robustness of results. A multidimensional poverty index (MPI) was also used to measure households' socioeconomic status. An equity impact analysis was conducted to explore the distribution of impact among different MPI quintiles.

Results: The total programme cost of the intervention was INT$ 787,187. Direct transfer costs accounted for around 30% of total programme costs, while staff costs accounted for around 25% of total programme costs. The total programme cost per beneficiary was INT$ 313, of which INT$ 92 consisted of direct transfer payments, suggesting a cost transfer ratio of 2.4. Direct healthcare utilisation costs reflected a small proportion of total provider costs, amounting to a maximum of INT$ 21,756, if no eligibility criteria are applied to visit counts. The provider cost per additional eligible ANC visit was INT$ 1,012, while the provider cost per additional combined sum of ANC, PNC or immunisation visit without eligibility criteria applied was INT$ 245. MPI estimates suggest that around 27.4% of participants' household were multidimensionally poor. MPI quintiles were not statistically significant in the model of visit counts.

Discussion: Given the nature of the outcomes (i.e health facility visits, or fractions thereof) and the unclear clinical benefit, it was not possible to make any conclusions of cost-effectiveness with reference to typically used thresholds. Presented ICERs therefore only offer a summary of cost and outcome measures and cannot be used to directly compare cost-effectiveness with other studies. This study was unable to deem the Afya cash transfer intervention cost-effective. A simple comparison with current health expenditure per capita in Kenya suggests that the intervention as implemented is likely to be unaffordable.

A New Antenatal Care Model: Cost Analysis at Primary Health Facilities in Tanzania

PRESENTER: **Amisa Chamani**, MUHAS

AUTHORS: Bjarne Robberstad, Amani Thomas Mori

Background: Since 2002, Tanzania has been implementing the focused Antenatal Care (ANC) model that recommended four antenatal care visits. In 2016, the World Health Organization (WHO) reintroduced the standard ANC model, with more interventions, including a minimum of eight contacts . However, cost-implications of this change to the health system is unknown, particularly in countries like Tanzania, that failed to optimally implement the simpler focused ANC model. We compared the health system cost of providing antenatal care under the focused and the standard models at primary health facilities in Tanzania.

Methods: We used a micro-costing approach to identify and quantify resources used to implement the focused ANC model at six primary health facilities in Tanzania from July 2018 to June 2019. We also used the standard ANC implementation manual to identify and quantify additional resources required. We used basic salary and allowances to value personnel time while the Medical Store Department price catalogue and local market prices were used for other resources. Cost were collected in Tanzanian shillings and converted to 2018 US$.

Results: The overall annual health system cost of providing focused antenatal care was US$185,282 across six facilities under the focused ANC model and US$358,290 for the standard ANC model. Specifically the average cost was US$40,172 at a health centre and US$26,234 at a dispensary and increased by 90% at a health centre for a standard ANC model and 97% at a dispensary. Personnel cost accounted for more than one third of the total cost for both ANC models at a health centre and a dispensary. The cost per pregnancy increased from about US$33 to US$63 at a health centre and from about US$37 to US$72 at a dispensary.

Conclusion: Introduction of a standard ANC model in Tanzania will more than double resources use at ANC compared to the current practice. More recurrent resources will be needed at both health centres and dispensaries compared to capital items. While resources availability has been one of the challenges to effective implementation of the focused ANC model, more research is required, to consider whether these costs are reasonable compared to the additional value for maternal and child health.

10:45 AM – 11:45 AM TUESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Leveraging Compendium of UHC Interventions and Related Country Tools to Facilitate Choices in Developing Benefits Packages

SESSION CHAIR: **Tessa Edejer**, World Health Organization

ORGANIZER: **Karin Stenberg**, World Health Organization

DISCUSSANT: **Ole F. Norheim**, Professor, Department of Global Public Health and Primary Care, University of Bergen

The UHC Compendium: A Resource to Support Country Decision Making and Planning Around Service Packages

PRESENTER: **Karin Stenberg**, World Health Organization

AUTHORS: Teri Reynolds, Wajeeha Raza, John Fogarty, Ms. Altea Sitruk, Melanie Bertram, Kratu Goel, Edith Patouillard, Dan Ollendorf, Tessa Edejer, Agnes Soucat

Background: Resources are scarce across all settings, and health service provision ultimately involves implicit or explicit trade-offs regarding what is included – or excluded - from the health benefit package. Rather than investing in ad-hoc increases in the health package at the margin, decision makers will benefit from guidance and tools that support them to undertake a comprehensive review of health interventions that should be considered for advancing UHC and the health-related Sustainable Development Goals. Decision makers will similarly benefit from information related to each health intervention, in terms of how well it performs in relation to criteria such as cost-effectiveness, budget impact, equity, addressing vulnerable populations, and health system capacity requirements. Such information is critical to inform selection processes in view of local priorities and constraints.

Methods: We engaged in a consultative process to create a knowledge repository on health interventions. Data on intervention descriptions, classifications, and the resource inputs required for delivery were gathered using standardized data collection tools and subject to quality controls by subject matter experts and a technical advisory team. Specific detail was included on resource requirements including health workforce, health products, and procedures used in the diagnosis and treatment of ill health. Health actions were bundled when co-delivery was appropriate. The intervention list was compared with other intervention repositories for evidence on cost-effectiveness and linked to an inventory of appropriate impact modelling tools.

Results: The UHC Compendium is a comprehensive list of interventions organized within a rationalized frame and linked to resource input data on health worker tasks; health worker time; medical equipment and health products; and health care infrastructure. The Compendium structure

provides a basis for developing bundles of services suitable for economic analysis and budget impact analysis, which in turn supports linkages to evidence syntheses on cost-effectiveness, such as DCP3 and the Tufts Medical Center Cost-Effectiveness Analysis (CEA) Registry. The information is available through an interactive website, where users can filter the information according to their specific policy question.

Conclusions: The development of a standardized nomenclature for health interventions facilitates data integration and linkages across different tools and evidence platforms to support benefit package processes. By bringing evidence together, the UHC Compendium platform provides a global good to benefit country decision makers and global analysts alike. Data on resource use should be contextualized to match local delivery systems and adjusted to reflect local prices.

A Country Selection Interface to Support Decision-Making in Benefits Package Development

PRESENTER: **Ms. Altea Sitruk**, World Health Organization

AUTHORS: Melanie Bertram, Karin Stenberg

The UHC Compendium serves as a comprehensive repository of interventions and services that countries can choose from when developing benefits or service packages for UHC. WHO's approach to generalized cost-effectiveness analysis (WHO-CHOICE) can support benefits package development by enhancing allocative efficiency. This approach evaluates interventions across diseases and conditions against the alternative of "doing nothing" using a standardized methodology that allows for comparisons across the health sector.

We undertook efforts to align the estimates of cost-effectiveness produced by WHO-CHOICE with the interventions and services included in the UHC Compendium in order to enable countries to use cost-effectiveness data to inform their benefits package development. Cost-effectiveness estimates are available for combinations or "bundles" of UHC Compendium actions. These data are made available in the UHCC Cost-Effectiveness Portal, an entry point to the UHC Compendium that is to be utilized by users that are looking to inform their benefits package selection with cost-effectiveness data. Action bundles are displayed in the cost-effectiveness portal in a league table format, highlighting their links to the UHCC architecture. The portal is populated with indicative cost-effectiveness data which are displayed as the user selects their country typology. To allow for further contextualization, the portal will, in the future, link to the OneHealth Tool which can be used to run a country-specific cost-effectiveness analysis for implementing the bundles. The context-specific data will reflect the local burden of disease and local prices. These data can then be fed back to the UHCC Cost-Effectiveness Portal, so that users can review and compare cost-effectiveness estimates for their specific context. This link between the UHC Compendium and WHO cost-effectiveness estimates enables country users to ensure their investment decisions are informed by cost-effectiveness.

From Global Standards to Country Reality: Principles of Health Benefit Packages

PRESENTER: **Rob Baltussen**, Radboudumc

AUTHORS: Melanie Bertram, Ole F. Norheim

Developing a health benefit package is not a one-off action – it is a dynamic process, with the package changing over time as countries develop. There is no one-size fits all, and every country will follow its own unique path towards UHC. However, all countries can be guided by a set of universal guiding principles for the process of selecting essential health care services. By adopting these principles, countries can move towards a health system where decisions are made using transparent and evidence-based methods, and where efforts are geared towards ensuring universal access to services that improve health the most, for those with the greatest needs.

The WHO Technical Advisory Group on Health Benefit Packages (TAG) has developed a guiding document that lists eight principles that have generally been adopted in countries that support systematic priority setting.

In this session, the eight principles are presented. Next, existing tools are discussed in terms of how well they support the principles of benefit package design as outlined in these principles. The discussion will focus on the WHO-developed UHC Compendium database and associated tools, but also on other existing evidence summaries and guidance documents available at the global level.

We discuss how well the existing evidence repositories respond to the data needs of countries in relation to locally owned clearly defined criteria. We distinguish between data-driven analysis and the political processes and institution building that need to be considered to support evidence-based decision making. Throughout these discussions, concrete examples from country processes are used.

In light of the findings, we provide recommendations for further expansion of the UHC Compendium tool set and its orientation towards empowering country users. Finally, we discuss the potential role that different global and national networks, actors and institutions can play in supporting locally owned processes.

Is Universal Health Coverage Affordable? Estimated Costs and Fiscal Space Analysis for the Ethiopian Essential Health Services Package

PRESENTER: **Dr. Alemayehu Hailu**, University of Bergen

AUTHORS: Getachew Teshome Eregata, Karin Stenberg, Ole F. Norheim

Background: To make progress towards UHC, countries should prioritize and clearly define the type and mix of health services that respond to population needs. Moreover it is essential to ensure that the essential health services package (EHSP) can be provided with available resources. In Ethiopia, an evidence based process was followed to develop the EHSP, using explicit criteria. The analysis resulted in a list of over 1,000 interventions. This study aimed to estimate the financial resources required to implement the Ethiopian EHSP from 2020–2030, to assess the affordability and fiscal sustainability of the package.

Methods: We used the OneHealth Tool to estimate the costs of expanding the EHSP service provision in the public sector in Ethiopia. Combinations of ingredient-based bottom-up and program-based summary costing approaches were applied. We predicted the fiscal space using assumptions for economic growth, government resource allocations to health, external aid for health, the magnitude of out-of-pocket expenditure, and other private health expenditures as critical factors affecting available resources devoted to health. All costs were valued using 2020 US dollars (USD).

Results: The resources needed to implement the EHSP would increase steadily over the projection period due mainly to increases in service coverage targets over time. By 2030, 13.0 billion USD (per capita: 94 USD) would be required. The largest (50%–70%) share of estimated costs was for medicines, commodities, and supplies, followed by human resources costs (10%–17%). The expected available resources based on a business-as-usual fiscal space estimate would be 63 USD per capita by 2030, highlighting a funding gap. Allocating gains from economic growth to increase the total government health expenditure could partially address the gap.

Conclusion: The Ethiopia EHSP was developed using a data-driven process. However, fiscal considerations were only measured towards the end of the process. The projections indicate a need to consider a phased implementation approach for the service package, and continued work to prioritize health interventions within the available resource envelope.

10:45 AM –11:45 AM TUESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Advances in the Assessment of Equity in Health Care Using Benefit Incidence Analysis: Insights from Low-, Medium- and High-Income Settings

SESSION CHAIR: **John Ataguba**, University of Cape Town

ORGANIZER: **Martin Rudasingwa**, Heidelberg University

DISCUSSANT: **Bona Chitah**, University of Zambia

Has Socioeconomic Inequality in Health Spending Decreased As a Result of Universal Health Coverage Policies in Burkina Faso, Malawi, and Zambia? Evidence from a Quasi-Longitudinal Benefit Incidence Analysis

PRESENTER: **Martin Rudasingwa**, Heidelberg University

AUTHORS: Edmund Yeboah, Emmanuel Bonnet, Valéry Ridde, Paul André Somé, Adamson Muula, Bona Chitah, Chrispin Mphuka, Manuela DeAllegri

Introduction

Ensuring equitable access to health services for all socioeconomic groups is a global challenge in achieving Universal Health Coverage (UHC). Despite many investments to achieve UHC, inequalities in health and health utilization are still very high in many countries, especially in sub-Saharan Africa. Following the global call to reduce socioeconomic inequalities in health and health access, sub-Saharan African countries including Burkina Faso, Malawi and Zambia have implemented various reforms aimed at UHC, such as user fee removal policies, targeted subsidies, and performance-based financing. While evidence on the equity impact of these reforms in terms of access to health care is increasing, evidence on whether and how the implementation of these reforms has altered the distributional incidence of health spending is still limited. We present the changes in the distributional incidence of both public and overall health spending (including pubic, donor and private expenditure) on curative and maternal health services at three time points in Burkina Faso, Malawi and Zambia.

Methods

We apply Benefit Incidence Analysis (BIA) to measure socioeconomic inequality in public and overall health spending on curative services and institutional delivery disaggregated by different health facility typologies and residence settings (urban versus rural). We use nationally representative data from the Integrated Household Living and Condition Surveys, Demographic and Health Surveys, Zambia Household Health Expenditure and Utilization Survey, Health Information System, and National Health Accounts. To capture changes over time, the study repeats the analysis at three points in time for each country. We use concentrations indices (CIs) and dominance tests and adjust the CIs to monthly seasonal variations in healthcare utilization.

Results

The distribution of both public and overall spending has become increasingly egalitarian over time in all countries. The distribution of public spending tends to be more egalitarian or pro-poor than the distribution of overall spending. The distribution of both public and overall spending has been more egalitarian at lower levels of care (health centers) than at higher levels (hospitals). In both Burkina Faso and Zambia, but not in Malawi, there has been greater inequality in spending on institutional delivery services than on curative services. Socioeconomic inequality in health spending is higher in rural areas compared to urban areas.

Discussion

Implementation of health policies towards UHC, such as public subsidies and user fee removal policies, has the potential to reduce socioeconomic inequality in health spending. However, various implementation failures hamper the elimination of inequalities in health benefits, especially for maternal services, at a higher level of care and in rural areas. Public spending is crucial in achieving greater equality given the pro-rich distribution of private health expenditure. There is a need to understand the sources of inequality and inequity to address them adequately using policy.

Equity of Health Financing Under Indonesia's Single-Payer Health Insurance System: A Benefit Incidence Analysis from Two Waves of the Enhance Household Survey

PRESENTER: **Manon Haemmerli**, London School of Hygiene & Tropical Medicine

AUTHORS: Hasbullah Thabrany, Virginia Wiseman, Augustine Asante

Background

Universal Health Coverage (UHC) is a key component of the Sustainable Development Goals (SDGs). An important measure of UHC is equity in health service utilization by different socioeconomic groups. Many countries implementing pro-poor reforms to expand subsidized health care, especially for the poor, recognize that access alone will not be sufficient to meet the SDGs without high-quality health care. As the poor are more likely to use low quality health services, measures to improve access to health care need to emphasise quality as the cornerstone to achieving equity goals. In 2014, Indonesia introduced the Jaminan Kesehatan Nasional (JKN), a national health insurance scheme to make health care available to at least 95% of the population of 260 million by 2022. As high geographical disparities in quality of care exist in Indonesia, the real equity impact of the JKN is likely to be distorted if quality is ignored in any evaluation. This paper evaluates the impact of the JKN on access to quality services in Indonesia by adapting a popular quantitative approach, Benefit Incidence Analysis, to incorporate a quality weighting into the computation of public benefit for health care.

Methods

We used panel dataset consisting of a nationally representative sample of 7552 households surveyed in 10 provinces of Indonesia in early-2018 and late-2019. Household members were asked about their utilisation of health services, health payments and socio-demographic information. In parallel, a survey of public health facilities was conducted in the household survey areas, and information about health facility infrastructure, basic equipment, and staffing was collected. In each facility, an index of structural quality was computed. Finally, individuals who reported visiting a public health facility in the month before the interview were matched to their chosen facility. The cost of an outpatient visit was estimated using National Health Account data. Standard BIA and an extended BIA that adjusts for the quality of services were conducted using the panel data.

Results

The distribution of benefit for primary health care was slightly pro-poor. The change in concentration indices over time suggests that equity in the distribution of subsidies for primary care has improved slightly. The improvement was greatest in the public sector, for which the concentration index decreased substantially (from -0.11 to -0.15). Distribution of benefit for the private sector also improved, although to a less extent. However, when weighting the BIA by the quality of services utilised, the size of the improvement in equity was considerably reduced.

Conclusion

As Indonesia is on the road to achieving UHC, results from this study are encouraging. Despite challenges, equity in health financing seems to be on the right track, with the distribution of subsidies becoming more pro-poor. As many low and middle-income countries are implementing reforms to support UHC, it is critically important that health policies emphasise quality care as a pathway to ensure that the poor and vulnerable have better health outcomes. Methods to measure equity of health financing need to be fine-tuned to ensure that quality of care is accounted for.

Provincial Differences in Equity Distributions of Public Health Subsidies in Lao PDR: Policy Priorities or Differences in Health-Seeking Behavior?

PRESENTER: **Aurelie Klein**, Heidelberg Institute of Global Health/ International Labour Organization

AUTHORS: Manithong Vonglokham, Viroj Tangcharoensathien, Manuela DeAllegri

Background

There is an evidence gap on equity distribution of public financing for health at sub-national level. In decentralized settings, including Lao PDR, policy makers at sub-national levels decide on fund allocations. According to the National Health Accounts 2015/2016, around 57% of domestic government expenditure on health was managed at provincial level. Provincial governors have the power to reallocate budget across sectors and within the health sector. As a result, the share of the public budget allocated to provincial and district hospitals and health centres varies between provinces.

Methods

First, we will used data from the Lao expenditure and consumption survey (LECS) 2012/13 and national health accounts data at national level and in three provinces to conduct a benefit incidence analysis of public health subsidies disaggregated by province. In this approach the financial weight given to services at each level of the health system are the same across all provinces. Differences in utilization rates and patterns drive differences in equity distributions. Second, we will use provincial level health expenditure data to estimate province-specific unit subsidies for each level of the health system. The weights given to each level (health centre, district/ provincial hospitals) will be different for each province. The equity distributions of public subsidies in this second step result from different utilization patterns, the demand side, but also from the different financial weight given to each level of the health system in each province, and the supply side. The Ministry of Health has recently improved financial reporting which facilitates monitoring expenditure by level of facility in each province. We plan to complete our analysis using LECS data 2018/2019 and including all provinces.

Results

Heterogeneity exits in equity distributions of public health subsidies across provinces in 2012/13 (CI ranges from -0.09, std error 0.18, p-value 0.6340 to CI 0.36, std error 0.15, p-value 0.0276 while the national average CI was 0.26, std error 0.05, p-value 0.000). In two out of the three provinces, the comparison between concentration indices using province specific weighting and national level weighting suggested a less pro-rich distribution if unit subsidies are estimated using provincial level weighting. In our planned analysis for 2018/19, we expect a continued heterogeneity in the concentration indices across all provinces as well as differences resulting from estimating subsidies based on national- or provincial-level weighting.

Discussion

Funding allocation decisions at provincial or subnational levels can influence the equity distribution of public subsidies and therefore require increased political attention. The analysis suggests that both demand and supply side can influence the equity distribution of public health subsidies. Policies promoting better access to health services and better financial protection for poor and vulnerable groups should take this into account. Finally, national level benefit incidence analysis conceals inequities across provinces or regions. This is even more relevant if benefit incidence analysis should contribute to the monitoring of the Sustainable Development Goals linked to reducing inequalities and leaving no one behind.

Measuring Health Care Equity within Local Health Organizations: An Application to Mental Health Expenditure in England

PRESENTER: **Laura Anselmi**, The University of Manchester

AUTHORS: Matt Sutton, Erik Schokkaert, Tim Doran, Evan Kontopantelis

Background

The allocation of national health care budgets to local organisations is key to enabling the equitable provision of health care services. Need weighted capitation formulae, typically reflecting variations in demographics, morbidity, deprivation, and local input prices, are used in a number of countries to allocate resources to local organisations within the National Health Service. However, the use of formulae does not guarantee that resources, once allocated, are spent on the population in need.

We propose to use need estimates produced from person-based formulae as a benchmark to assess equity in expenditure within local organisations. We illustrate the computation and use of alternative inequality indices with an application to costed secondary mental health care utilization in England.

Methods:

We use need estimates produced with the person-based resource allocation formula for mental health care in England to benchmark the distribution of expenditure across GP practices and individuals within 211 local health organizations, Clinical Commissioning Groups (CCGs), in 2015. We use individual demographic records for over million adults registered with a GP practice, linked with their mental health care costed service use and need. Need was estimated based on ethnicity, physical health diagnoses and household type and GP practice and area level characteristics, all linked in from multiple data-sets. We compute the redistribution index (adapted relative mean deviation), a Kakwani Index and a Theil Index.

Results:

Preliminary results on the indices of redistribution indicate that to match the distribution of need, CCGs should redistribute 5% of expenditure across GP practices and 23% across individuals within GP practices. .

The Kakwani indices indicate that expenditure is progressive to need in 25% of CCGs with progressive and regressive GP practices within each CCG.

The Theil indices indicate that most inequity in expenditure within CCG is driven by inequity within GP practices rather than across GP practices.

All measures point to large variation in equity across CCGs and across GP practices within the same CCG, with most inequity within rather than across GP practices.

Discussion:

The measures of redistribution, progression and inequality in expenditure can be used for monitoring equity in health care use within local organisations. The implications of using alternative need measures, equity definitions and indices, and how these may best match different policy objectives, should be investigated. The development of methods and improvement of administrative data required to compute these indices should be promoted.

12:15 PM – 1:15 PM TUESDAY [Cross-Cutting Themes And Other Issues]

COVID - Funding and Financing

MODERATOR: **Simantini Mukhopadhyay**, Institute of Development Studies Kolkata

A Rapid Situational Assessment of the Impacts of the COVID-19 Pandemic on the Provision and Utilization of Essential Health Services in Bangladesh

PRESENTER: **Shamima Akhter Akht**, ThinkWell Global

AUTHORS: Mursaleena Islam, Dr. Syed Abdul Hamid, Nasrin Sultana, Nurul Amin

Introduction: Despite early anecdotal evidence of significant reductions in health service utilization related to the COVID-19 outbreak in Bangladesh, the scale, incidence and drivers of health service impacts were poorly understood. The Government of Bangladesh (GOB) has committed to maintain the provision of essential health services as a component of the National COVID-19 Preparedness and Response Plan. However, a lack of evidence on the scale of service impacts, as well as the drivers and root causes of these impacts, meant that the GOB lacked an evidence-base for important decisions on health service strategy, planning, and resource allocation.

Methods: A rapid situational assessment was undertaken, including (1) quantitative analysis of facility-level data from the national health management information system to describe the scope and dimensions of service disruption, as well as (2) qualitative assessments to explore the

key drivers of service impacts and major health financing challenges during the COVID-19 outbreak. Qualitative interviews were undertaken with a purposively sampled cross-section of stakeholders in every division of Bangladesh, including both public and private sector health service managers; professional and lay heath care workers.

Results: The situational assessment revealed significant reductions in the utilization of essential health services compared to 2019 levels, with the greatest year-on-year reductions seen in March and April 2020. Reductions of up to 37%, 33% and 17% were seen in antenatal care, post-natal care, and facility-based deliveries, respectively. On the demand-side, our analysis revealed barriers to essential service provision including: mobility challenges related to the national shutdown of public transport, and fear of iatrogenic COVID-19 infection. Demand-side stakeholders reported that community-level resource mobilization as well as coordinated effort from local COVID-19 Management Committees helped the community to overcome financial or other barriers to accessing care. On the supply-side, shortages of personal protective equipment was noted as important barriers. The perceived impact of policy responses in addressing service delivery barriers was mixed, the most frequently mentioned were: (i) the reallocation of underspent health budgets to district and facility management teams for COVID-related activities; and (ii) the rapid deployment of thousands of pre-qualified clinicians from the national waiting list for MOHFW service posts. On budget reallocations, respondents reported challenges in utilizing funds because they lacked the financial management expertise necessary and the given line items were too restricted. On the deployment of pre-qualified candidates, many respondents reported positive service impacts from the rapid deployment of large numbers of clinical professionals but noted the lack of corresponding redundant capacity for support and ancillary staff.

Conclusion: Our analysis revealed several important drivers of COVID-mediated health service and health financing disruptions with the potential to inform better strategy and planning in Bangladesh. Specific recommendations for the GOB include: (i) to strengthen the financial, and managerial capacities of district and facility managers to better enable them to utilize emergency budget reallocations, and (ii) maintaining, and expanding the pool of pre-qualified health and support professionals to ensure continuous excess human resource capacity for deployment in the current outbreak, or for future health system shocks.

Using Data to Inform Pandemic Financing: The Development and Use of a Rapid COVID-19 Resource Mapping Exercise in Malawi

PRESENTER: **Ian Yoon**

AUTHORS: Pakwanja Twea, Nik Mandalia, Stephanie Heung, Saadiya Razzaq, Leslie Berman, Eoghan Brady, Gerald Manthalu, Andrews Gunda

Introduction

In early 2020, the Government of Malawi developed a multi-sectoral National COVID-19 Preparedness and Response Plan (NCPRP) aimed to coordinate the national response to the COVID-19 pandemic and minimize its impact. However, the dominance of donor funding, coupled with a fragmented financial landscape, limits the government's ability to harmonize efforts towards the NCPRP. Thus, to generate visibility on resource availability and direct resources to priorities defined within the NCPRP, the Ministry of Health initiated a rapid COVID-19 resource mapping exercise in May 2020, with technical support from the Clinton Health Access Initiative (CHAI).

Methods

Data were collected regarding financial commitments and expenditures from government and development partners against the objectives and activities of the NCPRP. A standardized excel-based data collection tool was used, into which respondents entered their data directly with guidance from the research team. Data points included organizations' COVID-19 activities across multiple dimensions, such as funding sources, implementing agents, geographies, and timelines. Organizations also indicated whether commitments are reallocated from essential health services and if funding is flexible to other activities in the National COVID-19 Plan.

Data were compiled into the COVID-19 Resource Mapping database. Financial commitments and expenditures were analyzed against NCPRP activity budgets to quantify funding gaps and inform the changing policy needs for the COVID-19 response.

Results

A USD 20 million financial gap against the USD 90 million needed by the NCPRP was identified. In the health sector, USD 86 million was mobilized for COVID-19 response activities. USD 61 million is budgeted for objectives and activities outlined in the NCPRP. The remaining USD 25 million is allocated to activities outside the NCPRP's scope. Although areas of the NCPRP are fully funded, there are significant financial shortfalls for infection prevention and health workforce activities which each have a funding gap greater than 50%. 49% of funds are new resources, while 51% are reallocated from other essential health services. However, assessing the opportunity costs of re-programming financial resources from other essential services requires further analysis.

COVID-19 Resource Mapping builds on health sector Resource Mapping, an annual process led by the Ministry of Health since 2011 used to estimate sector-wide budgets in Malawi. The Government of Malawi quickly deployed a COVID-19 exercise tailored to Malawi's contexts and policy needs by leveraging the flexibility of the existing health sector tool and process. Respondents' familiarity with the data collection tool also supported a short, four-week data collection period with submissions from 40 out of 52 targeted organizations.

Conclusion

The rapid collection and analysis of financial data has supported real-time decision-making for COVID-19 planning and budgeting in 2020. Data are collected continuously using a dynamic classification system so that information remains relevant to the changing nature of the pandemic. The process has built upon the broader institutionalization of health sector Resource Mapping. As countries look to strengthen their systems for pandemic preparedness and response, rapidly deployable financing tools have the potential to be key policy tools for governments to act based on evidence.

Does Progress on Universal Health Coverage Explain COVID Cases and Deaths?

PRESENTER: **Mr. Bishnu Bahadur Thapa**, Brown University

AUTHORS: Angelina Ossimetha, Dr. Momotazur Rahman, Omar Galarraga

Background

Introduction

The trajectory of the COVID-19 pandemic has been different for different countries. The trajectory is reflected in the varying number of per-population cases and deaths. Such variation may be a function of a number of country-specific factors such as population distribution, disease profile, non-pharmaceutical interventions (e.g., lockdowns) undertaken at the wake of the pandemic, political leadership, and others.

We examine the extent to which a country's progress towards universal health coverage (UHC) explains COVID outcomes. We also measure how the effect of UHC varies across different levels of government trust. We proxy the UHC progress using service coverage index (SCI). The SCI is a broad-based measure of UHC, and is tracked at the country level by the World Health Organization (WHO) and its collaborating partners.

Hypothesis

Our overall hypothesis is that the UHC-SCI has a protective effect on health, and therefore, is negatively associated with the COVID outcomes (COVID cases and deaths per 100k population).

Methods

Our data for the SCI comes from the WHO while the longitudinal (daily) data on COVID outcomes and other key variables come from "ourworldindata.org" (University of Oxford). The data on government trust is obtained from the social capital component of the Legatum

Prosperity Index (LPI), 2019.

Using data from 173 countries, we run cross-country linear regressions, with month fixed effects and country-level clustering. We run two sets of linear regressions. First, we regress each COVID outcome on the SCI. Second, we regress each COVID outcome on the SCI and the interaction term between SCI and trust on national government. Both sets of regressions include controls for GDP per capita, share of population above 65, a measure for income inequality, poverty rate, and share of diabetic patients.

Findings

Our findings, based on longitudinal random effects model, suggest a positive and highly significant association between UHC and COVID cases/deaths. This is counterintuitive, and we suspect it is likely related to a number of omitted variables that we are unable to fully account for. The coefficient on the interaction term, however, is negative and highly significant.

Policy Implications

The effect of UHC seems to be protective among countries that are characterized by high level of public trust in national governments.

Does Past Public Health Spending Improve COVID-19 Response? Evidence from US Counties

PRESENTER: **Ms. Sneha Lamba**, Johns Hopkins Bloomberg School of Public Health
AUTHORS: Carrie Wolfson, Carolina Cardona, Natalia Y Alfonso, Alison Gemmill, David Bishai

This paper asks whether county and state governments in the US that historically spent more on public health were better able to control the novel COVID-19 pandemic in 2020. We consider COVID-19 cases at the county level reported between 22nd January 2020 and 19th July 2020 (180 days) among counties that had 10 or more cases within this time period. Restricting the analysis to this time period enables us to focus solely on the effect of past public health expenditures assuming the counties would not significantly reorganize public health spending in the early days of the pandemic.

Daily case data by county were smoothed using LOWESS and used to estimate first and second derivatives of the epidemic curve of each county. By 19th July, only 19% of the counties had successfully bent their COVID-19 incidence curve from a positive to a negative slope. We use three metrics of COVID-19 control as key dependent variables in our analyses: (i) height of the peak of the bent incidence curve, (ii) days elapsed from 10th case to the peak of the bent incidence curve and (iii) doubling time of the COVID-19 incidence rates within 30 days of the start of the epidemic. (i) and (ii) consider only counties that could successfully bend their incidence curves while (iii) considers all counties that had at least 10 cases.

Annual state and county level public health expenditure data were extracted using the Census Bureau's local and state finance files (compiled and analyzed by one of the authors in related publications). We use measures of Total State-level, County-Level Public Health Expenditures, and Inter-Governmental Transfers as well as Expenditures on Hazard Preparedness, and Communicable Diseases as key independent variables in analyses.

We estimated generalized linear models and accelerated failure time survival analysis models to estimate the association between local public health spending and effective control of COVID-19. Our model included the public health spending variables as well as set of variables to control for sociodemographic, health policy, population health, temperature, and political indicators, as well as state testing rates.

We find that county level public health expenditure is not associated with COVID-19 control across multiple specifications. However, state-level spending on communicable diseases and inter-governmental transfers were associated with controlling the pandemic among counties that were able to bend their curves. Next steps include extending the period of analyses until December 2020, and incorporating multiple incidence peaks into our curve bending definition that quantifies COVID-19 control. Finally, we will create unadjusted and adjusted measures of days to peak to identify counties that are positive deviants in COVID-19 control.

12:15 PM –1:15 PM TUESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Contemporary Developments in China Rapidly Evolving Health System and Its Implications on Health Expenditures, Demand for Care, and Care Quality

SESSION CHAIR: **William Hsiao**, Harvard T.H. Chan School of Public Health

ORGANIZER: **Terence C Cheng**, Harvard T.H. Chan School of Public Health

DISCUSSANT: **Karen Grépin**, The University of Hong Kong

The Relationship between Hospital Ownership and in-Hospital Mortality and Medical Expenses for Three Common Conditions: Cross-Sectional Analysis from China

PRESENTER: **Qingping Xue**, West China School of Public Health, Sichuan University

Background: The number of for-profit and not-for-profit private hospitals in China grew significantly since 2009 following a set of reforms encouraging private investment in the hospital sector. There are long-standing debates on the performance of different types of hospitals and empirical evidence on developing countries is scant. We study disparities in health care quality and expenditure in public, private not-for-profit, and private for-profit hospitals.

Methods: A total of 64,171 inpatients (51,933 for Pneumonia (PNA), 9,022 for Heart failure (HF) and 3,216 for Acute myocardial infarction (AMI)) who were admitted to secondary hospitals in Sichuan province, China, during the fourth quarters of 2016, 2017, and 2018 were selected for this study. The multilevel logistic regressions, adjusting for potential covariables, were utilized to assess the relationship between hospital ownership and in-hospital mortality rates for PNA, HF, and AMI, while the multilevel log-linear regressions for medical expenses.

Results: The private not-for-profit (OR, 1.47; 95% CI, 1.03, 2.10) and for-profit (OR, 1.48; 95% CI, 1.02, 2.14) hospitals showed higher in-hospital mortality than the public ones for PNA, but not for AMI and HF. There was no significant difference in expenses across hospital ownership types for AMI, but the private not-for-profit and for-profit hospitals were associated with 18% and 11%, respectively, higher total medical expenses for treating HF and a 13% and 12% higher for treating PNA than the public hospitals. No difference was found between the private not-for-profit and private for-profit hospitals both in in-hospital mortality and medical expense across the three conditions.

Conclusions: The public hospitals were associated with better or equal healthcare quality and lower medical expenses than the private ones in China, while no difference between private not-for-profit and for-profit hospitals. Our results contribute to the literature on the health care variations across hospitals of different ownerships and draw lessons and policy implications for the reform of healthcare delivery system to improve health care delivery in China.

Does the Increase in the Number of Large Scale Medical Equipment Affect Medical Expenditure? A Difference-in-Differences Analysis

PRESENTER: **Qiwei Deng**, Xi'an Jiaotong University

Background. With the development of advanced medical technology, the use and promotion of large-scale medical equipment (LSME) have greatly increased the number and total value of equipment recently. Increasing the allocation of medical equipment is likely to accelerate the increase in medical expenditure. In the past decade, China has published and updated the management measures for the allocation and use of LSME, trying to reduce the proportion of equipment cost in medical expenditure. It is of great significance to examine whether an increase in the number of Class II

medical equipment would have an impact on outpatient and inpatient expense and to reveal the relationship between medical expenditure and LSME deployment. It is valuable to alleviate the social problem of "unable to obtain and quite expensive medical care" in China.

Method. We have used data from the Health Financial Annals in Shaanxi province from 2011 to 2017, the data is based on 199 hospitals' financial income and expenditure, supplemented by basic information such as staff size and bed days, and also includes various expenses between different types, such as examination expense and medical expense. LSME configuration management items basically are divided into two categories, Class I and Class II, we obtained the number of class II medical equipment for analysis. We used the balance panel data of the hospitals to perform a fixed-effect regression to analyze the relationship between the number of class II medical equipment configuration and the average charge per visit of outpatient and the average charge per visit of inpatient. Then we performed a difference in differences (DID) analysis to evaluate the relationship between the number of class II medical equipment increased from 0 to 1 or add by 1 regardless of the initial configuration and average charge per time visit of outpatient and inpatient.

Results. Through seven years of data analysis in Shaanxi Province, we found that there was a significant difference between the average charge per visit of inpatient and the number of LSME. Either the number of Class II medical equipment added by one regardless of the initial configuration with the inpatient expense or the inpatient examination expenses have a strong correlation. The increase in the number of LSME is accompanied by the increase in inpatient expense. While the relationship between outpatient expense and the number of Class II medical equipment amount was differ little, no statistically significant difference between the outpatient expense and the number of LSME.

Conclusion. Our findings show that there is a significant difference between inpatient expenditure and the number of LSME, but there is no statistically significant difference between outpatient expenditure and the number of LSME changes. We also found that the increase in LMSE did increase inpatient examination expenditure, but did not differ significantly from outpatient examination expenditures. This conclusion also has a strong relationship with the physician induced demand.

Explaining the Evolving Demand for Healthcare in Rural China 2011-2018: A Non-Linear Decomposition Approach

PRESENTER: **Ms. Yunwei Chen**, UNC Chapel Hill

With a goal of reducing patient loads at upper-level health facilities, reforms of China's health system over the past decade have aimed to strengthen primary care in lower-level clinics and health centers. This paper studies the changes in rural patient demand for health services across tiers of China's rural health system using longitudinal and nationally-representative data spanning 2011 to 2018. Despite policy goals, we document a continued large-scale shift in utilization from lower-level facilities to upper-level hospitals. We estimate that between 2011 and 2018, village clinic utilization dropped by 35% while the utilization of outpatient services in county hospitals increased by 78%. Non-linear decompositions show that structural changes in the patient, provider, and community factors accounted for more than half of the decrease in the demand for health services at the village level. The changing disease pattern shifting towards chronic diseases, along with the decreased availability of medical resources at village clinics, were the strongest contributors to the demand shift.

Trends in Equity of Inpatient Care for the Mid-Aged and Elderly in China from 2011 to 2018: Evidence from the Charls

PRESENTER: **Dr. Xiaojing Fan**, Xi'an Jiaotong University

Aim. The aim of this study was to assess the trends in equity of receiving inpatient health service utilization (IHSU) in China over the period 2011–2018.

Methods. Longitudinal data obtained from China Health and Retirement Longitudinal Studies (CHARLS) were used to determine trends in receiving inpatient care during 2011-2018. Ethical approval for collecting data on human subjects was received at Peking University by their institutional review board (IRB). This approval is updated annually. Crude and adjusted annual rates were calculated by means of Logistic regression and were used to define trends after controlling for socioeconomic characteristics, lifestyle and health status. Concentration curves, concentration indexes and its decomposition method were used to analyse its equity.

Results. This study showed that the annual rate of IHSU gradually increased from 7.99% in 2011 to 18.63% in 2018. Logistic regression shows that the rates of annual IHSU in 2018 were nearly 3 times (OR = 2.86, 95%CL: 2.57, 3.19) higher for rural respondents and 2.5 times (OR = 2.49, 95%CL: 1.99, 3.11) higher for urban respondents than the rates in 2011 after adjusting for other variables. Concentration curves both in urban and rural respondents lay above the line of equality from 2011 to 2018. The concentration index remained negative and increased significantly from − 0.0147 (95% CL: − 0.0506, 0.0211) to − 0.0676 (95% CL: − 0.0894, − 0.458), the adjusted concentration index kept the same tendency. The horizontal inequity index was positive in 2011 but became negative from 2013 to 2018, evidencing a pro-low-economic inequity trend.

Conclusions. We find that the inequity of IHSU for the middle-aged and elderly increased over the past 10 years, becoming more focused on the lower-economic population. Economic status, lifestyle factors were the main contributors to the pro-low-economic inequity. Health policies to allocate resources and services are needed to satisfy the needs of the middle-aged and elderly.

12:15 PM –1:15 PM TUESDAY [Demand And Utilization Of Health Services]

Health Insurance and Price Subsidies

MODERATOR: **Anthony Scott**, University of Melbourne

Empirical Analysis of the "Balance of Fit" between Service Areas in Germany

PRESENTER: **Theresa Hüer**, Health Economics Research Center, University of Duisburg-Essen, Germany
AUTHORS: Jürgen Wasem, Florian Buchner

Objectives: Geruso & McGuire in 2016 presented the concept of *Fit, Power and Balance*. While *Fit* describes how well risk adjustment payments to Social Health Insurance Funds (SHIFs) track SHIFs' costs, *Power* measures the marginal effect in risk adjustment payments due to marginal changes in expenditure from a single SHIF perspective. *Balance* assesses the differences in power across various types of medical services. We develop this concept further and calculate *balance* for differences in *Fit* across various types of medical services to analyse the impact on SHIFs' behaviour.

Methods: To calculate the *Balance of Fit*-approach the main types of service areas in the German risk adjustment scheme (e.g. spending on outpatient as well as inpatient care, on pharmaceuticals, on dialysis) are used to illustrate different service areas. The next steps are multiple linear regressions on spending in different service areas to calculate the *Fit* (R^2 and CPM), separately for the considered areas. Therefore, a data set of 2.8 million insured of a nationwide operating sickness fund is used. Data for demographic and diagnostic information as well as prescription drug codes for 2014 and expenditures for 2015 for these insured were available. *(Im)balance of Fit* is finally measured by the sum of squared deviations of the service area specific *Fit* from overall system *Fit* weighted by the respective share of service area expenditure in overall expenditure. In addition, multiple regressions using different morbidity information (outpatient diagnosis, inpatient diagnosis, pharmaceuticals and various combinations) are calculated to evaluate all possible combinations of *Balance of Fit*. This approach is carried out for three different models of the German risk adjustment scheme: (1) the model in its design until 2020 (selection of 80 diseases) and the model in its design from 2021 ((2) only with respect to the extension to a full model covering all diseases and (3) in combination with the new high-cost pool).

Results: The *Balance of Fit*-approach demonstrates a high degree of imbalance between service areas in the German system in all models. The table below demonstrates for example the results considering all diagnostic information and prescription drug codes in the regressions for estimating the spending in different service areas.

model area specific range

	(adjusted) R^2	CPM
1	0.06 and 0.37 (0.31)	0.12 and 0.35 (0.23)
2	0.06 and 0.42 (0.36)	0.12 and 0.37 (0.25)
3	0.55 (overall spending)	0,29 (overall spending)

Discussion: An *imbalance of Fit* in different service areas may be of less importance than imbalance of power, but it may lead to undesired distortions. If *Fit* is much better in one than in another service area, SHIFs may steer their insured in that area with the better *Fit*, because risk-averse SHIFs may prefer the lower residual variance. *Balance of Fit* therefore adds information for the regulator when designing a risk adjustment mechanism.

Dynamics in the Choice of Health Plans and the Demand for Health Care: Are Consumers Forward- or Backward-Looking?

PRESENTER: **Yanmei Liu**, University of Lucerne

AUTHOR: Dr. Stefan Boes

Choice-based health insurance systems allow individuals to select an insurance policy that best fits their needs. One important question is whether individuals exhibit forward- or backward-looking behaviour in decision-making of health plans, i.e., whether they choose a plan based on their expected (near) future health care needs or past-year health care consumption. The compulsory health insurance system in Switzerland that offers a standardized but rather comprehensive package of covered health services is an interesting setting for studying this question, as individuals can select from health plans with restricted access to health care providers or maximal yearly out-of-pocket expenditure. Using individual-level panel data about health plan choices and health care demand, we apply dynamic regression models to investigate whether changes in choices of health plan (including deductibles and the type of plan) are related to changes in future demand for health care. In the analyses, past health care consumption remains fixed for estimation of potential forward-looking behaviour. Preliminary results suggest little evidence for such behaviour, although individuals with rather high future health care needs indeed seem to anticipate this and proactively choose a lower deductible plan over the past time period. On the other hand, we find evidence for backward-looking behaviour since increases in past health care consumption for a given health plan are negatively associated with the level of deductibles that individuals choose within the following period. These results are stable when altering the lag structure in health care consumption and including control variables such as gender, age, subjective health status, and the region of living. The results are also consistent across different measures of health care demand, including the number of doctor consultations and hospital stays. Our results throw light on the recent policy debates in Switzerland about changing health insurance deductibles and empowering the insured by increasing health insurance literacy of the population.

Adverse Selection in Health Insurance Markets: Evidence from a Study in South Africa Using Panel Data

PRESENTER: **Pamela Halse**

Adverse health events can be very expensive and unaffordable with catastrophic financial and welfare implications that affect the entire family. Health insurance provides a form of financial protection against future and unpredictable healthcare expenditure. It allows policy holders to transfer consumption from when they are healthy to when they are sick.

Insurance companies operate through the principle of risk pooling where healthier members (who claim less than they contribute) subsidize sicker members (who claim more than they contribute). The notion of risk pooling in a voluntary insurance market creates an enabling environment for adverse selection. Adverse selection occurs where low risk/ healthier people abstain from purchasing health insurance, or purchase low levels of cover[1] until they anticipate an increased likelihood of healthcare expenditure. As individuals expected healthcare risks and likely expenses increase, their willingness to pay for insurance or purchase higher coverage increases (Rothschild and Stiglitz 1976). Where adverse selection exists, it inflates the price of cover, which, in turn causes more people to abstain from medical cover or to buy cheaper cover which ultimately results in an actuarial death spiral.

Previous studies on adverse selection, predominantly in developed countries, show that a range of factors influence people's decision to purchase insurance. These include economic (income level and employment status), demographic, education, risk appetite, past health shocks, and preference to access private health care.

In South Africa, the regulatory environment is conducive for adverse selection to exist. Health insurance is voluntary, but in most cases a necessity to access private healthcare[2]. Medical schemes must follow open enrollment and community rating requirements meaning they cannot deny applicants membership or differ their premiums based on the individual's age and health status. While medical schemes may implement waiting periods and late joiner penalties, it is unclear if these measures are sufficient to deter adverse selection. It is also worth noting that quality concerns and inadequate access including long waiting lines in the public sector means that it is not a good substitute for private healthcare for those that can afford insurance.

This paper examines decisions to purchase insurance in South Africa through using panel data from the National Income Dynamics Survey. The analysis focuses on respondents within the different waves who experience adverse health shocks such as being diagnosed with a chronic condition(s) as well as their self assessed health status. It also considers biomarkers like BMI and blood pressure and pregnancy/ births as indicators of household expenditure. The typical explanatory variables like income, education, age and risk appetite are also factored into the analysis

[1] Families may also only have partial cover where the members with the most risk belong to a medical aid and the rest do not.

[2] Some people may access private care at the primary level, but then use the state for specialist and hospital care.

12:15 PM –1:15 PM TUESDAY [Specific Populations]

ORGANIZED SESSION: Determinants and Disparities in End-of-Life Care Costs: Evidence from Real World Data (RWD) in Norway, Ireland and the United States

SESSION CHAIR: **Eline Aas**, University of Oslo

ORGANIZER: **Peter May**, Trinity College Dublin

DISCUSSANT: **Christian Brettschneider**, University Medical Center Hamburg-Eppendorf; **Jing Li**, Weill Cornell Medical College; **Charles Normand**, Trinity College Dublin

Living Situation, Healthcare Utilization and Total Healthcare Costs the Six Months Prior to Death for All Cancer Decedents in Norway

PRESENTER: **Gudrun Bjørnelv**

AUTHORS: Terje. p Hagen, Leena Forma, Eline Aas

Background: Annually, approximately 11,000 people die from cancer in Norway, which is currently the leading cause of death. People dying from cancer are heterogeneous regarding factors such as age, gender, comorbidity, and access to informal care. Most research of end-of-life care utilization focus on single aspects of care (i.e., only on hospital care), and frequently, on selected cohorts (i.e., only in the elderly). Because of the integrated

nature of palliative care, all care that patients receive at end-of-life in the different levels of the sector needs to be evaluated simultaneously, in non-selected cohorts. **Aim**: In the current paper, our aim was to describe the living situation, healthcare utilization and healthcare costs in all levels of the sector 6 months prior to death, for all cancer decedents (in 2009-2013) in Norway. **Methods**: We linked 6 national registers, and describe the no. days patient lived at home, in short- or long-term institutions or in the hospital. We describe their use of secondary (inpatient and outpatient care), primary (GP and ER consultations) and home- and community-based care (practical and nursing assistance) and estimate the cost in the different levels of the sectors (USD 2013). To estimate the difference in living situation, healthcare utilization and healthcare cost, depending on the type of cancer patients died from (lung-, colorectal-, prostate-, breast-, cervical- and other cancer) and other sociodemographic factors (age, gender, marital status, education, income and comorbidities), we used appropriate regression models, i.e., Negative binomial (for healthcare utilization) and generalized linear models (for healthcare costs). **Results**: In total, 52,926 individuals died from cancer in Norway between 2009-2013; 16% from lung, 12% from colorectal, 9% from prostate, 6% from breast and 1% from cervical cancer. On average, patients spend 123 days at home, 24 days in hospital, 16 days in short-term care and 24 days in long-term care during their last 6 months of life. Overall, patient's healthcare utilization increased towards their end-of-life. Between the different causes of cancer, healthcare utilization varied somewhat – thus – the healthcare costs also varied between them both in the secondary (min/max USD29,876/USD39,728), primary (min/max USD1,657/USD2,379) and home- and community based care setting (min/max USD21,937/32,549). However, the healthcare costs varied more between individuals depending on their age and access to informal care (marital status), than their underlying cause of death (type of cancer); increasing age reduced secondary care but increases home- and community-based care, while access to informal care increased the use of secondary care while it decreased the use of home- and community-based care. Those with higher education and income used some more secondary, but some less primary- and home- and community-based care, but the total healthcare utilization was relatively similar across different education and income levels. **Conclusion**: In Norway, a patients age and access to informal care, influences the patients end-of-life more than what the type of cancer does. Individuals socioeconomic status influences the type, but not the total, costs at end-of-life.

The 80/20 Rule in Last Year of Life: Who Are the Costliest Patients in the Irish System?

PRESENTER: **Peter May**, Trinity College Dublin
AUTHOR: Charles Normand

Background: The so-called '80/20 rule' and its variants is long-established in health economics; a minority of people (<20%) account for a large majority of costs (80%<) in any given year. Also well known is the relationship between costs and proximity to death; the last year of life is the most costly for most individuals, and the 1% of people who die annually in high-income countries account for 10% of spending. Little attention has been paid to the co-occurrence of these phenomena: that even among people in the last year of life, when costs are highest, the distribution of costs remains heavily concentrated in a relatively small group.

Aim: To describe and predict those who will die with very high costs.

Rationale: People who die with very high costs are a subject of strong policy interest. There has been little attention to who these people are, the extent to which living situation and socioeconomic status determine these costs as well as need, and the scope for prospective identification of this group. Efforts with routine data have encountered omitted variable difficulties and low explanatory power.

Methods: Data are used from two sources. The Irish Longitudinal study on Ageing (TILDA) is a population-representative biennial panel study of people aged 50+ in Ireland. It has run since 2010 with an initial sample size of 8,504. At time of submission over 1,100 of these participants has died. Data are collected on demographics, health and disability, health care use and myriad other factors (tilda.tcd.ie). Hospital Inpatient Episode (HIPE) data records all admissions into public hospitals in Ireland including sociodemographics and diagnoses (ICD-10 classification). We split each dataset into derivation and validation groups. We first examine associations between available predictors and outcome (high-cost death) in the derivation group. We then build predictive indices to identify those at risk of outcome, and we evaluate indices' predictive power in the validation data.

Results: While overall prevalence of very high-cost care is similar by socioeconomic status, drivers of those costs differ. For people with higher socioeconomic status, use of inpatient hospice is higher. For people with low socioeconomic status, use of hospital is higher. Quality of care is correlated with socioeconomic status. Provisional results show that predictive indices have sensitivity of ~0.60 and specificity of ~0.85 in both datasets. This compares favourably with prior efforts to prospectively identify people at risk of adverse events near end of life (e.g. Kelley and Bollens-Lund, 2018). However it is insufficient to merit invasive and/or high-cost interventions when risk of false positives is high. Consideration is given to how improved information among both patients and clinical teams might improve outcomes at limited cost. Further research is ongoing and will be finished prior to the Congress in July 2021.

Population-Level Assessment of Palliative Care Provision for People with Cancer in a Mid-Sized Metropolitan Area in the USA

PRESENTER: **J. Brian Cassel**, Virginia Commonwealth University
AUTHORS: Donna McClish, Danielle Noreika

Background: Large claims-based datasets in the USA provide the basis for much health economics research in the USA, but those datasets lack accurate and trustworthy indicators of specialist palliative care (SPC) involvement. Population-level (geographic) research about SPC use for cancer patients could reveal predictors and outcomes of SPC as well as possible inequities and disparities.

Aim: To evaluate the use of SPC in all cancer patients known to be deceased in a mid-sized metropolitan area of the USA.

Methods: We obtained data from the state cancer registry, state hospital discharge database, and the 3 SPC clinical teams serving the metropolitan area, and linked them together. The data included cancer registry cases (primary malignant neoplasms) for people who were adult and living in the metropolitan area when diagnosed and who died between 2012-2015, excluding those treated in veterans-only facilities. SPC encounters occurred in any location -- hospital, clinic/office, or home. Data on SPC encounters and hospitalizations were from a 6-year period, 2010-2015. Hospitalizations occurred within or nearby the metropolitan area, at 6 hospitals that offered SPC and 9 that did not.

Results: Data on 12,030 people were obtained, 2,958 (24.6%) of whom had at least 1 SPC encounter. The median number of days from SPC to death was 30 (IQR 107). For people who did not receive SPC (n=9072): 3877 (42.7%) did not go to a hospital that offered SPC and 1678 (18.5%) did not go to any hospital. About one-third (34%) of the people who were hospitalized at least once at an SPC-offering hospital used SPC. In a logistic regression, the following were associated with SPC use: being in an SES quintile other than the lowest; being younger; being Black; having a solid (versus hematological) cancer; having a shorter survival with cancer; dying in the latter two years of the study; being from an area of low or complete rurality; and having a hospital admission in the final 30 days of life (all $p<.05$). The AUC statistic was 0.749. Secondary analyses limited to those with poor prognosis cancers (n=4,889) and those who had at least 1 hospital stay (n=7,106) had similar patterns of associations. Preliminary analyses of disparities indicated that race (Black) was associated with both greater SPC use and also more hospital care in the final month of life (e.g., death in hospital, intensive care), and SPC use did not moderate the relationship between race and hospital utilization.

Conclusion: In a metropolitan area with multiple sources of SPC, fewer than 25% of cancer patients used SPC. Of those who did not, the majority actually went to SPC-offering hospitals. In this diverse population, Black cancer patients were more likely to use SPC and more likely to have hospital use at the end of life. The methods can be scaled to incorporate larger geographical areas or multiple metropolitan areas.

12:15 PM –1:15 PM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ORGANIZED SESSION: New Approach to HIV Prevention: Protecting Women from Economic Shock to Fight HIV in Africa

SESSION CHAIR: **Timothy Powell-Jackson**, London School Of Hygiene & Tropical Medicine

ORGANIZER: **Aurelia Lepine**, University College London

DISCUSSANT: **Matthew Quaife**, London School of Hygiene & Tropical Medicine; **Sandy Tubeuf**, Université Catholique de Louvain; **Antoine Nebout**, ALISS INRAE; **Mylene Lagarde**, LSE

Economic Shocks and Risky Sexual Behaviours: A Systematic Review of the Literature

PRESENTER: **Henry Cust**, LSHTM (London School of Hygiene and Tropical Medicine)

AUTHORS: Harriet Jones, Timothy Powell-Jackson, Aurelia Lepine, Rosalba Radice

Background: Natural disasters, global economic shocks as well as smaller individual level economic shocks are becoming more prevalent and impactful to the world's poor. With HIV disproportionately affecting young women in low- and middle-income countries, understanding the contribution of such economic shocks to driving risky sexual behaviours of both men and women is key in the response to HIV. This systematic review investigates the extent to which economic shocks explain HIV transmission through risky sexual behaviours.

Methods: We search economic, health and public health databases for papers that have both economic shocks and indicators of risky sex or their direct health impacts in them. We then screened these for investigations of the impact of economic shocks on behaviors or health impacts. We collected data and critically appraised the quality of included studies in order to perform a narrative analysis of the findings of the papers.

Results: We screened 1,523 papers, finally including 35 papers for data extraction. These 35, contained 31 unique negative and 11 unique positive economic shocks combined with over 320 risky sex and health outcomes. After highlighting the huge diversity in literature on this topic with vastly differing methods and definitions employed by authors to tackle each study's empirical challenges, we discuss the limitations of reviewing such studies and document the evidence of economic incentives driving risky sexual behaviours and risk of HIV exposure. We perform a narrative analysis and propose an 'expectations' framework by which to view economic shocks (i.e. how wide and how far into the future a shock is expected to last). By synthesizing the evidence through this lens, we see that the majority of shocks are persistent, those that are negative leading to consistent increases in risky sexual behaviours. Temporary shocks show increases in risky behaviours of those women at risk of transactional or commercial sex but there is a lack of evidence from more representative samples. Temporary and persistent positive shocks do not generally show improvements in risky behaviours. Only in the one analysis of a permanent positive shock, is there significant improvement in risky behaviours. Overall, we find that increases in risky sexual behaviours are more sensitive to negative shocks than decreases are to positive shocks. Persistent negative shocks consistently lead to increased risky sex in all samples but there is limited evidence that positive shocks, such as cash transfers interventions, encourage sustained behaviour change.

Conclusions: The implications of this research are that targeted protection against negative economic shocks, such as health or crop insurance, or savings interventions, will likely be effective in preventing STIs and HIV in low- and middle-income countries where transactional sex and unprotected sex are often used to smooth consumption.

From a Drought to HIV: Exploring the Effect of Agricultural Shocks on Transactional Sex and HIV in Malawi

PRESENTER: **Carole Treibich**, GAEL

AUTHORS: Eleanor Bell, Aurelia Lepine, Elodie Blanc

Background: In 2018, Sub-Saharan Africa has accounted for two third of new HIV infections globally. Recent literature showed that droughts over the last ten years explain 20% of cross-country variation in HIV prevalence rates in SSA. In the context of climate change, where the frequency and severity of extreme weather events has increased in the region and put many farm households in survival difficulties, efforts to control the HIV epidemic could be under threat.

Methods: This paper uses Demographic and Health Survey data collected in Malawi in 2015-2016 during a severe drought only affecting specific areas of the country to study the effect of an unanticipated economic shock on sexual behaviours of young women and men. Indeed, for the first time, transactional sex questions were included in the DHS questionnaire. Past droughts were built thanks to the Global Precipitation Climate Centre monthly precipitation dataset. Climatic shocks were matched with DHS clusters to identify households who suffer from droughts.

Findings: We find that women employed in agriculture who suffered from six months of droughts are twice more likely to engage in transactional sex in the last 12 months compared to women who did not suffer from any drought. Furthermore, these women are almost 50% more likely to suffer from STI symptoms. Amongst men employed outside of agriculture, recent drought increase by 75% the likelihood of engaging in transactional sex. Furthermore, one additional six-month drought period in the last five years increase by 14% and 19% the HIV prevalence among Malawian women and men. However, when considering women working in agriculture and who experienced at least a six-month period of drought in the last five years, those who belong to a household who owns live stocks are 35% less likely to be HIV positive.

Conclusion: These results suggest that women experiencing economic shocks as a result of drought (women employed in agriculture) use transactional sex with relatively unaffected men (men employed outside agriculture) as a coping mechanism, exposing themselves to risk of HIV in the process. The negative effect of drought on HIV prevalence is however mitigated by live stock ownership. This paper sheds light on the role of transactional sex in the spread of HIV and the importance of alternative coping strategies to limit these adverse effects.

Why COVID-19 May Lead to an Increase in HIV/AIDS in Africa: Evidence from a Cohort Study of Female Sex Workers in Senegal

PRESENTER: **Wen Qiang (Wally) Toh**, Erasmus University Rotterdam

AUTHORS: Carole Treibich, Sandie Szawlowski, Henry Cust, El Hadj Alioune Mbaye, Khady Gueye, Cheikh Tidiane Ndour, Aurelia Lepine

The COVID-19 pandemic has severely impacted sex work. In response to economic shocks, sex workers may trade off health for income by having better-renumerated unprotected sex. Comparing cross-sectional data from surveys done in 2015, 2017 and during the COVID-19 pandemic in June-July 2020 on a cohort of 650 female sex workers (FSWs) in Dakar, Senegal, we found that condom use prevalence estimated via list experiments fell by 17% in 2020 from 2017 levels. This corresponded to a 60% increase in the prevalence of unprotected sex. We investigated competing explanations for this decline by estimating subgroup heterogeneities in condom use prevalence. We showed that the economic reasons was likely to be a key driver, while reduced access to condoms per se, substitution between risks of contracting COVID-19 versus HIV/STIs, and a shift towards regular clientele did not seem to be major contributors. A back-of-the-envelope calculation showed that overall HIV/STI transmission risk has likely fallen, as the 70% fall in client numbers would likely have dominated. However, our survey was administered just three to four months into the pandemic. We discussed how a prolonged COVID-19 crisis could potentially lead to further declines in condom use prevalence or persistently low condom use after client numbers improve, with a focus on the debt channel. Our findings highlight the need for more research into the coping mechanisms of sex workers during the COVID-19 pandemic and their implications for HIV/STI transmission risks. Our findings also call for regular monitoring of debt accumulation, client numbers and condom use prevalence during and after the pandemic. Our study adds to the literature on how economic shocks influence risky sexual behaviours and suggests that economic interventions among female sex workers as a lever to curb HIV/STI transmission warrant serious consideration.

Anticipated Economic Shocks and Risky Sex: Does Tabaski Reduce Condom Use of Female Sex Workers in Senegal?

PRESENTER: **Henry Cust**, LSHTM (London School of Hygiene and Tropical Medicine)

AUTHORS: Aurelia Lepine, Timothy Powell-Jackson, Rosalba Radice

Background: Female sex workers are vulnerable to economic shocks and there is evidence that these shocks induce risky sexual behaviours. We assess how these shocks might be leading to unprotected sex in order to access risky sex premiums to help them smooth consumption. We test the effect of two different economic shocks to FSW: one is illness of their household member i.e. an unanticipated shock affecting sex workers only, the second is the religious celebration of Tabaski, i.e. an anticipated shock affecting FSW and their clients. Tabaski is a religious festival celebrated in West Africa characterised by the purchase of an animal and gifts at extremely inflated prices.

Methods: We use observational cohort study of around 600 FSWs in Dakar, collected in 2015, 2017, and 2020 to estimate the effect of the economic shocks on risky sexual behaviours of FSWs. Approximately 60% of FSWs were followed through each round, with new FSWs added to the cohort to maintain the sample. We describe the range and severity of economic shocks suffered by FSWs during the 30 days since their wave 3 interview in June-July 2020, the height of the COVID-19 pandemic, and describe the self-reported coping strategies used by FSWs. Our analysis of shocks and condom use focuses on the most recent two waves, 2017 and 2020, that both collected condom use information using "list randomisation", a method of indirect elicitation of sensitive questions. List randomisation allows respondents to reveal if they used a condom or not without the researchers ever finding out their answer but allows the researchers to calculate sample and sub-sample prevalence estimates for condom use.

Results: Our descriptive results show that a health shocks in FSWs' household cost around a month of typical earnings with Tabaski costing around 1.5 times typical monthly earnings. There is a strong preference for increasing sex work to cope with economic shocks over other consumption smoothing options. Our results show that an illness of a household member leads sex workers to reduce condom use by 40 percentage points. We find that sex acts that take place in the final week before Tabaski are also around 40 percentage points more likely to be unprotected. The effect from Tabaski fades further than 2 weeks away from the festival implying the economic pressure of needing to buy an animal and gifts for the festival is likely to be responsible for the increase to sexual behaviours.

Conclusions: There is evidence that condomless sex is driven by economics shocks. There is evidence that the period around Tabaski is associated with an uptick in risky sexual behaviours of female sex workers and contributes to the ongoing HIV epidemic. Access to savings and health insurance interventions or interventions that would help bearing or spreading the costs associated with Tabaski are expected to reduce risky behaviours and HIV.

12:15 PM –1:15 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Advancing Mixed-Methods Approaches for Considering Multiple Decision Criteria and Health System Constraints in Health Care Evaluation

SESSION CHAIR: **Anna Vassall**, London School of Hygiene & Tropical Medicine

ORGANIZER: **Fiammetta Bozzani**, London School of Hygiene & Tropical Medicine

DISCUSSANT: **Lesong Conteh**, LSE; **Rob Baltussen**, Radboudumc

Advancing Value Assessment Methods of New Cancer Drugs: From the Appraisal of Cancer Drugs Fund to the Design of an Extended Value Framework for Payers

PRESENTER: **Aris Angelis**, London School of Hygiene & Tropical Medicine

Background: In 2009, the National Institute for Health and Care Excellence (NICE) issued End-of-Life treatments guidance for extending its incremental cost effectiveness ratio threshold up to £50,000: when treatments offer at least 3 months of survival in patients with less than 24 months life expectancy, effectively increasing the baseline value of a quality adjusted life year (QALY) by x2.5. In 2016, NICE took over responsibility for the Cancer Drugs Fund (CDF), becoming a managed access fund for drugs with uncertain clinical benefits that have the potential of satisfying criteria for routine use, by addressing their uncertainties through collection of Real World Data (RWD) within 2 years. Besides CDF's meaningfulness and value to society remaining questionable, its current form indicates decision-makers' willingness to consider additional aspects of value in cancer drugs, besides their clinical benefits. This study postulates that for improved coverage decisions, transparency and allocative efficiency, value preferences should be quantified and explicitly communicated both in regards to drugs' performance and their uncertainty, a topic also highlighted in NICE's recent consultation on the review of its evaluation methods.

Objectives: The overall objective is to advance value assessment methods for cancer drugs by extending the value framework behind economic evaluation. It focuses on challenging, clinical uncertain CDF products with possible multidimensional benefits, to design a novel cancer value framework for resource allocation by payers. It aims:

1) To appraise the value of CDF relative to its stated aims in regards to further evidence development, by systematically analysing drugs' key uncertainties and examining the use of RWD in resolving them.

2) To extend CDF by systematically analysing drugs' clinical and non-clinical value elements and supplement them with other countries' HTA agencies appraisals, to generate a comprehensive cancer value taxonomy.

3) To validate the elements of the new value taxonomy for cancer drugs and assign their relative importance by engaging relevant stakeholders and eliciting their value preferences.

4) To design a novel value framework for cancer drugs as a decision-support tool for payers in England and abroad by combining findings using an appropriate quantitative decision analytical approach.

Methods: Decision theory and decision analysis provide theoretical foundations for measuring value, enabling the incorporation of multiple aspects including their uncertainty, trade-offs, and aggregation. The study includes 4 work streams in alignment with the 4 objectives:

1) CDF value appraisal: CDF document analysis and targeted literature review for RWD usefulness in resolving uncertainty.

2) CDF value extension: HTA agencies document analysis and targeted literature review for generation of a cancer value taxonomy.

3) Stakeholder preference elicitation studies: validation of cancer value elements and assignment of their trade-offs

4) Design of a new cancer value framework as a decision-support tool.

Outcomes: CDF's value will be appraised regarding its use of RWD to resolve key uncertainties against NICE specifications. A novel value framework for cancer drugs will be designed, incorporating specific value elements and their relative importance, to improve transparency and efficiency in resource allocation by allowing the explicit integration of evidence, its uncertainty and value interpretation.

Economic Evaluation of Locally-Led Quality Improvement

PRESENTER: **Meghan Kumar**

Quality improvement (QI) describes a management process approach taken to address issues in quality, in healthcare and beyond. Historically in health, QI has been implemented primarily in high-income hospital settings and focused on technical quality of care, though recent evidence has shown many successful applications at different income levels and in a variety of service delivery settings. At community level, QI interventions have been shown to contribute to increases in identification, referral and follow-up of pregnant women by community health workers.

We first present findings from an economic evaluation of QI in community health settings in Kenya (costing and budget impact analyses have been published previously). Building on this, we present a cost-effectiveness decision tree model focusing on the impact of community QI on maternal

and newborn health, presenting both process and health outcome measures. We find community QI in Kenya highly cost-effective with an incremental cost of $249 per DALY averted and incremental costs per additional skilled delivery of only $10.

Based on this work and other ongoing work developing methods for economic evaluation of QI interventions, we then describe how the methodological challenges unearthed are shaping a current economic evaluation of QI for hospital-based small and sick newborn health in four African countries and implications for other studies. We explore challenges including: cyclical nature of the intervention; defining fidelity where there is local autonomy in QI problem identification and intervention design; confounded links between intervention and health outcomes.

The continuous nature of the QI intervention is of particular interest when assessing costs, outcomes and sustainability. Most interventions provide a point-in-time improvement in a clinical process or health system (e.g. training of health workers on a new skill or introduction of a new diagnostic) that then either continues to provide benefits or dampens over time as people revert to pre-intervention behaviours and habits. QI is distinct from that because each cycle introduces a novel intervention – the QI intervention continues to spawn further cycles of change and action, if effective, which may focus on different points and processes. This provides the opportunity to yield a broad set of outcomes over time across health areas and we explore evaluation design implications of that and the importance of integrating mixed methods approaches to map possible causal chains to outcomes of interest.

Using System Dynamics Modelling to Estimate the Costs of Relaxing Health System Constraints: A Case Study of Tuberculosis Prevention and Control Interventions in South African Health Facilities

PRESENTER: **Fiammetta Bozzani**, London School of Hygiene & Tropical Medicine

AUTHORS: Karin Diaconu, Gabriela B Gomez, Aaron Karat, Karina Kielmann, Alison Grant, Anna Vassall

Health system constraints are increasingly recognised as an important addition to model-based analyses of disease control interventions, as they affect achievable impact and scale. Relaxing constraints to reach the intended coverage may incur additional costs, which should be considered in priority setting decisions.

This study explores the use of group model building, a participatory system dynamics modelling technique, for eliciting information from key stakeholders on the constraints that apply to tuberculosis infection prevention and control processes within clinics in South Africa. This information was used to design feasible interventions including the necessary enablers to relax existing constraints. Costs of the interventions and enablers were then calculated at two clinics in KwaZulu-Natal using input prices and quantities from the published literature and local suppliers.

Among the proposed interventions, the most inexpensive were retrofitting buildings to improve ventilation (US$ 1,644 per year), followed by decentralised management of antiretroviral therapy treatment for stable patients to reduce crowding (US$ 16,405) and installation of ultraviolet germicidal irradiation (US$ 20,583). Enablers identified included enhanced staff training, and supervision and patient engagement activities to support behaviour change and local ownership. Several of the necessary enablers identified by the stakeholders, such as obtaining building permissions or improving information flows between levels of the health systems, were not amenable to costing.

Despite this limitation, an approach to costing rooted in system dynamics modelling techniques can be successfully applied in economic evaluations to more accurately estimate the 'real world' opportunity cost of intervention options. More empirical evidence from different intervention types (e.g. new preventive technologies or diagnostics) could establish if the approach can be used to systematically identify interventions that would not be cost-effective in a given context based on the size of the investment in the required enablers.

12:15 PM –1:15 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Equity, Immunization, and Country Engagement

SESSION CHAIR: **Elizabeth Ekirapa Kiracho**, Makerere University School of Public Health

ORGANIZER: **Gatien de Broucker**, Johns Hopkins Bloomberg School of Public Health

DISCUSSANT: **Anthony Ssebagereka**, Makerere University School of Public Health

Evaluating the Short- and Long-Term Impact of Enteric Fever on Families in Nepal: Preliminary Results from the TyVAC Cost of Illness Study

PRESENTER: **Cristina Garcia**, Johns Hopkins School of Public Health

AUTHORS: Elizabeth Watts, Dr. Arun Sharma, Dr. Ram Hari Chapagain, Dr. Krishna Bista, Dr. Ganesh Rai, Dr. Ganesh Shah, Dr. Sanu Raja Shrestha, Dr. Rahul Bajracharya, Dr. Binod Lal Bajracharya

Background: Evidence on the broader economic burden of vaccine-preventable disease is critical to introducing new vaccines, such as the recently licensed typhoid conjugate vaccine (TCV), but few studies have assessed the economic consequences of enteric fever. While Nepal plans to introduce TCV into its National Immunization Program in 2022 and has received approval for Gavi support, competing priorities and new vaccines such as against COVID-19 threaten to delay introduction. To support planning for TCV introduction in Nepal, we estimated the household cost of enteric fever and the proportion of families experiencing catastrophic health spending and medical impoverishment in Nepal. The results presented here are preliminary, and data collection will continue until Q3 2021.

Methods: We prospectively collected resource utilization data and out-of-pocket expenditures from inpatients and outpatients ≥9 months with blood-culture confirmed typhoid and paratyphoid from two hospitals and one private outpatient clinic in the Kathmandu Valley, Nepal. Data was collected from exit interviews and follow-up interviews conducted at 14, 30, and 90 days to collect acute phase and long-term costs and changes in household living standards. Household costs included direct medical, non-medical, and indirect costs paid by the household less amounts paid or reimbursed by third party payers. Out-of-pocket health expenditures including direct medical and non-medical costs were considered catastrophic when the expenditure exceeded 40% of non-food consumption over one month. Long term household impact was assessed based on self-reported changes in living standards and ability to meet basic household needs. All costs were expressed in 2020 US dollars.

Results: Based on the preliminary sample of 41 participants, the average cost per episode of enteric fever was $76 (SD $162) and $283 (SD $224) for outpatients and inpatients, respectively. Most costs were incurred during the acute illness phase with an average duration of 6 days (SD 4 days). Overall, lost productivity comprised 28% of the total cost and was greatest among unpaid work like domestic or family work. Primary sources of financing were savings (95%), existing income (61%), and loans (17%). On average, the out-of-pocket payment represented 87% of monthly household non-food consumption, resulting in 51% of households experiencing short term catastrophe. Because households primarily used savings or income to pay for expenditures, the immediate impact on households might be greater than previously estimated in other studies. Additionally, time spent caring for the sick individual and away from production had long term negative consequences on household finances. Within 3 months of the illness, 20% of families experienced decreased income or consumption due to the illness. Additional spending related to the typhoid-illness after the acute phase increased the number of participants experiencing catastrophic health spending to 63%.

Conclusions: Enteric fever represents a significant economic burden to families in Nepal. High out-of-pocket payments and significant productivity loss beyond the acute illness phase increases the risk of catastrophic health spending, and the long-term consequences have the potential to keep families in a cycle of poverty. Evidence on the broader economic burden of enteric fever is critical to maintaining support for TCV introduction.

The Vaccine Economics Research for Sustainability & Equity (VERSE) Toolkit – a New Approach for Assessing Multidimensional Inequities in Healthcare Access & Outcomes

PRESENTER: **Bryan Patenaude**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Elizabeth Watts, Cristina Garcia, Deborah Odihi, Salin Sriudomporn, Gatien de Broucker

Background: Following a call from the World Health Organization in 2017 for a dashboard to monitor immunization coverage equity in line with the 2030 Agenda for Sustainable Development, this study proposes a new methodology and toolkit for measuring and tracking multidimensional vaccine-related equity in coverage, economic impact, and health outcomes. This work builds upon existing equity methods and toolkits by expanding the outcomes assessed and providing a method for aggregation across multiple dimensions of inequity including socio-economic, gender-based, and regional to create a composite equity metric that is trackable over time and comparable between settings.

Methods: The VERSE composite vaccination equity assessment metric is derived from literature on the measurement of socio-economic equity by Wagstaff and Erreygers combined with measures of direct unfairness in healthcare access outlined in the works of Fleurbaey, Schokkaert, Cookson, and Barbosa. The metric takes the form of a concentration index of vaccination coverage, where instead ranking individuals by income, individuals are ranked by multidimensional unfairness in access. The direct unfairness measure is the predicted vaccination coverage from a logistic model based upon multiple dimensions of fair and unfair sources of variation in vaccination coverage. Fair sources of variation in coverage may include whether the child is underage to receive the vaccine according to the national immunization schedule. Unfair sources of variation may include sex of the child, maternal education, or socio-economic status. The direct unfairness healthcare metric is then assessed as the predicted probability of vaccination, holding the fair determinants at reference levels and allowing the unfair determinants to vary. This metric is then utilized as the ranking variable in a concentration index alongside vaccination coverage to compute the composite coverage equity metric. Vaccine coverage can be replaced with DALYs averted, cost-of-Illness averted, or out-of-pocket expenditure, respectively, to compute multi-dimensional inequity over these alternative outcomes. Each of these multi-dimensional concentration indices can be decomposed to determine the percent contribution of each determinant to overall composite inequity. The resulting analysis can be conducted separately for individual vaccines as well as over a coverage indicator for zero-dose or fully immunized. Finally, the VERSE toolkit permits the examination of equity-efficiency tradeoffs through the presentation of an equity-efficiency plane, which pairs the composite metric with a coverage-based or production function-based measure of efficiency to examine the relative performance of subnational geographic units on the dual goals of equity and efficiency.

Results: Results from the application of the VERSE methodology will be available in 2021 for several countries: Bangladesh, India, Nigeria, China, and Uganda.

Conclusions: Our work builds upon existing toolkits by providing a method for aggregation across multiple dimensions of inequity. It also allows policymakers to determine the relative magnitude of drivers of overall inequity in vaccine outcomes rather than simply the drivers of socio-economic inequity. Additionally, the toolkit expands the available outcomes for inequity analysis from coverage to include financing and health outcomes. This framework could be adapted to generate a composite health system equity metric to track equitable progress toward Universal Health Coverage beyond the vaccine space.

Distributional Benefit-Cost Analysis of Rotavirus Vaccine Coverage in Uganda

PRESENTER: **Rornald Muhumuza Kananura**, Makerere University School of Public Health
AUTHORS: Gatien de Broucker, Arinaitwe Emma Sam, Samantha Sack, Anthony Ssebagereka, Aloysius Mutebi, Elizabeth Ekirapa Kiracho, Bryan Patenaude

Background:

Diarrhea is the second leading cause of death among children under 5 years of age contributing to 8% of global all-cause mortality in 2017. Low cost treatment, such as oral rehydration solution and Zinc supplementation, is widely available at healthcare facilities and through community programs. Still, diarrhea is among the top four leading cause of morbidity among children under 5 years of age in Uganda. Past studies have shown that a majority (approximately 45-65%) of childhood diarrheal morbidity and mortality is caused by rotavirus, which is vaccine preventable. Initially planned for 2016, the rollout of the rotavirus vaccine by the Ministry of Health in Uganda started in 2018. The primary goal of this study is to estimate the economic and health impact of the rotavirus vaccine rollout in Uganda considering equity in health outcomes in one of the first distributional benefit-cost analyses conducted in field of global public health.

Methods:

This study is a Distributional Benefit-Cost Analysis (DBCA), building upon the methods laid out by Asaria, Griffin and Cookson for Distributional Cost-Effectiveness Analysis (DCEA). The DBCA will integrate a valuation of non-health costs inclusive of indirect costs: neither DCEA and Expanded Cost-Effectiveness Analysis (ECEA) incorporate non-health benefits (DCEA) or costs beyond out-of-pocket payments (ECEA).

We estimated the baseline health distribution and modeled changes attributable to the rotavirus vaccine with data drawn from modeling estimates of the Vaccine Impact Modeling Consortium. Data on the rotavirus vaccine rollout, including vaccine coverage, doses delivered, vaccine cost, and demographic information on the vaccine recipients come from UNEPI and the Ministry of Health of Uganda. Economic burden data for Uganda used for valuation come from the Decade of Vaccine Economic project with primary data collection conducted in 2017-18.

Results:

Treating an acute diarrhea case costed $7 and $15 (if it required hospitalization) in medical costs, of which 67-73% were covered by the government in public healthcare facilities. Including non-health costs, the societal economic cost of a case climbed to $14 and $53 (hospitalized). About 49% and 71% (hospitalized) of the economic cost were non-health costs. Additionally, we find that the economic burden of diarrhea disproportionately affects households in the poorest socioeconomic strata (SES): over 53% of households in the poorest wealth quintile experienced catastrophic health expenditures, compared to 31% of those in the wealthiest quintile. Further results on the distributional impact of rotavirus will be available in the first quarter of 2021.

Conclusions:

By including non-health and indirect costs in addition to monetizing the health outcomes, DBCA may provide better framework than cost-effectiveness analysis when the goal is to compare health investments with non-health investments. Such a perspective may be particularly relevant for ministries of finance in low- and lower-middle income countries. The ability to conduct DBCA will be integrated to the Vaccine Economic Research for Sustainability and Equity (VERSE) toolkit, developed by the authors, to allow policymakers to generate country-specific cost-benefit estimates and equity metrics, useful for budget-impact and return-on-investment analyses as well as tracking equitable progress toward Universal Health Coverage.

Historical Equity Analysis in Uganda Using the Living Standards Measurement Surveys

PRESENTER: **Gatien de Broucker**, Johns Hopkins Bloomberg School of Public Health
AUTHORS: Anthony Ssebagereka, Rornald Muhumuza Kananura, Aloysius Mutebi, Elizabeth Ekirapa Kiracho, Bryan Patenaude

Background:

Ugandans benefit from public health programs implemented to prevent cases and a government-funded healthcare system in place to ease the medical costs for those who get sick, albeit unequally. Equity in healthcare generally conceives that payments made for healthcare services are based on the ability to pay (affordable) and correspond with need. Since 2010, there were considerable public investments in new primary healthcare infrastructure and workforce, in immunization programs, and in strengthening the supply chain for medications and medical equipment to promote Universal Healthcare Coverage (UHC). This study examined the effects of those large public investments in promoting equitable access to healthcare and the distribution of costs among households.

Methods:

Generating five indicators from new and routinely collected data, the Vaccine Economics Research for Sustainability & Equity (VERSE) toolkit offers a multifaceted assessment of equity. Starting with the concentration index (Wagstaff and Erreygers), those indicators of inequality also include

the Slope Index of Inequality, the Relative Index of Inequality, the Absolute Equity Gap, and the Relative Equity Gap.

The Ugandan Bureau of Statistics (UBOS) conducts a recurrent and longstanding national panel survey, the Living Standards Measurement Survey (LSMS), featuring household-level data on demographics, socio-economic status, consumption, health and healthcare, amongst other topics. UBOS published the reports and their associated data in open access; they are used for policymaking and advocacy in health and social development. All data for this study are derived from the household-level data from the LSMS from 2005 to 2019.

Results:

High out-of-pocket payments, often ranging between 10-40% of a household's annual income, cause catastrophic health expenditures in a significant portion of the Ugandan population, thus deterring those in need from accessing health services. The poor are most vulnerable to catastrophic expenditures as such expenses have the potential to bring them deeper into poverty. Prior work on the LSMS to generate measures of equity exists: Kwesiga et al. generated measures of catastrophic health expenditures up to 2016 and concentration indices for the household's out-of-pocket payments in healthcare. Estimates for each indicator of inequity up to 2019 will be available in the first quarter of 2021.

Conclusions:

The present study will apply different quantitative approaches to equity over the different periods covered by the LSMS to build a historical perspective of equity in healthcare in Uganda. It is a country-specific application of the VERSE toolkit using existing open-access data and policymakers will be able to compute those indicators using other data inputs. Such indicators may act as a benchmark and be particularly relevant for ministries of health in low- and lower-middle-income countries to track equitable progress toward Universal Health Coverage.

12:15 PM –1:15 PM TUESDAY [Supply Of Health Services]

ORGANIZED SESSION: Pay for Performance for Health Care Providers

SESSION CHAIR: **Paula Lorgelly**, University College London

ORGANIZER: **Luigi Siciliani**, University of York

Allocation of Health Care Under Pay for Performance: Winners and Losers

PRESENTER: **Anne Sophie Oxholm**, University of Southern Denmark

Background: Many physicians receive a payment for their performance (P4P). This performance is often linked to a health target that triggers a bonus when met. For some patients the target is easily met, while others require a significant amount of care to reach the target (if ever). Evidence is limited and mixed on how P4P affects inequalities in health care. Many of the existing studies focus on geographical variation in care and suffer from weak evaluation designs.

Objectives: This study aims to investigate how P4P affects physicians' allocation of care across patients with different responsiveness to treatment compared to a fixed payment, such as capitation and salary. We also investigate the importance of the availability of resources for physicians' response to P4P.

Methods: We make use of an incentivised computer-based laboratory experiment with 143 medical students. The participants were asked to take on the role of a physician. We compare the participants' treatments under P4P with their corresponding treatments when there is no bonus for reaching the target but only a fixed payment (salary or capitation). We also compare their treatment behaviour when faced with different degrees of resource constraints, i.e. when varying both the number of patients to service and the number of available services.

Results: Our findings suggest that patients who otherwise receive treatment below the performance target, but who have a potential to reach it, gain care under P4P. On the other hand, patients who do not have the potential to receive enough treatment to reach the target, receive less care under P4P. This redistribution of care arises when physicians are resource constrained and thereby forced to trade-off care between their patients. Interestingly, we also find unintended consequences of P4P when physicians are resource abundant. We find that physicians reduce care to patients who otherwise receive treatment above the performance target, even though the foregone care does not help other patients reach the target. Thus, in this case it is not a financial incentive driving physicians' behaviour, but potentially a consideration that care is less valuable above the performance target.

Discussion: Our findings have important policy implications. Currently, physicians operate under tight resource constraints in many health care systems. Under such market conditions, P4P may lead to underserving of patients who are unable to reach the performance target. If policymakers introduce P4P, they should therefore consider risk-adjusting the performance target such that it is possible for all patient types to reach the target. We also find unintended consequences of P4P when physicians are resource abundant. Under such market conditions, less health improving care may be provided to patients otherwise performing above target. Thus, the payers risk paying more for less care to these patients. To solve this issue, policymakers may consider risk-adjusting the performance target such that the requirements are raised for these high-performing patients.

Can Financial Incentives Shift Health Care from an Inpatient to an Outpatient Setting?

PRESENTER: **Katja Grasic**, University of York

Background This study investigates the effects of a financial incentive scheme that encourages the shift from a high-cost to a low-cost hospital setting. Specifically, we examine the effect of the Best Practice Tariff (BPT) for outpatient activity that rewards providers for treating patients in an office-based outpatient setting, rather than a theatre-based inpatient setting. The scheme, introduced across English hospitals in 2012, focuses on three treatments, of which two are high-volume diagnostic procedures (diagnostic cystoscopy, diagnostic hyteroscopy) and the third is a form of sterilisation for women (hysteroscopic sterilisation). The scheme operates by increasing the price paid for the office-based outpatient procedure and, in the case of two diagnostic procedures, by also lowering the price paid for the procedures performed in the inpatient setting.

Objectives We study the effect of the financial scheme on the probability of having the procedure performed in the outpatient setting. Additionally, we study secondary outcomes: health benefit, measured as the probability of having a repeat procedure within 60/90 days, patient volume and waiting time. We further study unintended consequences of the scheme, by analysing the effect of the policy on procedures that are very closely related to those incentivised, but do not attract additional bonus when performed in outpatient setting.

Data and Methods We use Hospital Episode Statistics (HES) Outpatient and Inpatient datasets for the period 2009/10 -2015/16. We employ difference-in-difference patient-level analysis in which we compare the changes in the probability of patients being treated in an outpatient setting (and the secondary outcomes) for the incentivised conditions relative to the selected control conditions. Control groups were selected based on their comparability for treatment in both inpatient and outpatient settings, trends in the main outcome in the pre-policy period (required for the parallel assumption to hold) and their clinical relevance.

Results Our results show that a targeted incentive scheme can result in a swift and substantial change in the choice of the treatment setting. We find a positive and significant effect of the policy on the probability to have the procedure performed in the outpatient setting for all three incentivised conditions, with the largest effect observed for cystoscopy and hysteroscopy (35.0 percentage points (pp) and 16.4 pp, respectively). The observed policy effect is smaller for sterilisation (3.7 pp). We do not observe a strong effect of the BPT policy on total volume of the incentivised procedures, nor on the inpatient waiting time for the procedure. Our results show a positive, but statistically insignificant increase in the probability to have the procedure repeated within 60/90 days for hysteroscopy, while no increase was observed for other conditions. We further show that the policy had a positive and significant effect on shifting the setting for closely related, but non-incentivised conditions.

Discussion Our study shows that a financial incentive can be successful in shifting patients from inpatient to outpatient setting, without evidenced negative consequences. This gives policy makers a strong tool to increase healthcare efficiency and reduce costs.

Financial Incentives to Improve Hospital Performance: Reducing in-Hospital Waiting Times for Coronary Bypass in England

PRESENTER: **Søren Rud Kristensen**, University of Southern Denmark, Danish Centre for Health Economics

Background: Pay for performance (P4P) aims at improving quality and efficiency in the health sector. National P4P schemes can be limited in their ability to address outcomes that are relevant for all targeted providers. The Prescribed Specialised Services Commissioning for Quality and Innovation (PSS CQUIN) scheme in the English National Health Service is an example of a scheme that aims to address this limitation by letting hospitals influence the set of incentives they face. We study a PSS CQUIN scheme that was introduced to ensure that semi-urgent patients admitted to hospitals or referred for a coronary artery bypass grafting received surgery within seven days of referral, therefore reducing their in-hospital waiting time.

Objectives: We evaluate the scheme on the primary outcome of receiving surgery within seven days of referral or admission, and secondary outcomes that may also be affected by the scheme: patients' total length of stay, mortality within 30 and 365 days, and the probability of experiencing a patient safety incidence.

Methods: We employ difference-in-differences models to estimate the impact of the scheme using patient level data from English Hospital Episodes Statistics in 2014/15-2017/18. Our treatment group comprises 12 hospitals that adopted the scheme. We use 16 eligible hospitals that did not take up the scheme as our control group. To demonstrate the robustness of our results we repeat the analysis using a sample limited to patients from a group of providers identified using propensity score matching on a separate sample of hospital characteristics (foundation trust status, teaching status, market forces factor, hospital size, geographical location and proportion of doctors).

Results: The incentive scheme was not effective in achieving its intended objective. Compared to patients treated at non-incentivised hospitals, in the period after incentives were introduced, patients treated at incentivised hospitals were only marginally more likely to receive surgery within seven days from angiogram or transfer (0.4 percentage points) and the difference was not statistically significant. The total length of stay for CABG patients in the period after incentives was marginally lower (7%) at incentivised hospitals compared to non-incentived hospitals after incentives were introduced and the effect was statistically significant at a 5% level. However, the difference in performance between incentivised and non-incentivised hospitals was observed already before the incentive scheme was launched. Additional analyses suggest that the difference was not due to an anticipation effect, as the difference occurred before the scheme was announced. Instead, our analyses suggest that hospitals taking up the scheme were those already focused on improving the incentivised outcome. There was no statistically significant difference in mortality or the probability of being exposed to a patient safety incidence in the period after incentives were introduced.

Conclusion: Our findings point to a difficulty in designing performance incentives adaptable to local needs. In doing so, payers risk paying providers for efforts that were already underway and would have likely materialised without the scheme. We suggest that further research is necessary to develop incentive schemes that are flexible, yet effective in pursuing national goals.

Paying for Health Benefits Using Patient Reported Outcome Measures

PRESENTER: **Luigi Siciliani Sici**, University of York

Background. Payments to healthcare providers are often based on the number of patients they treat according to their particular health condition with well known limitations. Payment based on health outcomes, a form of pay-for-performance, has long been advocated as a possible solution.

Objective. This study adopts a contract theory approach to determine the appropriate size of the bonus, and therefore to inform practical implementation of pay-for-performance schemes that reward health outcomes.

Methods. The study has two main components. First, it provides a simple but general model for the design of an incentive scheme that rewards health gains, as a function of key parameters related to patient health benefits and provider costs. We adopt a positive economics perspective where the purchaser specifies a bonus to achieve an objective or target based on the observed empirical distribution across providers (e.g. increasing health again by one standard deviation or to the level of health in the top quartile or quintile of the health distribution). Second, the model is calibrated based on data from two elective procedures, hip and knee replacement, for which PROMs data have been collected to illustrate the applicability of the framework and to show the sensitivity of the size of the bonus to different assumptions on benefits and costs.

Results. We show that the optimal pricing rule suggests that the bonus should be set to reflect the difference between the provider's marginal cost of a health improvement before the policy intervention and the provider's marginal cost evaluated at the target health set by the purchaser. Using data from hip and knee replacement in England we calibrate the model for the average provider with respect to two key parameters, provider costs and post-operative health. We then compute the bonus payments that the purchaser would have to make to achieve target levels of post-operative health equivalent to improvements of one or two standard deviations of the health distribution observed across providers. To infer the shape of the cost function for the average provider, we make assumptions related to fixed and variable costs. In our calibration for hip replacement, we find that the price for one unit of health improvement as measured by the Oxford Hip Score to achieve an improvement of 1.13 OHS (equivalent to one standard deviation observed in the empirical distribution) ranges between £45 and £226 under different assumptions related to the cost function. For knee replacement, the price for one unit of health improvement as measured by the Oxford Knee Score to achieve an improvement of 1.06 OKS (equivalent to one standard deviation observed in the empirical distribution) ranges between £72 and £254 under different assumptions related to the cost function. The price doubles for a health target of two, rather than one, standard deviation improvement.

Conclusions. The study bridges the gap between economic theory and policy, and informs the design of P4P schemes where health is observable and measured accurately.

12:15 PM – 1:15 PM TUESDAY [Cross-Cutting Themes And Other Issues]

HEALTH PREFERENCE RESEARCH SIG SESSION: Stated Preferences Among the Public

MODERATOR: **Emma Frew**, University of Birmingham

Public Preference in Primary Care: A Systematic Review of Discrete Choice Experiments

PRESENTER: **Ka Keat Lim**, King's College London

AUTHORS: Audrey Lim, Xin Rou Teh, Sock Wen Ng, Su Miin Ong, Sheamini Sivasampu

Background: Primary care, being the public's first point of contact for health issues, is a vital component of the healthcare system. As countries reform their primary care to better address ageing population and rising prevalence of chronic conditions, it is important to consider public preferences so that any reform does not adversely affect the public uptake of primary care. While public preference in primary care has been examined in numerous discrete choice experiments (DCE), there has been little systematic effort to synthesize the findings.

Aim: To identify, to organize and to assess the strength of evidence of the attributes examined in DCEs of primary care.

Methods: We performed systematic searches in five bibliographic databases (PubMed, Embase, PsycINFO, Econlit and Scopus) from inception until 15 April 2021 for DCEs that examined public's or patients' preferences in primary care. DCEs published in English and conducted among the general population or the patients were included. DCEs that examined preferences on specific treatments, specific services or hospital outpatient clinics were excluded. Two reviewers independently screened papers for inclusion and assessed the quality of all included studies using the good research practice checklist by Bridges et al 2011. We categorized the attributes of primary care, based on the Primary Care Monitoring System (PC Monitor) framework, into three levels (structure, process, outcome) and their associated dimensions and features. We stratified the evidence levels for each attribute into strong, moderate, limited, conflicting or inconclusive based on study quality and consistency of findings (direction of association and statistical significance) across ≥75% studies.

Results: From 139 articles screened for full-text, 30 met the inclusion and exclusion criteria, most (80.0%) from high-income countries. They recruited 882.6±777.2 respondents (overall response rate 63.4±23.8%), of whom 41.5±9.4% were men. The DCEs examined preferences on minor acute (50.0%), non-specific / other (50.0%), major acute (16.7%) and chronic conditions (13.3%), using attributes identified through literature reviews (80.0%), qualitative studies (63.3%), analyses of policies (10.0%) and / or expert / investigators' opinions (10.0%). Of 55 unique attributes, process attributes dominated (34/55) outcome (16/55) and structure attributes (5/55), with waiting time for appointment topping the list. Less than half (20/55) of the unique attributes including waiting time for appointment, waiting time at the clinic and out-of-pocket cost had strong or moderate evidence of association with public uptake of primary care. Meanwhile, attributes with limited or inconclusive evidence included facility size, opening at lunchtime and attention to personal situation.

Conclusion: The higher number of process attributes potentially reflects more varied priorities in selecting process of care attributes, which are also more visible to the patients in primary care than outcome and structure attributes. Our study highlights a paucity of DCEs that examined preference in primary care among low- and middle-income countries or in the management of chronic conditions. In addressing these gaps, we recommend future DCEs to specify the types of visits and to define their attributes clearly, to ease the operationalization of their findings in policy decisions.

Is There Something Special about Rare Diseases? Examining Societal Preferences for Rare Diseases in a Priority Setting Context

PRESENTER: **Vivian Reckers-Droog**, Erasmus University Rotterdam
AUTHORS: Lucas Goossens, Job van Exel, Werner Brouwer

Objectives: Orphan drugs (i.e. drugs for patients with a rare disease) have become increasingly available after incentives provided by (supra) national regulations imposed some 20−30 years ago. Nonetheless, many orphan drugs are so expensive that they do not meet standard cost-effectiveness criteria for reimbursement from public funding. This raises the question whether orphan drugs should be exempted from these criteria, for example, because of their (often) limited budget impact. Currently, little is known about societal preferences in this context. The objective of this research was, therefore, to examine whether members of the public believe that orphan drugs should be reimbursed, knowing that similar, but non-orphan drugs are not reimbursed for patients with otherwise identical (disease) characteristics.

Methods: We conducted a discrete choice experiment (DCE) in a sample (n=1,100) representative of the general public in the Netherlands by age, sex, and education level (data collection completed in December 2020). We used a Bayesian D-efficient design with informed priors to design 40 choice tasks, divided into four blocks. We elicited respondents' preferences for reimbursing orphan drugs indicated for patients with different ages, levels of disease-related health loss, and treatment-related health gains (the latter two attributes operationalised in terms of quality of life and life expectancy (LE) without the drug), conditional on an increase in mandatory health-insurance premium. Within each block, respondents were assigned to one of two DCE versions with different wordings (version 1: "common" versus "rare" disease; version 2: "high" versus "low" budget impact) to assess whether preferences were related to the rarity of the disease per se or to the budget impact of the drug. After completing the choice tasks, we asked respondents to explain their preferences for reimbursing the orphan drug. We analysed the data using descriptive statistics and mixed-effects logistic regressions.

Results: Preliminary results indicate that 33% of respondents were consistently *in favour* of reimbursing the orphan drug, while 22% was consistently *against* reimbursing it, for example, because this would be "unfair to patients with a common disease". The remaining 45% had preferences that varied and depended on patient, disease, and drug characteristics. The latter group of respondents were more likely to favour reimbursing the orphan drug when it was indicated for patients aged >1 and <70 years old, with a short remaining LE without the drug, and a relatively large LE gain from the drug.

Conclusions: Our results suggest that members of the public generally prefer exempting orphan drugs from standard cost-effectiveness criteria for reimbursement. However, there is considerable heterogeneity and the preferences of many members of the public depend on the characteristics of the patients, disease, and type and size of the health gain. These findings may inform reimbursement decisions on orphan drugs and give insight into the circumstances in which exempting these drugs from cost-effectiveness criteria may have public support.

The Use of Composite Time Trade-Off and Discrete Choice Experiment Methods for the Valuation of Mental Well-Being As Measured By the Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS): A Think-Aloud Study

PRESENTER: **Mr. Hei Hang Edmund Yiu**, Warwick Medical School, The University of Warwick
AUTHORS: Hareth Al-Janabi, Stavros Petrou, John Buckell, Jason Madan, Sarah Stewart-Brown

Background

Concerns have been raised regarding the sensitivity of standard health-related quality of life tools for valuing mental health and well-being. The Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS) is popular in the public sector, widely validated and recommended by policy makers across the UK. Eliciting a preference-based valuation for the SWEMWBS could allow it to be used for cost-utility analyses of mental health and wellbeing interventions.

Objective

The aim of this study was to investigate the cognitive process of completing composite time trade-off (C-TTO) and discrete choice experiment (DCE) exercises in the valuation of the SWEMWBS to inform the optimisation of a valuation protocol.

Methods

Fourteen face-to-face cognitive interviews were conducted with a convenience sample in the UK using concurrent and retrospective think-aloud and verbal probing techniques. Each participant completed 8 C-TTO tasks and 8 DCE tasks generated from experimental designs. Participants were asked to think-aloud their feelings and thoughts during or after the completion of the valuation tasks within a computer assisted personal interview setting. Verbal information was subsequently transcribed verbatim. Axial coding was adopted to explore underlying relationships between open codes. Thematic analysis was used to identify themes within the verbal text.

Results

Whilst all participants found the valuation tasks generally manageable, six broad themes emerged. 1) Format and structure, which is about the design of appropriate practice examples across people from different backgrounds, explanations of instructions and presentation layout of the valuation platform. 2) Features of items and levels, including interactions across different combinations of levels of SWEMWBS items, modelling implications concerning the non-linear effects of levels, and the sign of non-monotonic valuation. 3) Decision strategy, which documented the shortcut to assist trade-off decisions including weighting the importance of items, availability, satisficing and framing heuristics, etc. Lexicographic ordering and preference heterogeneity phenomena were also observed. 4) Valuation feasibility, which investigated the completion burden in terms of imagination and quantification of mental well-being states, information processing, the role of incentives and the value of thinking aloud. 5) Valuation outcome, which analysed the quality of data collected. The nature of the responses was affected by participants' discriminatory ability across mental well-being states, their time trade-off decisions towards states, and their ability to choose between forced alternatives under each DCE pair. 6) Reflections on mental well-being. The positive feedback regarding the usefulness of these valuation tasks on reflecting personal preferences enhanced the feasibility and practicality of using techniques widely used for health state valuation for valuing mental well-being.

Conclusions

The interviews suggested valuation of SWEMWBS states was feasible and contributed insights regarding the robustness of the proposed methods. A modified protocol informed by the qualitative results will be tested in a larger sample across the UK. A preference-based mental well-being valuation set has the potential to enhance cost-utility based decision-making across the public sector.

Policy Evaluation for Older Adults

MODERATOR: **Sally Stearns**, The University of North Carolina at Chapel Hill

Trends in Differences across Subgroups of Adults in Preventive Services Utilization in the US

PRESENTER: **Dr. Salam Abdus**, US Agency for Healthcare Research and Quality

There were large differences across subgroups of adults in preventive services utilization before 2010. The Affordable Care Act (ACA) had numerous provisions aimed at increasing utilization as well as at reducing disparities. First, the ACA mandated that starting in September 2010, all non-grandfathered private insurance plans must cover recommended preventive services. Second, implemented in September 2010, the dependent coverage provision allowed individuals aged 26 or younger to be covered by their parents' private health insurance plans. Third, in 2014, many states expanded Medicaid, Marketplace enrollment began, and individual mandate took effect. Lastly, ACA funding for expanding Community Health Centers and for training of health care professionals may have affected health services utilization through impacting the supply of health care professionals and resources.

Many studies examined the effects of the ACA on disparities in preventive services. This study filled three critical knowledge gaps regarding the impact of the ACA on disparities in preventive service use. First, the ACA comprised a broad range of reforms, including some that took effect soon after its passage. This study took a broad approach to tracking disparities in preventive care so as to capture both the regulatory reforms implemented in 2010 and the coverage expansions implemented in 2014 (and in subsequent years in some states). Second, the analysis considered preventive services disparities across a wider range of socioeconomic characteristics than prior research, examining not only race/ethnicity and income, but also insurance coverage, Census region, and urbanicity. Third, this study examined preventive services utilization of adults within the intervals recommended by the United States Preventive Services Task Force, which, for some preventive services, were longer than a year.

This study examined the trends in preventive services utilization from 2008 to 2016, and the trends in the differences in utilization across population subgroups during this time period. In particular, trends in utilization of general checkups, blood cholesterol screening, mammogram, and colorectal cancer screening were compared across subgroups of adults aged 19 to 64 defined by race/ethnicity, insurance coverage, poverty status, Census region, and urbanicity. Data from the Medical Expenditure Panel Survey Household Component (MEPS HC) were used to examine service utilization before the passage of the ACA (2008/09), after the implementation of the preventive services mandate (2012/13), and after Medicaid expansions (2015/16). Multivariate logistic regression models of preventive services utilization were used to predict utilization for each subgroup of adults in each time period, and to examine how utilization across subgroups changed between 2008/09 and 2015/16.

Preliminary results show that there were modest increases in utilization between 2008/09 and 2015/16 for all preventive services except mammogram. For three out of four preventive services, some differences across Census regions narrowed. However, large gaps in utilization across income groups and between those with and without coverage persisted. Disparities across racial/ethnic groups in general checkup, and urban-rural differences in colorectal cancer screening persisted over time as well. Results from this study suggest that while some differences have narrowed, large gaps in preventive service utilization across population subgroups still remain.

Health Inequalities and the Progressivity of Old-Age Social Insurance Programs

PRESENTER: **Mr. Jeroen van der Vaart**, University of Groningen

AUTHOR: Dr. Raun Van Ooijen

Motivation: Socioeconomic inequalities in health and mortality have been rising over the last decades in many countries. Rising inequalities in health and mortality have important implications for the fairness and affordability of social insurance programs, particularly programs aimed at old-age. At the benefit level, higher incomes, who live longer than lower incomes, collect retirement benefits for a longer retirement period. Also, higher incomes tend to be healthier and require less long-term care (LTC) than lower incomes.

Objectives: We examine the redistribution of welfare in old-age social insurance programs. Furthermore, we investigate the mechanisms through which these socioeconomic inequalities redistribute welfare. We consider both redistribution of benefits due to inequalities in long-term care (LTC) needs and mortality and redistribution through progressive social security taxes and means-tested LTC co-payments.

Methods: We model consumption and saving behavior of singles and couples throughout the life-cycle. Households face uncertain labor income at working age and uncertain and heterogeneous health and mortality across socioeconomic groups implying precautionary savings to differ across these groups. In addition, we assume that households value giving bequests to their heirs, implying a potential saving motive for bequests. We carefully model the public LTC and pension system in the Netherlands. The Netherlands has a generous and comprehensive LTC system, including substantial means-tested co-payments for nursing home care. We estimate the parameters of the structural life cycle model using unique administrative data on income, wealth, LTC use and mortality from the Netherlands.

Results: Old-age insurance programs imply a strong redistribution of welfare due to socioeconomic inequalities in LTC needs and mortality. The welfare effect amounts to almost half a year of additional consumption for the income rich compared to those in the bottom lifetime income quartile. This is substantial given that long-term care and mortality risks occur late in life. The model also allows investigating the underlying mechanism of this welfare effect. A large part of the excess welfare gain for richer households is explained by their strong preferences for leaving bequests: the rich spend a shorter amount of time in LTC, implying less co-payments and a larger bequest upon death.

Improving Access to Care for Older Self-Employed in France. Are Social Subsidies a Game Changer?

PRESENTER: **Ms. Estelle Augé**

AUTHOR: Nicolas Sirven

Objectives. This study measured the causal impact of social subsidies on the access and the amount of ambulatory care consumed among working and retired self-employed, by evaluating the quasi-experimental setting of the PARI (*Programme d'actions pour une retraite indépendante*) program. This pro-active policy of targeting individuals at risk was implemented by the social security scheme for self-employed (RSI) in France in 2015, with the aim to improve the pathway of care and prevent loss of autonomy. It consisted of a complete analysis of the economic, social and health situation of its insured persons, craftsmen and merchants aged 60 to 79, and of proposing an individualized solution (composed of social subsidies) and coordinated by the various social and health actors. Our research extends the previous literature in two ways. First, this study complements the rapidly growing literature on self-employed workers health and healthcare in Europe. Second, we contribute to the literature on the determinants of care consumption, especially the under-studied area where the granting of a subsidy could materialize the income and price effect and leads to increase healthcare.

Methods. We used RSI's medico-administrative data and from panel models with individual and time fixed effects, a difference in differences approach was used to measure the causal impact of the PARI program in intention to treat. This was an experimental phase (2014-2016) during which 10 local RSI delegations volunteered to experiment it, the other 18 forming the control group, for a total of 28 local RSI delegations. The identification of the treatment effect consisted of comparing the change in trend in access to care (conditional logit) and amount of ambulatory care consumed (log linear model with correction of the re-transformation into euros by a scale factor) between local experimental agencies (treated group) and local non-experimental agencies (control group) before and after the introduction of the program in 2015. Robustness checks were performed to ensure the sensitivity of analytic approach.

Results. The results indicate that, in the short term, there was an improvement in the access to ambulatory care by treated populations, especially men, without effect on the amount of expenditures. The effects on access concern the use of care potentially related to loss of autonomy (prostheses, medical equipment and pharmacy).

Discussion. The PARI program is therefore proving to be a successful example among prevention strategies. The effects seem to be strong given the combination of (1) targeting strategy, (2) a proactive approach, and (3) an adapted offer. From a pragmatic point of view, the particularity of the

RSI was in its construction that allowed crossing data and skills from several fields (health and social), a strategic articulation for social protection in the implementation of an effective reform.

Inequities in Physician Use Among Older Adults in Canada: A Longitudinal Analysis

PRESENTER: **Mohammad Habibullah Pulok**, Dalhousie University

AUTHOR: Dr. Mohammad Hajizadeh

Introduction: Horizontal equity in health care (equal care for equal need irrespective of socioeconomic status) is one of the main policy goals of universal health care systems in many developed countries, including Canada. In fact, the two criteria of "universality" and "accessibility" in the Canada Health Act (1984) provide the basis for equitable utilization of health care services without any financial or other barriers. Previous cross-sectional studies demonstrate that wealthier Canadians use more health care services compared to their poorer counterparts despite their same level of need. This study, for the first time, provided longitudinal evidence on income-related inequities in physician use among older adults in Canada. Using the Canadian longitudinal National Population Health Survey (NPHS), this study examined trends in income-related inequities in the probability and intensity of general practitioner (GP) and specialist visits among the individuals aged 65+ years during period between 1998/99 and 2010/11.

Methods: The random effect probit and negative binomial models were fitted to predict the probability of visit and number of visits, respectively. The concentration index-based horizontal inequity (HI) approach was used to measure inequities in GP and specialist visits. The sensitivity of the HI estimates was assessed using Wagstaff's and Erreygers's methods. Additionally, the mobility index (MI) was employed to compare short-run and long-run estimates of inequities in physician visits. A decomposition method was employed to explain the contributing factors to the observed horizontal inequities in GP and specialist visits.

Results: We found significant pro-inequities in both the probability and the number of specialist visits. Inequity in the likelihood of a GP visit was slightly pro-rich. The observed pro-rich inequity in the number of GP visits was not statistically significant. We did not find any significant change in the extent of inequity in physician use over the study period. The results from the MI estimates suggest that the extent of long-run inequity for both probability and number of specialist visits were higher than the short-run estimates. This result implies that upwardly income mobile individuals contribute to inequity in specialist care utilization in the long run. Education was the most important contributor of inequity in specialist visits, while unobserved heterogeneity explained most of the pro-rich inequity in both types of GP visit. Sensitivity analyses revealed no change in the findings.

Conclusion: This study contributed to the Canadian and international literature on inequities in physician use among older adults by presenting robust empirical evidence from a longitudinal analysis. We demonstrated that richer Canadians with growing income over time were significantly more likely to visit a specialist compared to their poorer counterparts. Although physician services are free at the point of use, we found poorer older adults in Canada used less physician services than richer older adults for the same level of health care need. These results warrant further attention to improve health care use among poorer Canadian.

Keywords: Equity, health care, panel data, concentration index, mobility index, Canada.

1:45 PM –2:45 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Methodological Advances in Immunization Program Costing: Applied Examples from 4 Country Studies

SESSION CHAIR: **Ziad Mansour**, Connecting Research to Development

ORGANIZER: **Sarah Wood Pallas**, Centers for Disease Control and Prevention (CDC)

DISCUSSANT: **Mercy Mvundura**, PATH

Cost of Typhoid Conjugate Vaccination Campaign in Harare, Zimbabwe

PRESENTER: **Amos Petu**, World Health Organization

AUTHORS: Anna Hidle, Gwati Gwati, Nandini Sreenivasan, Marc Poncin, Portia Manangazira, Sarah Wood Pallas

Background: In 2019, the Zimbabwe Ministry of Health and Child Care (MOHCC) conducted the first mass vaccination campaign delivered to accessible points in schools and the community using typhoid conjugate vaccine (TCV) in Africa in response to a seasonal typhoid outbreak in Harare. The study objective was to estimate the campaign's financial and economic costs.

Methods: The retrospective cost analysis was conducted from two perspectives: provider and beneficiary. The campaign provider perspective analysis used an ingredients-based microcosting approach to estimate incremental financial (monetary outlays) and economic costs (monetary outlays plus the value of in-kind and donated resources) incurred by the organizations implementing the campaign (MOHCC, City of Harare, World Health Organization, UNICEF) inclusive of all funding sources. Data were collected for all levels and sites and analyzed by program activity and resource input, in total and per dose. The beneficiary perspective analysis estimated out-of-pocket expenditures and in-kind resources used by beneficiaries and their caregivers to seek and receive TCV vaccination during the campaign period, including beneficiary and caregiver time, any lost wages, transport costs, and any other costs. Data were collected as part of a post-campaign coverage survey of a sample of children aged 6 months to 15 years who reported being vaccinated with TCV (n=1,625). Costs were summarized by direct and indirect costs in total and per vaccinated beneficiary survey respondent and extrapolated to the target population in Harare using survey weights. Costs for both perspectives are presented in 2019 U.S. dollars (US $).

Results: From the campaign provider perspective, the total financial cost of the campaign was US $761,864 and the total economic cost was US $981,844. Using administrative coverage of 318,698 TCV doses administered during the campaign, the financial cost per dose was US $2.89 including vaccine and vaccination supplies (US $0.79 per dose without vaccine and vaccination supplies). The economic cost per dose was US $3.08 including vaccine and vaccination supplies (US $1.48 per dose without vaccine and vaccination supplies). From the beneficiary perspective, the mean weighted direct costs were US $0.02 per vaccinated beneficiary. A mean of 13 minutes per vaccinated beneficiary were reportedly spent by beneficiaries and their caregivers seeking vaccination and being vaccinated, with a base case mean weighted monetary value of time spent of US $0.04 per vaccinated beneficiary.

Conclusion: This study adds to the limited evidence on beneficiary costs to receive vaccination as well as delivery costs from the first TCV vaccination campaign in Africa. Beneficiary perspective costs were modest compared to campaign provider costs, reflecting the strategy of delivering vaccination at accessible points in schools and the community appropriate to the age cohorts targeted in this densely populated urban setting. Costs may be higher from both perspectives in other campaign settings (e.g., rural areas) and other age cohorts (e.g., vaccinated adults, who were not included in this beneficiary cost analysis). Given recurring seasonal typhoid outbreaks, the cost analysis results could help Zimbabwe plan and mobilize resources needed to implement future TCV vaccination campaigns and identify opportunities for budgeting efficiency.

Cost of Human Papillomavirus Vaccine Service Delivery in a Multi-Age Cohort, School Based Vaccination Program: Zimbabwe, Preliminary Results

PRESENTER: **Anna Hidle**, Washington State Department of Health

AUTHORS: Timothy Brennan, Julie Garon, Qian An, Anagha Loharikar, Portia Manangazira, Taiwo Abimbola

Abstract

Background: After a pilot project in 2014-15 Zimbabwe introduced the human papillomavirus (HPV) vaccine nationally in 2018 for girls aged 10–14 years through a primarily school-based vaccination campaign with two doses administered at 12-month intervals. In 2019, a first dose was

delivered to a new cohort of girls in grade 5 of girls age 10 years if out-of-school (OOS), along with a second dose to the 2018 multiple cohorts. Additional effort was made to identify and mobilize OOS girls by Village Health Workers (VHWs) in the community. Zimbabwe reported 1,569,905 doses of HPV vaccine administered during the 2018 and 2019 campaigns. This analysis evaluated the cost of Zimbabwe's national HPV vaccine introduction.

Methods: A retrospective, incremental, ingredients-based cost analysis from the provider perspective was conducted. Financial and economic cost data were collected at district and health facility levels using a two-stage cluster sampling approach and four cost dimensions: program activity, resource input, payer, and administrative level. Costs are presented in 2020 US$ in total and per dose.

Results: The total weighted costs for combined district and health facility administrative levels were US$ 828,731 (financial) and US$ 2,060,943 (economic). For service delivery, the total weighted cost per dose was US$ 0.16 (financial) and US$ 0.59 (economic). The program activities with the largest share of total weighted financial cost were training (37% of total) and service delivery (30%), while the largest shares of total weighted economic costs were service delivery (45%) and training (19%). Efforts by VHWs to reach OOS girls resulted in an additional US$ 2.99 in financial cost per dose and US$ 7.79 in economic cost per dose.

Conclusion: The service delivery cost per dose was lower than that documented in the pilot program cost analysis in Zimbabwe and studies elsewhere, reflecting a campaign delivery approach that spread fixed costs over a large vaccination cohort. The additional cost of reaching OOS girls with the HPV vaccine was documented for the first time in low- and middle-income countries which may provide information on potential costs for other countries.

Cost of Human Papillomavirus Vaccine Service Delivery in Single-Age Cohort, Routine-Based Vaccination Program in Senegal: Preliminary Results

PRESENTER: **Timothy Brennan**, CDC Foundation
AUTHORS: Anna Hidle, Ousseynou Badiane, Alassane Ndiaye, Aliou Diallo, Jerlie Loko Roka, Qian An, Reena Doshi, Anagha Loharikar, Taiwo Abimbola

Objective: Assess the cost of national introduction of Human Papillomavirus (HPV) vaccine in a single-age cohort of nine-year-old girls and evaluate the costs of routine HPV vaccination in Senegal.

Methods: The government of Senegal introduced the HPV vaccine nationally in 2018 using a routine delivery strategy with financial assistance from Gavi, the Vaccine Alliance. A retrospective, incremental, ingredients-based cost analysis was conducted from the provider perspective. HPV vaccination-related cost data were collected at all four administrative levels (national, regional, district, and health facility). At the national and regional levels, costs were collected from all involved units, while costs from the district and health facility levels were collected from a nationally representative sample of units. A multi-stage cluster sampling approach was used; districts were stratified by geographical status (urban, rural, or mixed) and selected using probability proportional to size sampling with volume of measles vaccine first dose delivered as the size variable. Within sampled districts (31/77 districts selected), a minimum of two health facilities were selected by simple random sampling (77/1518 health facilities selected). Financial costs were defined as monetary outlays from all organizations involved in HPV vaccine introduction and routine vaccination, while economic costs included financial costs plus opportunity costs, defined as the value of existing and in-kind or donated resources. Data were collected through an Excel-based cost questionnaire and deployed via the Open Data Kit (ODK) Collect application on Android-based tablets. Country-hired data collectors were trained to collect costs at both the district and health facility level. The cost questionnaire was organized by program activities (service delivery, planning, training, social mobilization, supervision and monitoring, cold chain, and other), with questions regarding resource input, payer, and administrative level embedded within each program activity section. Sampling weights were applied to costs at the district and health facility levels to estimate costs at these levels across all units in Senegal. Costs are presented in nominal year (2018-2020) U.S. dollars.

Results: The total weighted financial cost across all administrative levels (national, regional, district, and health facility) was US $ 848,963, excluding service delivery and vaccine and vaccination supplies program activities. By district, the median of total unweighted financial costs was US $ 4,188, and by health facility level, the median of total unweighted financial costs was US $ 27. Analysis for excluded program activities is in progress; presented results will include all program activities. Furthermore, the final analysis presented at the iHEA Congress will include the share of weighted financial costs for each program activity by administrative level and weighted unit costs by program activity, administrative level, and overall.

Conclusion: These results represent one of the first cost studies of national HPV vaccine introduction using routine delivery in a low- or middle-income Gavi-eligible country and the first study that is nationally representative at the district and health facility administrative levels. These results can support Senegal with budgeting for future vaccine introductions as well as inform other countries which plan to introduce HPV and other new vaccines at a national scale.

Engaging Local Leaders to Improve Vaccination Campaign Effectiveness in Lebanon: Cost and Cost-Effectiveness Analysis

PRESENTER: **Sarah Wood Pallas**, Centers for Disease Control and Prevention (CDC)
AUTHORS: Racha Said, Joseph Khachan, Maria Ghorayeb, Noha Farag, Ziad Mansour

Background: Improving vaccination campaign coverage to reach populations typically unreached by routine services is important for health equity and disease control. Engaging local government officials and civil society outside the health sector in vaccination campaigns or outreach could improve coverage. This study estimated costs and effectiveness of an intervention to engage local leaders in an inactivated poliovirus vaccine campaign in Lebanon.

Methods: Among municipalities with <80% oral poliovirus vaccine coverage, 64 were randomly selected and assigned 1:1 to the intervention or control group. In intervention municipalities, the program implementer, Connecting Research to Development (CRD), conducted a pre-campaign census of households with eligible children to be vaccinated and established Task Forces with health sector, local government, and civil society representatives. Task Forces were trained to conduct coordination meetings, microplanning, social mobilization, and supervision during the campaign. CRD engaged field workers who conducted a post-campaign monitoring (PCM) survey to estimate vaccination coverage in the 64 municipalities. Incremental intervention financial costs (monetary outlays) and economic costs (financial costs plus the monetized value of in-kind resources) from the program implementer's perspective were collected from CRD financial records, a staff time tracker, and Task Force member questionnaires. No vaccination campaign costs besides the intervention were included (assumed equivalent in intervention and control groups). The cost analysis timeframe was the intervention implementation period, December 2017-February 2019. Costs were converted to 2019 US dollars (1515 Lebanese pounds to US$1). Costs were categorized by program activity, resource input, and funding source, and calculated in total, per dose administered, and per dose per percentage point difference in coverage. In scenario analysis, costs were projected over three years (2019-21), assuming two additional similarly effective campaigns during this period and a 3% discount rate.

Results: PCM survey-estimated coverage in intervention municipalities was 87.5% compared to 71.0% in control municipalities. Intervention economic costs were $402,915 (financial costs: $84,845), with the largest shares for Task Force training (39%), microplanning (27%), and the pre-campaign census (22%). The intervention's economic cost per dose administered in intervention municipalities was $24.39 (financial cost: $5.14), and $1.48 per dose per percentage point difference in coverage between intervention and control municipalities. The three-year projected total economic costs were $646,130, or $13.04 per dose administered and $0.79 per dose per percentage point difference in coverage.

Conclusions: The intervention was effective in increasing coverage, suggesting the importance of engaging local leaders outside the health sector, particularly in settings with populations (e.g., Syrian refugees in Lebanon) that may be difficult for the health sector to reach. Financial costs were modest for initial investment activities that provide benefits over several years; most intervention costs were economic recurrent costs of in-kind time from health sector staff, local government officials, and civil society volunteers. Costs per dose administered and per dose per percentage point difference in coverage were lower when considering potential intervention benefits over future campaigns and were within the range estimated for

other coverage improvement initiatives in recent reviews. Future research should explore the intervention's effectiveness over time and in different settings.

1:45 PM –2:45 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

Equity and Evaluation Methods

MODERATOR: **Tracey Sach**, University of East Anglia

Incorporating Equity Concerns in Cost-Effectiveness Analyses: A Systematic Review of the Literature

PRESENTER: **Thomas Ward**, University of Exeter

AUTHORS: Anne Spencer, Antonieta Medina-Lara, Ruben E Mujica Mota

Introduction

Healthcare policies are predominantly evaluated based on their relative efficiency, where the health benefits of a policy are weighed against the costs of implementing that policy. An increasingly heterogeneous population and a treatment landscape that is moving further towards targeted medicine inherently have implications for health inequalities and healthcare inequities. Moreover, methods for assessing equity implications within economic evaluations are increasingly advocated within the published literature. The aim of this study is to review the methods available within Economics and Health Economics to incorporate equity within economic evaluation. We add to the literature by comparing the data requirements, methods and scope of each method and apply a traffic light system to assess their practical suitability for use in cost-effectiveness analysis and health technology assessment (HTA).

Methods

A systematic search of PubMed, Embase and EconLit was undertaken from database inception. The search was designed to identify methodological approaches employed to evaluate healthcare equity impacts in cost-effectiveness analyses of healthcare interventions. Eligibility criteria were developed based on the specific objectives of this review and previously published reviews. We summarise the methods and measures used to capture inequality or equity of health outcomes and resource use, including a summary of key method attributes and an overview of the range of health inequalities measured.

Results

A total of 46 studies informed the review. Equity evaluation methods could broadly be grouped into five categories: equity-based weighting (EBW) methods; extended cost-effectiveness analysis (ECEA); distributional cost-effectiveness analysis (DCEA); multi-criteria decision analysis (MCDA); and mathematical programming (MP). EBW methods and MP enable equity consideration within cost-effectiveness frameworks through adjustment to incremental cost-effectiveness ratios. In contrast, equity considerations are represented through financial risk protection outcomes in ECEA, social welfare functions or specific equity distribution measures in DCEA, and simple scoring or ranking systems in MCDA.

EBW methods, MCDA and aggregate DCEA require only aggregate cost and effectiveness data, whereas other methods, including conventional DCEA, require modification to the underlying cost-effectiveness model structure or parameters. Both EBW and MCDA approaches utilise information on societal preference for inequality aversion to weight cost-effectiveness outcomes based on their equity impact. Conventional DCEA requires input data conditioned on relevant equity strata, whilst aggregate DCEA requires estimates of the distribution of healthcare resource use from external data to approximate a policies distributional equity impact using aggregate outcomes. In contrast, ECEA relies on data relating health outcomes to household expenditure and the risk of 'catastrophic' expenditure or poverty. MP relies simply on specification of relevant equity constraints alongside a maximisation objective.

Discussion

We conclude that DCEA is likely the most parsimonious method for equity evaluation, providing consistent and comparable output across cost-effectiveness analyses, but relies on availability and analysis of data that is often not readily available. Importantly however, the choice of equity evaluation framework relies heavily on the specific equity objective. Within the context of HTA, an initial priority should be garnering societal preference for the equity concerns that inform such objectives; only then can serious discussion around the choice of evaluation framework begin.

Bridging the Gap: Aligning Economic Research with Disease Burden

PRESENTER: **Lauren Anh-Thy Do**, Tufts Medical Center

AUTHORS: Dan Ollendorf, Patricia G Synnott, Siyu Ma

I. Background

Both shifts in global burden of disease (GBD) and crises–such as the Covid-19 pandemic–can reshape health system priorities, signaling a need for context-sensitive and evidence-based policymaking. Cost-effectiveness analysis (CEA) is critical for identifying high-value interventions that address the world's most burdensome diseases. In this study, we examine whether the level of CEA evidence is proportionate to the burden associated with 21 major disease categories.

II. Methods

Cost per quality-adjusted life year (QALY) and cost per disability-adjusted-life-year (DALY) studies published from 2010-2019 were identified using the Tufts Medical Center CEA and Global Health CEA Registries. Disease burden was measured in DALYs, based on the Institute for Health Metrics and Evaluation's 2019 GBD study. Additionally, we identified a list of interventions deemed "essential" for universal health coverage by the Disease Control Priorities Network to examine the relationship between this listing and cost-effectiveness evidence.

We analyzed the relationship between literature volume and disease burden by examining the number of published CEA studies mapped to a GBD category against the corresponding disease burden using ordinary least squares linear regression. Graphical plots were organized by geographic region and income-level. Results located below the regression line but with relatively high burden indicated disease areas that were "under-studied" compared to expected study volume.

Additionally, we identified the number of CEAs per intervention on the essential list and categorized their base-case findings using four willingness-to-pay thresholds: i) cost-saving, ii) <1 times GDP per capita (1xGDP), iii) 1-3xGDP, or iv) not cost-effective (>3xGDP).

III. Results

Under-studied disease areas varied by region. For example, we identified only 3 and 4 mental/behavioral health studies in Latin America/Caribbean and North Africa/Middle East, respectively. For South Asia and Sub-Saharan Africa, neonatal disorders (e.g., preterm birth complications, encephalopathy) was the most under-studied with only 3 and 5 relevant CEA studies, respectively.

There were large research disparities between higher income countries (HICs) and low and middle income countries (LMICs). In fact, only 8.36% of the literature within the CEA Registry studied an LMIC. HIC CEA volume for mental/behavioral disorders was 100-fold higher, while LMIC study volume remained concentrated in HIV/AIDS and other communicable and neglected tropical diseases.

Regarding the list of 60 essential interventions, only 33 (55%) had any supporting CEA evidence, and only 21 had a decision context involving an LMIC. With the exception of 1 intervention, available CEA evidence revealed those 21 interventions to be cost-effective; two-thirds did not exceed the 1xGDP threshold, 14.3% did not exceed 1-3xGDP, and 14.3% were cost-saving.

IV. Conclusion

Our analysis highlights disease areas that require significant policy attention, as CEA is a critical prioritization tool for health spending. Research gaps for highly prevalent, lethal, or disabling diseases as well as interventions critical for universal health coverage may be stifling potential efficiency gains. Additionally, most CEA research output remains focused on high-income settings, even in the face of significantly growing disease burden elsewhere. These trends severely limit the ability of local health systems in LMICs to make evidence-informed decisions that prioritize high-value healthcare.

Developing a Checklist for the Quality Assessment of Cost-of-Illness (COI) Studies

PRESENTER: **Lena Schnitzler**, Maastricht University

AUTHORS: Silvia Evers, Louise Jackson, Aggie T. G. Paulus, Tracy Roberts

Objective: The aim of this paper was to develop a new consensus-based checklist that can help appraise the quality of COI studies. As part of the development process the authors explored (i) the tools used by researchers to appraise the quality of COI studies, and (ii) the criteria a tool (or checklist) should comprise in order to appraise COI studies.

Methods: First, a scoping review was conducted to explore the different quality appraisal tools used. Second, the criteria in the identified tools were assessed. Third, relevant criteria applicable to COI studies was synthesised to develop a 'new checklist' for the quality appraisal of COI studies. Fourth, expert qualitative interviews were conducted to seek feedback on the relevance and applicability of the 'new checklist'. Last, the 'new checklist' was finalised based on the consensus built through interviews. Experts interviewed included international health economists. The semi-structured, open-ended interviews were audio-recorded, transcribed and coded in NVivo. A Framework approach was used for analysis.

Results (preliminary): The scoping review found that researchers used various different checklists and guidelines, mainly intended for the assessment of full economic evaluations, in order to critically appraise the quality of COI studies (BMJ checklist, CHEC-list, CHEERS, Drummond Methods, Drummond 10-point checklist). The CHEC-list was used as part of the development process for a 'new checklist' for COI studies, resulting in a list of 15 criteria divided into three dimensions: study characteristics, methodology & cost analysis, and results & reporting. 21 experts from 12 different countries were interviewed (October 2020-April 2021) and provided their feedback on the 'new checklist'. The length of the interviews ranged between 45-75 minutes. The following themes were identified through the interviews: (i) Need for a quality appraisal tool, (ii) Format and criteria included, (iii) Role of scoring, (iv) Addressing subjectivity, and (v) Guidance requirements.

Next steps: Anticipated next steps include further discussing the interview findings, modifying and finalising the 'new checklist' based on interview findings; determining how to assess the criteria; and developing a guidance manual alongside the checklist.

Conclusions: -

The Economic Costs of Hemodialysis Treatment in the Management of Acute Kidney Injury in Rwanda

PRESENTER: **Dr. Tolulope Olufiranye OLUF**, Clinton Health Access Initiative (CHAI)

AUTHORS: Mr. Sukrit Chadha, Alexis Rulisa, Diana Kizza, Nurilign Ahmed, Cassandra Nemzoff, Eoghan Brady, Regis Hitimana

Background

Acute Kidney Injury (AKI) is a common problem in many health settings with an incidence rate of 0.3-1.9% in Africa.[i] In Rwanda, patients covered under the Community Based Health Insurance Scheme (CBHI) with AKI requiring dialysis can access up to 18 sessions over 6 weeks at any of the six major public hospitals and one private dialysis center.

The wide range in tariffs and hospital claims for Hemodialysis across providers suggests differential sourcing resources whose prices are not standardized, however neither the breakdown of cost nor the driver of the variability in cost are well understood. CBHI sustainability partly depends on the ability of the scheme to ensure value for money, for health services purchased. By costing the dialysis services from each facility, the CBHI scheme has better visibility on potential cost containment, cost savings and pooled procurement opportunities, which can inform investment decisions of the procurement and *tariff revisions*.

Methods:

Bottom-up costing approach was used to estimate costs over a period of 12 months dialysis treatment of AKI patients who received hemodialysis (HD). Retrospective hospital data was obtained from hospital records from four public tertiary care hospitals including University Teaching Hospital of Butare (CHUB), University Teaching Hospital of Kigali (CHUK), Rwanda Military Hospital (RMH) and King Faisal Hospital (KFH). Additional data were sourced from Fee-For-Service billing records and insurer claims system, and normative cost estimates were derived from iterative consultation on the care pathways with four Rwandan nephrologists. Key variables included input costs, patient volumes, conditions diagnosed and treated. This input-based costing approach included all dialysis-specific costs (direct) and overhead costs (indirect) related to provision of hemodialysis for AKI patients for both recurrent and fixed costs. Costs by category, unit cost per patient and average cost per patient session were computed and compared for the four facilities.

Results:

The sample consisted of 160 patients. RMH provides HD at the lowest cost per patient per session (RWF 108,030) out of which 76% (RWF 82,554) are recurrent costs of catheter, dialysis kit, lab cost, dialysis and non-dialysis consumables. Costs are highest at CHUK RWF 274,861, of which RWF 154,048 (56%) is recurrent, with the kits being the major cost driver. There is a high variability in costs with a standard deviation of RWF 63,048.

Lower costs at RMH are driven by procurement costs because of better sourcing agreements, higher number of sessions and, hence purchasing. Differences in procurement and administrative processes.

Conclusions:

The findings from this analysis are informing discussions to streamline procurement for these hospitals through the Rwandan Food and Drugs Authority (FDA). Such discussions have led to cost savings for certain dialysis products such as 'Nipro Dialysis powder A solution 5L.' More research into the high variability in costs is indicated to identify sources of inefficiency.

[i] D. Adu, P. Okyere, V. Boima, M. Matekole, and C. Osafo, "Community-acquired acute kidney injury in adults in Africa," *Clinical Nephrology*, vol. 86, pp. 48–52, 2016.

1:45 PM –2:45 PM TUESDAY [Specific Populations]

Issues in Child and Family Health Economics

MODERATOR: **Priya Bhagowalia**,

Catastrophic Health Expenditures, Poverty and Child Education Outcomes

PRESENTER: **Nadeem Ahmad**, JNU

AUTHOR: Dr. Priya Bhagowalia

Health shocks are an unpredictable state of disease or impairment that prevents people from functioning normally. Health shocks often lead to poverty in low- and middle-income countries which is manifested in high treatment costs, reduced labor supply, income loss, and assets depletion

and debt (Gertler and Gruber, 2002; Lindelow and Wagstaff, 2005; Wagstaff and Van Doorslaer, 2003; Xu *et al,* 2003; Russell, 2004).

India has a high burden of diseases accompanied with high treatment costs particularly for vulnerable sections (Dreze and Sen, 2013; Madan *et al,* 2015; Jackson *et al,* 2015). India's health system faces the challenge of combating communicable, maternal, neonatal, and nutritional diseases (CMNNDs) and non-communicable diseases (NCDs). Approximately 60% of health expenditures are borne by patients (NHSRC, 2019).

This paper examines the determinants of and magnitude and distribution of catastrophic out-of-pocket health expenditures to assess impact on impoverishment. We also study the inter-generational impact of parental health shocks on child education attainment and child's school and work activities.

We use the India Human Development Survey (2004–2005 and 2011–2012).) which is a nationally representative panel data. To address issues of endogeneity, we use child fixed effects regressions, which allow controlling for unobserved time-invariant characteristics of children and parent.

Our estimated headcount ratio reveals that at a 10% threshold expenditure, 31% of the households incurred catastrophic health expenditure (CHE) in 2004-05, and 34% in 2011-12. Out of pocket (OOP) health expenditures pushed 6.55% and 7.22% of households into poverty in 2004-05 and 2011-12 respectively indicating that the financial burden of health shock increased. More non-poor households were pushed into poverty but severity of poverty increased, suggesting that already poor households need more protection. The presence of children, elderly members in the households, treatment in private hospital, whether accompanied by other members during treatment significantly increased the probability of CHE and impoverishment

Results on the inter-generational impact of parental health shocks show that a child's probability to be enrolled in school decreases by 2% and years of schooling by 0.1 year. Both short-term and long-term education are affected by parental health. We find that there is an increase in children's likelihood of entering the labor force by 4% and number of days worked by 8 days. This effect is stronger for paternal health shock, compared to maternal health shocks and more pronounced for boys and children aged between 12 years to 18 years.

Our findings suggests that the financial burden due to health shocks is higher in the informal sector. The effect is larger for households facing hospitalization and disability from work due to major morbidity. We also highlight the long-term implications of health shocks in terms of their impact on child related outcomes, especially education. Given this background, it is important to help households cope with the health and financial burdens while ensuring that long term human capital investment is unaffected.

Child Health As a Predictor of Health and Socioeconomic Outcomes in Early and Later Adulthood: Findings from Canada Using the NLSCY-T1FF Linkage

PRESENTER: **Ms. Emmanuelle Arpin**, University of Toronto

AUTHORS: Claire de Oliveira, Arjumand Siddiqi, Audrey Laporte

The acquisition of stocks of skill and health in childhood is essential for contemporaneous and future outcomes (Heckman & Cunha, 2008). This suggests that health and achievement gaps observed in early and later adulthood may find their roots in childhood. Research in this area has largely focused on the effects of perinatal indicators, such as birth weight rather than health conditions in early childhood (Almond et al., 2005, 2005; Behrman & Rosenzweig, 2004; Conley et al., 2006), and only a handful of studies have been conducted in Canada (Contoyannis & Dooley, 2010; Currie et al., 2010; Oreopoulos et al., 2008), as data limitations have restricted investigations in this setting.

Our objective was two-fold: first, to investigate the relationship between health conditions in childhood (ages 4-11), and health and socioeconomic outcomes in early (age 18) and later adulthood (ages 25-33); and second, to examine the pathways through which health conditions in childhood affect health and socioeconomic outcomes in adulthood (i.e., does this occur by directly affecting health in adulthood, or indirectly by affecting educational attainment, which in turn affects health in adulthood).

We use the new data linkage between the National Longitudinal Survey of Children and Youth (NLSCY) and administrative tax data from the T1 Family File (NLSCY-T1FF) from Statistics Canada. The linkage allows researchers to follow a cohort of children (ages 0-11) from 1993 to 2015 (ages 23-33). Where the NLSCY includes rich longitudinal information on child development and family environment in childhood, the T1FF includes administrative tax data for each child in adulthood (e.g., T4 income, social assistance). Our main indicator of child health is the diagnosis of a chronic condition, physical or cognitive (e.g., asthma, epilepsy, ADHD). Contrary to a health endowment at birth, a health condition in childhood represents a *change* to the initial stock of health. The long-term outcomes are high school completion, health behaviours, income, employment and social assistance (>18). There may be unobserved factors between families such as genetic make-up that may influence the probability of having a childhood health condition, and subsequently bias estimates. To control for selection issues, we make use of sibling fixed effects. We fully exploit the longitudinal nature of the data to also examine the effect of health conditions in childhood on later outcomes at different points in time.

Results show that cognitive impairments in childhood negatively affect earnings in adulthood compared to physical impairments in both the pooled and family fixed effects models. Individuals who suffered from cognitive conditions report lower earnings and retain a lower probability of completing high school at 18. Pathway analyses suggest that health conditions in childhood carry an indirect effect on later outcomes through educational attainment. Overall, this research will contribute to the understanding of how health conditions in childhood may represent sources of socioeconomic and health inequalities in adulthood.

Reproductive Autonomy in Modern Family Planning Care: A Critical Assessment Using Data from 68 Low- and Middle-Income Countries

PRESENTER: **Ms. Liana Rosenkrantz Woskie**, The London School of Economics and Political Science

Background & Objectives: Improving women's autonomy is a key policy goal globally. Access to, and uptake of, modern family planning (mFP) services can facilitate autonomy through increased labor force participation, social mobility and economic freedom. However, the extent to which women are able to exercise reproductive autonomy in their choice of mFP care is not well understood and is often assumed in global accounting of reproductive care coverage. As we celebrate the recent conclusion of the Family Planning 2020 (FP2020) Agenda, we require a critical re-examination of progress focusing on women's ability to exercise free choice *within* mFP.

Methods: We use data from the Family Planning Estimation Tool compiling country data from the Demographic and Health Surveys (DHS), Performance Monitoring and Accountability 2020 (PMA2020) surveys, Multiple Indicator Cluster Surveys, and Reproductive Health Surveys. We examined progress on Family Planning 2020 using a subset of available variables from an reproductive autonomy framework developed by Senderowicz et al and the WHO Interagency Statement on Eliminating Forced, Coercive and Otherwise Involuntary Sterilization. We also look at methods available at the point of purchase and calculate a Herfindahl-Hirschman Index (HHI) of concentration to examine the distribution of mFP methods in use; an indirect measure of available choice. The study population was surveyed women across 68 low-and middle-income countries targeted by FP2020 between the ages of 15 and 49 years.

Results: We find that approximately 53 million women gained access to mFP in study countries between 2012 and 2019. However, of these women 10.1% reported they did not make the decision to use their current mFP method; the choice was made by someone else e.g. a spouse or healthcare worker. In almost every country, autonomous choice of mFP method was lower within the poorest wealth quintile. In addition, even if a decision was made autonomously, 39.7% of women lacked the information required for informed consent, such as: knowledge of alternative mFP methods or known side-effects of a given method. We observed wide between-country variation: 83.9% of women lacked this information in Pakistan, while only 27.3% did in Senegal. Method availability at the point of purchase was better, though this also varied significantly by country with an all-country mean of 75.7% (primary care facilities with 3 or more methods available) and a number of countries falling below 30%. Concentration of mFP methods ranged with HHI-scores from 1,768 in Bolivia (relatively low concentration) to 9,040 in DPR Korea (highly concentrated), where as many as 95.1% of women were using an IUD.

Conclusions: While the 1990s marked a shift towards women's empowerment and away from population control in mFP, an assessment of available data raises concern. Taken together these results suggest that the continued practice of centering mFP success on the volume of women

covered may mask issues of low autonomy and empowerment. This is of particular relevance given the renewed focus on mFP in the face of climate change, higher rates of compromised autonomy amongst poor women and the prominence of permanent mFP methods.

Inducing Labor: The Impact of Health Care Access on the Child Penalty

PRESENTER: **Elena Patel**, David Eccles School of Business, University of Utah

AUTHORS: Ithai Lurie, Shanthi Ramnath

It is well established that mothers face a labor market "child penalty'" compared to fathers through lower post-birth wages and labor force participation. Common reasons for these disparities include endogenous occupational choice and inter-generational preference transmissions (Angelov et al 2016, Kleven et al 2019). Yet, little is known about whether access to health care contributes to this gap. Pregnancy is a health shock that uniquely impacts mothers, including their labor supply choices and productivity. However, there is little heterogeneity in access to health care in the European context due to to the pervasiveness of government-sponsored universal health care. Health insurance, and therefore access to health care, is not guaranteed in the US---in fact nearly one-fifth of the US population was uninsured in 2010. This suggests that the US child penalty may be influenced by a set of factors that are not relevant for the European experience.

In this paper we study the impact of access to health care on the US child penalty by observing labor market outcomes in administrative tax data for a 1\% random sample of mothers giving birth between 2009 and 2017. We compare post-birth gendered-differences in labor supply outcomes to pre-birth differences using a differences-in-differences strategy to measure the US child penalty. We find that the child penalty in wage and self-employment is 6 percentage points and 1.1 percentage points, respectively.

Next, we estimate how access to health care influences the child penalty by exploiting variation in the health insurance rate created by the enactment of the Affordable Care Act (ACA). The ACA dramatically expanded health insurance coverage in the U.S.---by 2015 the uninsurance rate had dropped by 25\%. Using a combination of health survey data and tax data we show that insurance coverage rates similarly increased for mothers in the months surrounding birth. We use a triple-difference estimation strategy to compare the child penalty for births that occur before and after the ACA was enacted. We find that the child penalty for wage employment decreased by 2 percentage points for post-ACA births. Said differently, mothers are 2 percentage points more likely than fathers to work post-birth after the enactment of the ACA. The gap in self-employment also narrows; however, the change is due to a decrease in women's participation in self-employment relative to men.

Finally, we exploit geographic variation in access to health care that existed before the ACA to identify variation in the intensity of the ACA health care expansion. If increased relative labor force participation is driven by increased access to health care, then these impacts should be strongest in low-access areas prior to the ACA expansion. Consistent with this hypothesis, we find that areas with low health care access, those that stood the most to gain from the ACA, experienced larger increases in the relative employment of mothers, and therefore the largest reduction in the child penalty. These patterns suggest that improvements in maternal health due to better access to care led to declines in the child penalty.

1:45 PM –2:45 PM TUESDAY [Demand And Utilization Of Health Services]

Treatment Delays and Service Delivery Disruptions

MODERATOR: **Luís Sá**, University of Minho

A Disaster Waiting to Happen? Elective Waiting Times in the Face of Austerity and COVID-19 Lockdowns in England

PRESENTER: **Callum Brindley**, Erasmus School of Health Policy & Management

Title: A disaster waiting to happen? Elective waiting times in the face of austerity and COVID-19 lockdowns in England

Value added: Long waiting times for health care are an important policy concern in England that are likely to gain even more attention with historically large waiting lists and underperformance to meet targets exacerbated by the COVID-19 pandemic. The study investigates the relationship between health spending and waiting times for inpatient and outpatient elective specialist care in England between 2014 and 2019 (i.e. waiting time elasticities).

Methods: The study borrows from the theoretical framework of Martin and Smith (1999 and 2003) and estimates waiting time elasticity as a function of demand and supply determinants. The generalised model specification is represented formally as:

$$Ln(W_{it}) = B_0 + B_1.Ln(S_{it}) + B_2.Ln(X_{kit}) + B_3.Ln(M_{ji}) + B_4.(N_{ht}) + a_i + u_{it}$$

where W_{it} is a measure of waiting time in the i^{th} CCG (geographic unit) in time period t, S_{it} is a measure of spending, X_{kit} is a vector of k time-varying variables and M_{ji} is a vector of j time-constant variables and N_{ht} is a vector of h indicator variables reflecting time period fixed effects that are uniform across CCGs. The study's identification strategy makes uses of panel data and geographic heterogeneity to estimate the effect of spending on waiting time while accounting for endogeneity.

Data Sources: NHS England waiting list statistics, programme spending and budget allocations by clinical commissioning group (CCG) (geographic unit).

Results: The study found that waiting time elasticity for elective inpatient care is approximately -0.5 and statistically significant when estimated using panel data for all specialisations based on total spending from 2014-2019. We find that this effect is even larger for patients waiting longest. Waiting time elasticity for elective outpatient care, in contrast, does not have a clear sign. Disaggregated by major specialisation category, waiting time elasticity for elective inpatient care ranges from approximately -0.1 to -1.6 with larger uncertainty for certain specialisations.

Conclusions: Building on previous research that investigated the relationship between waiting times and various demand and supply determinants, this study is the first to analyse the causal effects of health spending in general. The study demonstrates that increasing resources to the NHS will noticeably decrease waiting times, which have instead been steadily increasing since 2010. This intuitive finding is particularly relevant and timely given constraints on health spending and additional pressures on the NHS associated with the COVID-19 pandemic. Considering other evidence that links waiting times to health outcomes as well as health inequalities, the findings of this study highlight the risks of current spending trends and provide a case for increased resources to the NHS.

Disrupted Service Delivery? The Impact of Conflict on Antenatal Care Quality in Kenya

PRESENTER: **Adanna Chukwuma**, World Bank Group

AUTHORS: Kerry L. Wong, Uche E. Ekhator-Mobayode

African countries facing conflict have higher levels of maternal mortality. Understanding the gaps in the utilization of high-quality maternal health care is essential to improving maternal survival in these states. Few studies have estimated the impact of conflict on the quality of health care. In this study, we estimated the impact of conflict on the quality of health care in Kenya, a country with multiple, overlapping conflicts, and significant maternal survival disparities. We drew on data on the observed quality of 553 antenatal care visits between January and April 2010. Process quality was measured as the percentage of elements of client-provider interactions performed in these visits. For structural quality, we measured the percentage of required components of equipment and infrastructure and the facility's management and supervision on the day of the visit. We spatially linked the analytical sample to conflict events from January to April 2010. We modeled the quality of antenatal care as a function of exposure to conflict using spatial difference-in-difference models. We found that antenatal care visits that occurred in facilities within 10,000 m of any conflict event in a high-conflict month received 18 to 21 percentage points fewer components of process quality on average and had a mean management and supervision score of 12.8 to 13.5 percentage points higher. There was no significant difference in the mean equipment and infrastructure score at the 5 percent level. Rural facilities drove the positive impact of conflict exposure on the quality of management and supervision. The quality of management and supervision, and equipment and infrastructure did not modify the impact of conflict on process

quality. Our study demonstrates the importance of designing maternal health policy based on the context-specific evidence on the mechanisms through which conflict affects health care. In Kenya, deterioration of equipment and infrastructure does not appear to be the primary mechanism through which conflict has affected antenatal care quality. Further research should focus on better understanding the determinants of the gaps in process quality in conflict-affected settings, including provider motivation, competence, and incentives.

Breast Cancer Diagnosis Delay and Patients' Time and Risk Preferences: A First Empirical Appraisal

PRESENTER: **Mr. Olivier Supplisson**, Hospinnomics (PSE/AP-HP)

AUTHORS: Antoine Marsaudon, Jean-Christophe Vergnaud, Rochaix Lise, Christine Le Clainche

In 2018, according to the International Agency for Research on Cancer, breast cancer accounted for 11.6% of new cancer cases worldwide and 6.6% of deaths. Diagnosis delay has been identified as a factor significantly influencing patient survival rates and generated a substantial amount of academic literature (see Unger-Saldana and Infante-Castaneda [2009]).

However, so far, the literature studying the link between the diagnostic delay and individual's covariates has mainly focused on sociodemographic variables, relationship networks, symptom perception, and emotional states. Meanwhile, a recent contribution (e.g. Goldzahl [2016]) studies the statistical relationship between time and risk preferences and breast cancer screening prediction, which is known to be a factor reducing diagnostic delay. Our paper aims at introducing such preferences in the literature by focusing directly on diagnostic delays.

Using an original sample (N=346) built through online surveys targeting women who were diagnosed with breast cancer in the 5 years before the survey, we study the statistical relationship between diagnosis delay and individuals' time and risk preferences.

We test this relationship using two sets of indicators for each type of preference. The first set uses self-reported preferences through Likert-scales. The second set uses indicators defined on questions involving choices based on hypothetical revenue-flows (consumption-saving choice and lottery choice).

Controlling for several sociodemographic, socioeconomic, medical, and emotional covariates, we use a probit model to estimate how preferences and personality traits are linked with having a diagnosis higher than 3 months. Indeed, previous literature concludes that women with delays of 3 months or more has 12% lower 5-year survival than those with shorter delays.

We do not find any link between the probability to have a diagnosis delay higher than three month and time discounting preference and personality traits. However, we do find a negative statistical significant link between risk tolerance and the probability to have a diagnosis delay higher than three months.

Our results might be of interest in the current context where health information on breast cancer screening programs does not affect mammography utilization. Interventions aiming at decreasing patient delay might address their thinking process. Framing messages challenging the formation of women's subjective risk perception might be effective strategies.

1:45 PM –2:45 PM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Incentives and Technology Nudges to Improve Health

MODERATOR: **Verity Watson**, University of Aberdeen

Contraceptive Use, Men's Involvement and Polygyny: Experimental Evidence from Burkina Faso

PRESENTER: **Aurelia Lepine**, University College London

AUTHORS: Ben d'Exelle, Richard Bakyono, Ludovic Tapsoba

Background: The husband's influence on the use of modern contraception has been widely studied in monogamous households, but little evidence exists on the husband's influence in polygynous households. This is an important knowledge gap, as more than half of the women live in polygynous unions in several West African countries.

Method: we use a field experiment with a sample of 1,074 couples, stratified between monogamous and polygynous couples in Burkina Faso. In the experiment, we distribute a voucher that gives access to a free family planning service and a modern contraceptive supplied by existing health facilities. We experimentally vary the husband's involvement by randomizing whether the woman in private ('woman treatment') or the husband with the woman being present ('couple treatment') receives the voucher. We investigate the effect of receiving the voucher in private on the probability to redeem the voucher and compare treatment effects between monogamous and polygamous couples. Six months later, we collect data on direct effects of the intervention on pregnancy of the voucher recipient and of her co-wives and on unintended consequences (intimate partner violence).

Results: First, we find that the proportion who redeemed the voucher was only 9.31%. However, the uptake of the family vouchers was significantly greater for the 'woman treatment' than for the 'couple treatment' among monogamous unions, however we did not observe any difference in voucher uptake between the women and couple treatment in polygynous unions. However, further analysis showed a positive effect of involving the husband on the use of the voucher when there was rivalry among co-wives. When testing different potential causes for this effect, we observed a behavioural response in fertility from rival co-wives since wives who used the voucher and who were rival with their co-wives were more likely to have a co-wife who was pregnant at follow-up than rival co-wives who did not use the voucher. This result confirms the importance of co-wife's competition on fertility decision. Secondly, women in monogamous unions who receive the 'couple treatment' were less likely to choose a long-term contraceptive method while we found the opposite effect among polygynous households in which there was rivalry. Thirdly, our study highlights some unexpected effects of starting contraception without involving the husband. We find that women in monogamous households who received the voucher in private were more likely to be pregnant six months after receiving the voucher. In addition, they were more likely to report physical intimate partner violence.

Conclusion: The results are consistent with the fact that a policy aiming to increase access to contraceptive methods of women without involving the husband are likely to be ineffective when there is rivalry between co-wives and may have adverse impact on women's wellbeing in monogamous households. We conclude that family planning policies in rural Burkina should aim at reducing fertility preferences of men in monogamous unions and reduce rivalry between co-wives in polygamous households.

Stronger Together: Experimental Evidence on the Effects of Group Incentives for Preventive Health Services

PRESENTER: **Mylene Lagarde**, LSE

AUTHOR: Carlos Riumallo Herl

In low- and middle-income countries, many people continue to die from diseases that have cost-effective treatments because of failures to use preventive services and products. Since many individuals undervalue the benefits of prevention, especially when diseases remain asymptomatic, as is the case for cardio-vascular diseases (CVD), one solution is to offer small financial rewards to individuals for taking up preventive health services. Although there is a growing recognition of the power of social effects to help counter individual biases, team incentives have rarely been used outside firms, despite the widespread prevalence of organised groups in communities throughout the developing world.

We partnered with a micro-finance organisation in El Salvador and designed a cluster-randomised trial to test the effects of equivalent financial rewards provided to teams or individuals for attending a free health check-up for the prevention of cardio-vascular diseases. We enrolled 400 groups of 3-6 individual members jointly liable for the repayment of a micro-credit, and randomly allocated them to no incentive, group or individual incentives. We additionally split each incentive group to test whether there are heterogeneous effects for small rewards compared to equivalent lotteries for large rewards. Throughout all incentive treatments, the (expected) value of the incentive was USD5. We used administrative data to track the uptake of the preventive visit, and conducted a follow-up survey to check the effects of attending the check-up on a range of outcomes.

Against a low uptake in the control group of about 15.5%, we find that incentives increase the demand for free preventive services by up to 23 percentage points, and that group incentives are equally or more effective than individual incentives. 37.2% of individuals complete the medical check-up when they receive a reward immediately after, against 36% of members of groups who only get paid when all members have come to the clinic. When incentives consist of lotteries, group incentives perform much better: they attract 38.2% of individuals to the clinic, against 27.5% for individual lotteries. Using follow-up data, we find no effect of the preventive check-up on perceived CVD risk or adherence to treatment, but a small positive effect on health investment. Since group incentives were only paid if all members attended the clinic, they are more cost-effective than individual ones, at USD3.30-3.60 per completed visit. Overall, our results suggest that leveraging the power of existing social networks may present a new avenue for designing more cost-effective financial incentives in low- and middle-income countries.

Changes in Local Health Supply from Conditional Cash Transfer-Driven Demand: A Local Economy Externality of Colombia's Familias En Acción

PRESENTER: **Ana Correa**

AUTHORS: Neha Batura, Lara Goscè, Jolene Skordis

Introduction and background

Familias en Acción (FA) is a conditional cash transfer (CCT) programme implemented in Colombia in 2000. Eligible families receive a bimonthly stipend if they ensure children aged 0-6 attend regular health checks, and children aged 7-18 attend school (Acción Social, 2010). The impact of this programme on beneficiaries has been evaluated, most notably by Attanasio et al. (2005). However, the externalities of the programme on non-beneficiaries remain under-researched. Benson (2012) explored whether the education supply had adjusted in response to the increased demand for education from beneficiaries of FA. She found education-related local economy externalities, with mixed directions. Health-related local economy externalities of CCTs have not been studied to date. This paper aims to evaluate changes in local health supply as a result of an increase in the proportion of FA beneficiaries.

Methods

We used data from the Biannual Investment Plan (BIP) dataset, provided by the Colombian Ministry of Health (Ministerio de Salud, 2019). This dataset collates investment requests from hospitals, clinics, and health centres in Colombia, for the period between 2007-2019. No health infrastructure investment can occur unless it has been proposed within the BIP, making it a good proxy measure of local changes on health supply. The total monetary amount of investment requests by municipality by year is the dependent variable.

The proportion of FA beneficiaries in each municipality, lagged by 2 years, is the explanatory variable. Our hypothesis is that the larger the proportion of FA beneficiaries, the more demand pressures on local health infrastructure, leading to larger investment requests. We used a mixed effects model, controlling for municipality-level characteristics. The analysis was conducted by operational phases of the programme: Phase 1 (2000-2006), Phase 2 (2007-2011), and Phase 3 (2012-present) (Urrutia and Robles Báez, 2018).

Results and discussion

The proportion of FA beneficiaries was only statistically significant in Phase 2. The results for Phase 2 showed that for every additional 1 percentage point of the population that was a FA beneficiary, investment requests increased by 339.35%. Other significant explanatory variables included population size, being a rural (decreased investment) or urban (increased investment) municipality, and GDP per capita of the municipality. The model only explained 10% of the variation in investment requests.

Phase 2 saw the expansion of the programme to urban areas with high GDP per capita, but with a large proportion of their population living in poverty and with uneven access to health services (Urrutia and Robles Báez, 2018). Rich urban municipalities have a larger capacity to absorb increased demand and have many complementarities that can benefit health infrastructure (WHO, 2016). Increased demand from CCT beneficiaries in urban areas is more likely to result in higher investment in health supply. This investment would benefit not just the CCT beneficiaries, but the entire community, alleviating health inequities. A CCT programme like FA can address the vast health inequities in urban settings, through its local economy externalities affecting health supply.

1:45 PM –2:45 PM TUESDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: Using Qualitative Approaches to Better Understand the Impact of Life-Course Stage on Measuring Capabilities for Economic Evaluation

SESSION CHAIR: **Paul Mitchell**, University of Bristol

ORGANIZER: **Joanna Coast**, University of Bristol

DISCUSSANT: **Giulia Greco**, School of Economics, Makerere University

Paper 1: Is It Enough to Measure Capability Wellbeing for Children and Young People? An Exploratory Analysis Using Constant Comparative Approaches

PRESENTER: **Samantha Husbands**, University of Bristol

AUTHORS: Paul Mitchell, Philip Kinghorn, Sarah Byford, Cara Bailey, Paul Anand, Tim Peters, Isabella Floredin, Joanna Coast

Measuring the quality of life of children and young people for the purposes of economic evaluation has typically been focused on measuring current wellbeing. However, focusing only on wellbeing ignores the importance of opportunities for future development (i.e. well-becoming), and does not take account of any future aspirations that children and young people might have. The capability approach provides an evaluative space in which broader aspects of wellbeing can be considered in funding decisions, including the opportunity to develop future capabilities. This study uses qualitative methods and analysis to explore whether factors related to future well-becoming appear to be important to the capabilities of children and young people, drawing on the perspectives of both children and young people themselves, and those with parental responsibility for the children and young people.

In-depth qualitative interviews were undertaken to explore the aspects considered important to the quality of life of children and young people aged 6 to 15 years. Children and young people were involved directly in data collection (using an innovative hierarchical mapping task as a basis to generate discussion), in addition to their parents/guardians. Qualitative data were initially coded according to whether aspects identified as important focused on current wellbeing or future well-becoming and a constant comparative analysis was undertaken to compare the themes emerging as important to quality of life, both now and in the future.

Thirty-eight individual interviews with children and young people and their parents/guardians were analysed. Most topics discussed by participants focused on current capability wellbeing, including attachment to others, emotional security, and achievement. However, future aspirations and items related to well-becoming were also talked about. Much of what the children and young people considered important for their future focused on educational attainment, however, for many of these participants, educational achievement was seen as a vehicle for future stability and security, and would facilitate the freedom to make choices in relation to their future careers and lifestyles. Parents also discussed educational achievement and its link to future security, and in addition mentioned the importance of their children being physically safe and healthy – with some encouraging healthy behaviours now to be continued into the future. Parents also discussed the importance of their children being able to develop their own identities through engaging in current and future hobbies and interests and mentioned the need for children to develop social skills to facilitate future relationships with others.

The results of this qualitative analysis indicate that 1) the future capabilities of children and young people are important to them now, and 2) that the development of capabilities now can be important to achieving future aspirations. This suggests that it might be important to go beyond

measuring only capability wellbeing for children and young people in economic evaluation and also include the measurement of capabilities that will facilitate future well-becoming.

Paper 2: Exploring Capability Wellbeing in Young People Expected to Live a Shorter Life, Using a Constant Comparative Approach

PRESENTER: **Isabella Floredin**, University of Bristol

AUTHORS: Samantha Husbands, Susan Neilson, Paul Mitchell, Joanna Coast

An outcome measure for children and young people who are near the end of their life has not yet been developed for use in economic evaluation. Existing child measures of health-related quality of life can be used with children and young people at the end of life (EoL); for children and young people, these may include those with both life-limiting and life-threatening conditions. It is acknowledged, however, that these measures were not designed, developed or validated for specific use in EoL populations. Health measures used with children and young people at the EoL may fail to capture what is important to this specific population in this context. The use of adult EoL measures with children and young people is also likely to be inappropriate. Whilst such adult measures may capture the end of life period, they may fail to capture what is important at this time for young people; the terminology used may also be age inappropriate for those children and young people who are completing the measure themselves.

The purpose of the research is to capture aspects of life that are important to young persons with life-threatening and life-limiting conditions, and to use this information to develop attributes for a measure of capability for young people who are near the end of their life. The capability approach of Amartya Sen has been argued to offer an alternative basis for measure development in economic evaluation at the EoL compared to standard measures used to generate quality adjusted life years (QALYs) that focus primarily on health functioning. This research will extend this application of the capability approach to EoL in children and young people.

Qualitative work using a constant comparative approach is currently being conducted with young people (14-18 years old) who are expected to live a shorter life, and parents/guardians of young people who are expected to live a shorter life, but who are unable to participate directly because of their condition. Prior to the conduct of the research, materials were shared with a 'Young Experts' involvement group, comprising young people who are living with a life-limiting or life-threatening condition. This provided feedback on the terminology used in the recruitment documents. Online interviews are now being conducted with young people and parent/guardians, with recruitment through a charitable UK organisation supporting families with children who are expected to live a shorter life. Findings from these interviews will be presented, in relation to what is considered important in the young person's life right now, how the young person thinks that what is important to them has changed since the diagnosis of their condition and how they think it may change going forward. Preliminary findings around the likely attributes of the capability wellbeing measure for children and young people at the end of life will be presented.

Paper 3: Selecting and Piloting Appropriate Tools for Capturing Outcomes Related to Adult Social Care in the UK

PRESENTER: **Philip Kinghorn**, University of Birmingham

AUTHORS: Sandhya Duggal, Robin Miller, Jerry Tew

In the UK, several non-health related outcome measures are recommended for use in economic evaluation of social care by the National Institute for Health and Care Excellence, including ICECAP measures. ICECAP-O was developed through in-depth qualitative work with older adults (aged 65 years and over), whereas ICECAP-A was developed for use with the general adult population (including those over 65). There is similarity in most attributes on ICECAP-A and ICECAP-O, although one notable difference is in relation to the role attribute on ICECAP-O and the achievement attribute on ICECAP-A, which reflect the concept of feeling valued versus a sense of aspiration and achievement, respectively.

Returns submitted by local authorities in England show that 71% of new requests for social care support were received from older adults (aged 65+). At the same time, spending on long-term services for working age adults is almost as high as that for older adults, possibly reflecting greater complexities of need amongst those in the younger age range. We have used ICECAP-O in several recent studies relating to adult social care, largely on the basis of a normative choice that the role attribute is likely to be better suited to the circumstances of people using social care services; certainly more so than a sense of adhering to a strict age cut-off.

A further complication is to present the relatively conceptual/abstract attributes and attribute levels in a format that is widely accessible, given that samples of people in receipt of social care services will include highly vulnerable groups. We have developed an accessible version of ICECAP-O in which the tabulated text is replaced with a combination of a reduced volume of text, supported by pictorial elements.

Adults in receipt of social care services (above and below age 65) were asked to 'think-aloud' as they completed either the original version of ICECAP-O or the accessible version of the measure, during an interview conducted via Zoom. We then asked them to look at the formatting of the other version and specify which version they personally preferred. Participants were randomised as to which version of the questionnaire the saw first, in advance of the interview. Interviews were audio recorded and transcribed verbatim. From the transcripts, three raters identified the frequency of errors in comprehension, retrieval, judgement and response.

The sample included participants with significant physical and moderate cognitive impairments due to ill health. Error rates will be reported in the presentation. Interviews were held during an unprecedented period of pandemic and national 'lockdown' and participants frequently sought clarification as to whether they should report their quality of life at that moment (as per the instruction on the questionnaire) or interpret the question in terms of their pre-COVID19 quality of life. Qualitative analysis indicates that even when participants expressed a personal preference for the original version, they understood the need for measures to be accessible and had no objection to receiving the accessible version.

Paper 4: Exploring the Impact of the Life-Course on Potential Outcomes for Economic Evaluation Using a Narrative Approach

PRESENTER: **Joanna Coast**, University of Bristol

AUTHORS: Hareth Al-Janabi, Eileen Sutton, Paul Mitchell, Samantha Husbands

There is evidence that health state and happiness vary across different stages of life, but this is not the same as asking whether the components of wellbeing, that is, from a capability perspective, what is valued and what there is reason to value, differ as people move through different stages of life. Attribute development within the ICECAP capability wellbeing measures rests on discussion with informants about what is important to them in their lives. Attributes appear to differ across the life-course, with particular difference between the attributes of ICECAP-SCM (for adults at the end of life) and the other two adult measures, ICECAP-A (for adults) and ICECAP-O (for older people).

This work conducts further analysis of the ICECAP attribute development interviews, to explore the question of 'where do values come from'. It focuses on how different factors drive what is valued, and how this can inform thinking about the estimation of these values for economic analysis across the life-course:

Transcripts from interviews used to develop ICECAP-A (n=36, adults, including 8 older adults aged 65+) and ICECAP-SCM (n=23, including both the general population of older adults aged 65 plus and those receiving residential or palliative care) are included. These transcripts, particularly for ICECAP-A, contain strong narrative elements, with participants discussing the stories of their lives in depth. A narrative approach to analysis is therefore being employed, whilst still retaining the application of an economic lens to the analysis. This narrative approach draws on both the analysis of narratives and a narrative mode of analysis, concepts associated with Polkinghorne.

The analysis of narratives uses methods similar to those used in the generation of the ICECAP measures (generating codes and developing analytic accounts to synthesise the data), but incorporates both deductive and inductive elements. Deductive concepts are derived from theory and existing evidence related to three areas: (i) value formation based on sociological work exploring relationships between values and varying characteristics; (ii) capabilities as objects of ultimate values; and (iii) the life-course approach which relates values to context and social norms, as well as age

The narrative analysis is focusing on creating the stories of individual participants. The thematic thread (or plot) running through each story, being the account of how that informant reached their current set of values. Values are here interpreted as the things that a person has reason to value,

with individual stories focusing on transitions related to major 'shocks' and, particularly, changes in life stages. It explores how participants use autobiographical stories to express how they arrive at what they have reason to value in terms of their doings and beings in life.

The two sources of data will be combined to reach a deeper understanding of the factors that influence what a person has reason to value taking account of the different experiences that individuals have in their lives and the implications for economic analysis. Findings from the work and an exploration of the use of this method in a health economic context will both be presented.

1:45 PM –2:45 PM TUESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Are Public Facilities Set up to Respond to Strategic Purchasing Signals: Insights from East Africa

SESSION CHAIR: **Joseph Kutzin**, World Health Organization

ORGANIZER: **Nirmala Ravishankar**, ThinkWell

DISCUSSANT: **Moritz Piatti**, World Bank

Reforming Legal Frameworks to Enable Direct Facility Financing: Evidence from Tanzania

PRESENTER: **Gemini Mtei**, Abt Associates Inc.

AUTHOR: Sheila O'Dougherty

Background

Delivery of quality public health services especially at primary health care (PHC) level requires, among other things, facilities to have financial resources that can be used to procure high priority inputs to deliver services. Service providers also need autonomy and flexibility in decision making to use available resources. Public financial management (PFM) rules and regulations in most developing countries do not recognize frontline service providers as independent financial management entities with autonomy to manage revenue and expenditure. Instead national or sub-national governments typically have the mandate to procure inputs for service providers. Such arrangements lead to inefficiencies in service delivery as in most cases inputs that are procured are either insufficient or do not match population priority services.

Methodology

This paper describes PFM changes introduced in Tanzania to address this challenge and explores its impact on facility autonomy. It draws from a detailed review of government documents, routine monitoring data as well as a facility study conducted under USAID Public Sector Systems Strengthening (PS3) Activity.

Findings

Under Tanzania's "decentralization by devolution" system, the national government is responsible for policy formulation across sectors. The Local Government Authorities (LGA) are independent government entities that are responsible to implement national policies. Prior to 2016, health facilities were not recognized as spending entities by the country's PFM framework. Funds that collected by facilities were managed by LGAs, which were responsible for procuring all inputs for facilities. Some health facilities in regions or LGAs that were supported by development partners to implement a community health fund or a results-based financing scheme had facility bank accounts. However, even in these facilities there was no formal recognition of facilities as a spending entity. In 2017 the country adopted a nationwide Direct Facility Financing (DFF) reform whereby it was declared mandatory for every health facility to open a bank account as a condition to receive financing from the Health Sector Basket Fund (HSBF), a donor-supported pooled fund managed by Treasury. Core PFM systems for planning, budgeting (PlanRep) and financial management systems (FFARS) were extended to service providers by revising the Chart of Accounts to add facility provider codes for each service provider in the country. The DFF and the extension of core PFM systems to include service providers improved service providers visibility and autonomy to plan, budget and manage program implementation. The reform has improved predictability of funds, reduced stock-outs and enhanced accountability at health facilities, hence improving their responsiveness to community needs.

Conclusion

The introduction of the DFF modality represents a major revolution in the PFM system in Tanzania, which proved that it is possible to improve the alignment between sector financing and PFM rules and regulations with the purpose of improving strategic purchasing in the central Treasury budgetary system of the country.

Institutional Arrangements for Increasing Facility Autonomy and Their Effect on Performance: Insights from Kenya

PRESENTER: **Anne Musuva**, ThinkWell

AUTHORS: Angela Kairu, Stacey Orangi, Felix Murira, Boniface Mbuthia, Nirmala Ravishankar, Edwine Barasa

Introduction

When Kenya transitioned to a devolved system of government in 2013, newly formed county governments required all public hospitals, which generate considerable own-source revenue from user fees and insurance reimbursements, to remit the funds to the county treasury. In contrast, some counties transferred funds they received from the national government through earmarked conditional grants to primary health care (PHC) centers. In more recent years, counties have embarked on reforms to grant greater financial autonomy to public facilities. Against this backdrop, we undertook a study to explore the effect of facility autonomy on performance by comparing three counties: one with no facility autonomy (A), one with modest facility autonomy (B), and one with extensive facility autonomy (C).

Methods

This study used a mixed-method approach. In each of the three counties, one public hospital and two public health centers was purposively sampled. Data collection was done through in-depth interviews and by reviewing financial and performance data across the past three fiscal years. We interviewed representatives from government agencies, facility managers and public financial management (PFM) experts. We analyzed qualitive data in NVIVO and used Ms Excel for descriptive analysis of the quantitative data.

Findings

All three counties are in the process of establishing facility improvement funds (FIF) as a mechanism to earmark revenue generated by public facilities for healthcare delivery. The institutional arrangements under consideration vary across the counties. There remains ambiguity between key government institutions – specifically National Treasury, the Ministry of Health, and the Controller of Budget -- about the implications of the PFM Act for the flow of funds between facility accounts, the county revenue account, and the FIF. In county C, health facilities have been granted the authority through executive order to retain and spend the funds they collect from user fees and insurance reimbursements despite there not being supporting legislation. Facilities use the funds they collect to pay for commodities when there are stock outs, hire casual workers, and facility maintenance costs. In county A, both hospitals and primary healthcare facilities have limited facility autonomy. Only one hospital is set up to claim reimbursements from the national health insurer, and these funds accrue to the county. PHC facilities are meant to receive transfers from the county under conditional grants from the national government, but disbursements are unpredictable and infrequent. In county B, PHC facilities receive funds from the counties on a regular basis and may use them to address their immediate needs, but hospitals still lack autonomy. In both counties A and B, facilities lacking financial autonomy suffered from frequent stock-outs and delays in decision-making.

Conclusion

Ensuring that facilities have funds that they can use flexibly and account for them is critical for improving service delivery in the public sector in Kenya. This could be enabled through clear guidance from the national government about how counties can authorize facilities to retain and spend own-source revenue as well as more evidence about the pros and cons of different arrangements so counties can learn from each other.

Flow of Funds to the Frontlines: Insights from Uganda

PRESENTER: **Freddie Sengooba**

AUTHORS: Aloysius Ssennyonjo, Elizabeth Ekirapa Kiracho, Angellah Irene Nakyanzi, Tapley Jordanwood

Introduction: Decentralization in Uganda has taken a dynamic path since 1997, when the Local Government Act was passed to devolve decision-making powers and service delivery responsibilities to districts. Progressive reforms followed to channel more funds to the districts and strengthen subnational governance structures. The national government also introduced primary health care (PHC) grants that flow directly to health facilities, including public health centers and hospitals under the jurisdiction of local governments. In recent years, donors have funded results-based financing (RBF) programs whereby the national government channels additional payments to government-owned facilities based on outputs. Against this complex landscape, we undertook this study to map the flow of funds to the frontlines and explore the decision-making dynamics between local governments and health facilities to inform ongoing policy discussions around health financing reforms for making progress towards universal health coverage (UHC).

Methods: This study used a mixed-method approach, based on a survey of 8 districts. In each district, one public hospital, three public health centers and one private-not-for profit facility was purposively sampled. Data collection was done through in-depth interviews with district health officers, facility managers, and key policy makers at the center. Budget and expenditure data were collected from each district health office and health facility for the past two fiscal years. We analyzed qualitive data in NVIVO and used MS Excel for descriptive analyses.

Findings: Wage grants account for 79.2% of the funds allocated from the national government for PHC at the district level; while districts maintain the payroll for all public sector employees including health workers, the payments are managed directly from the national level. The remaining 20.8% of funds reflected in the district votes in the national budget are further divided into PHC grants for health facility and district health office operations and infrastructure maintenance. Public sector health facilities receive discretionary funds from two main sources: the non-wage PHC grants and RBF payments. While the direct funding is small compared to the in-kind transfers the facilities receive (i.e., health worker salaries and health commodities financed by the national government), they can exercise considerable control over these funds. They use it to pay for basic operating costs and commodities in the case of stock-outs. However, there is variation in how facility autonomy is interpreted and operationalized across districts. Most facilities and district officials interviewed expressed the need for increasing the allocation for the PHC grants, as well as strengthening expenditure reporting systems.

Conclusion: Uganda is actively discussing reforms for achieving UHC, including initiating a national health insurance scheme. Understanding the financial and decision-making nexus between local governments and health facilities, and refining financing and accountability structures for frontline health providers is critical for such reforms to have the intended effect of improving the delivery of priority PHC services. Key recommendations include giving districts greater autonomy over the allocation and management of facility PHC grants, providing the legal basis for facility autonomy, and increasing the funds available for discretionary spending at the local level.

1:45 PM –2:45 PM TUESDAY [Supply Of Health Services]

ORGANIZED SESSION: Healthcare Market Competition in Low and Middle Income Countries: Measurement, Outcomes and Policy

SESSION CHAIR: **Catherine Goodman**, LSHTM (London School of Hygiene and Tropical Medicine)

ORGANIZER: **Kara Hanson**, London School of Hygiene & Tropical Medicine

DISCUSSANT: **Soren Kristensen**, University of Southern Denmark; **George Gotsadze**, Curatio International Foundation

Concentration and Fragmentation in the Market for Healthcare Services in Georgia

PRESENTER: **Mari Tvaliashvili**, Curatio International Foundation

Background: The private sector is increasingly recognized as playing an important role in health systems in low- and middle-income countries (LMIC), yet policymakers struggle to identify the private sector's role in relation to their Universal Health Coverage (UHC) objectives. Developing policies for engaging with private health care providers requires a good understanding of how healthcare markets operate. Markets are described according to their market structure, ranging from highly competitive to highly concentrated. While excess concentration risks have long been recognized, the evidence is emerging from many LMICs about the potential risks to patients of excess fragmentation. This scenario is especially interesting in the Georgian context, as Georgia offers a striking case study of a highly privatized healthcare system in a LMIC, where for-profit providers are contracted and paid by a public single-payer, the Social Service Agency (SSA), that manages a pooled public fund. This paper aims to reveal Georgia's healthcare market's structure and nature: to what extent the market is characterized by fragmentation and concentration and the implications for UHC policy.

Methods: The analysis was carried out using the public SSA database that includes data on monthly patient utilization by service type of contracted service providers (n=595), for 2016, 2017 and 2018. We assessed horizontal concentration within two broad product markets – outpatient and inpatient care – with output measured in terms of treated cases. Measures of market concentration included the Herfindahl Hirschman Index (HHI), and the Concentration Ratio (CR) of the 3 and 5 largest firms, calculated for each health facility using a geographical market definition based on travel time isochrones. We also measure travel time to the 3rd nearest competitor.

Results: Analysis is currently being finalized. To provide a rich picture of market structure, we will present data on the distribution of each market concentration measure for each product market. In addition, we will assess variation in the concentration facilities face by business model (large networks, medium networks, independents), and by size of settlement (capital city, other big cities, small cities, smaller settlements). Sensitivity analysis will explore the impact of varying product market definitions, and isochrone size.

Conclusions: We will reflect on the methodological challenges of defining markets and measuring concentration, and the implications for similar analysis in other LMIC settings with limited data availability. The implications for UHC-related policies will be explored, including both the risks arising from market power, and the additional costs and risks to quality arising from fragmentation in some product markets.

Competition and Retail Markups for Antimalarials in Kenya & Uganda Under the Affordable Medicines Facility - Malaria

PRESENTER: **Sarah Tougher**, London School of Hygiene & Tropical Medicine

Background

There is increased interest in improving the quality of care in the private for-profit sector in low- and middle- income countries (LMICs). In the case of malaria, a large proportion of patients purchase antimalarial treatments from for-profit pharmacies and drug stores. However, the medicines obtained are often inappropriate because cheaper non-recommended treatments are widely available. Subsidies for artemisinin combination therapies (ACTs), the first-line treatment in most malaria-endemic countries, have been implemented in the private sector to improve coverage of ACTs. The largest initiative of this type was the Affordable Medicines Facility – malaria (AMFm), which was implemented at a national scale in seven countries from 2010-2013.

Methods

This study assessed the effect of competition on retail markups for subsidised and unsubsidised antimalarials among drug retailers in two of the countries that implemented AMFm: Kenya and Uganda. These countries were selected because AMFm implementation differed across the countries, particularly the promotion of and adherence to recommended retail prices. We examined two hypotheses: first, that competition would reduce retail markups for unsubsidised antimalarials (non-artemisinin therapies) in both countries; and second, that competition would reduce retail markups on subsidised antimalarials (quality-assured ACTs) in a setting with no promotion of recommended retail prices (Uganda), but not where there was good promotion and adherence to recommended retail prices (Kenya).

The analysis was based on nationally representative cross-sectional data comprising 1,672 drug retailers across the two study countries. Data are from a cluster census survey that enumerated all outlets with the potential to provide antimalarials. To describe the level of market concentration in the retail antimalarial market, we use the Hirschman-Herfindahl-Index (HHI) based on two administrative boundary market definitions. We examine the effect of competition on retail markups for subsidised and unsubsidised antimalarials using spatial, ie. distance-based, measures of competition. We controlled for a comprehensive set of product, outlet, and market characteristics, andused coefficient stability methods to examine the robustness of our results to unobservable selection.

Results

Using the HHI, we find highly concentrated markets in both urban and rural areas in both countries, but concentration is substantially higher in rural areas. Retail markups for unsubsidised antimalarials are higher in areas with less spatial competition in Uganda, supporting our first hypothesis in that country. However, results are sensitive to the measure of spatial competition used. In Kenya, there is no evidence that markups are higher in less competitive markets for either subsidised or unsubsidised antimalarials.

Conclusion

The results illustrate the heterogenous nature of for-profit healthcare markets in LMIC- settings and highlight the challenges of intervening in the sector. Interventions that seek to leverage competition may not be effective in rural areas where there are few providers. Conversely, interventions that require direct interaction with providers for delivery or supervision may be difficult to deliver at scale in urban areas due to the large number of providers.

Healthy Competition? Market Structure and the Quality of Clinical Care in Tanzania

PRESENTER: **Timothy Powell-Jackson**, London School Of Hygiene & Tropical Medicine

Introduction. The private healthcare sector in many low- and middle-income countries is rapidly expanding. Private sector advocates have long argued that market competition drives private providers to become more efficient and responsive to patients but empirical studies are limited to mostly high-income settings. We examine whether healthcare competition is associated with quality and prices in Tanzania, exploiting primary data on quality of clinical care from unannounced standardised patients that allow us to compare quality across providers without confounding due to patient case-mix.

Methods. Our sample covers 228 private for-profit and faith-based facilities. Using standardised patients, we compile rich data on history taking, examinations and diagnostic tests completed by the provider and the treatment given to the patient to generate process measures of quality of care. To complement these data, we measure compliance with infection prevention and control practices, patient experience of care, and price. Our empirical approach exploits the fact the faith-based facilities are more insulated from the pressure of market competition, while for-profit facilities rely on patient revenue for their survival. With data on the universe of facilities, we develop a geographical measure of competition, based on the density of competing facilities within 5 km of the study facilities.

Results. We find no evidence that competition is associated with better process quality of care in the full sample of health facilities, and this remains the case when we examine differences between for-profit and faith-based providers. There is a large positive association between competition and prices: compared to the zero competitors, prices are US$1.49 lower in facilities with one to five competitors, and US$2.85 lower in facilities with more than five competitors. This relationship is driven entirely by for-profit facilities.

Conclusion. The findings suggest that patients in areas with greater competition benefit from lower prices, without substantial deterioration in the quality of care. There is no evidence that market competition in such a setting is a potential driver of better quality of clinical care.

Shaking up the Market: Impact of Indonesia's National Health Insurance Scheme on Healthcare Competitive Landscape

PRESENTER: **Ms. Rebecca Ross**, Palladium

Background: Indonesia introduced its national health insurance scheme – JKN – in 2014, aiming to achieve 95% coverage in five years. Leveraging the private health sector was essential and the government aimed to drive competition to reduce price while maintaining or improving quality. Under the USAID-funded Health Policy Plus project, we assessed JKN's effect on the competitive landscape of hospitals, pharmaceuticals, and medical devices sub-sectors. We analyzed whether JKN incentivized private sector firms to engage in the market, to scale up services and products, and to improve quality.

Methods: This mixed method study collected data through a facility survey and key informant interviews. The survey sampled 73 private hospitals stratified by geography, class, ownership, and JKN affiliated status. We used descriptive and statistical analyses to assess JKN's association with changes in hospital capacity, utilization, and finances comparing data from 2013 (pre-JKN) and 2016 (post-JKN). Semi-structured interviews were conducted with decision-makers from 24 companies in service delivery, pharmaceutical, and medical devices sub-sectors to assess the market perspective on competition, product/service introduction and reduction, and business investments.

Results: The private hospital market grew 30% over the first three years of JKN, primarily in for-profit hospitals. Hospital sector informants raised concerns around low reimbursement rates, but JKN-accepting hospitals seemed more optimistic about the hospital's financial health relative to non-accepting hospitals (67% and 33%, respectively). Though capacity at private hospitals increased during the reference period, results suggest that JKN did not incentivize private hospitals to offer more or additional services.

Pricing pressures were more evident in the pharmaceutical sector, where year-to-year sales volume growth increased from 3% to 5% between 2013 and 2015, but the annual financial value of these sales decreased from 13% to 7%. There was potential monopsonistic pressure as the government introduced a centralized procurement system for drugs with single winner policy for routine drugs with generic options. Accordingly, competition among domestic firms increased on price, though no evidence emerged that product quality increased.

The medical devices subsector grew over the study period: e.g., by 9 percent in 2014-2015, and was projected to grow annually by more than 16 percent in 2017 and 2018. The government also introduced the centralized procurement system for medical devices, without the single winner policy, allowing for choice by the ultimate "purchaser" - public hospitals and clinics. Key informants articulated the insurance and procurement systems enabling a more open marketplace.

Discussions & Conclusion: JKN as a buyer has impacted price and choice in the three sub-sectors differently, motivating varying levels of competition. While JKN has stimulated the private health market in most of the country, the primary change is on cost reduction and volume growth, rather than incentives for investing in service diversity and quality. The difference in perception of the pharmaceutical and medical device marketplace indicates a need to further refine a strategic purchasing mechanism that provides choice that incentivizes quality. Having complementary options such as top-up/supplementary insurance should be considered to maintain balance of cost, access, and quality in a mixed health system.

3:00 PM–4:00 PM TUESDAY [Special Sessions]

CENTERPIECE SESSION: The Economics of Vaccine Markets

MODERATOR: **Audrey Laporte**, University of Toronto

SPEAKER: **Hannah Kettler**, GAVI; **Michael Kremer**, University of Chicago

4:30 PM–5:30 PM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

ORGANIZED SESSION: Evaluating Existing Evidence and Collecting New Information to Inform Tobacco Policy Impacts

SESSION CHAIR: **John Buckell**, University of Oxford

ORGANIZER: **Ce Shang**, The Ohio State University Wexner Medical Center

Harm Reduction for Smokers Who Do Not Want to Quit: Using Tobacco Policy to Encourage Switching to e-Cigarettes.

PRESENTER: **John Buckell**, University of Oxford

AUTHORS: Lisa Fucito, Suchitra krishnan Sarin, Stephanie Omalley, Jody Sindelar

Abstract

A pressing, but relatively under-researched, tobacco policy concern is how to help smokers who have no interest in quitting (NIQ). These smokers tend to be older and smoke heavily meaning that they suffer health consequences of smoking more than other smokers. An alternative strategy to quitting is harm-reduction; by switching from cigarettes to less harmful tobacco products NIQ smokers could continue to obtain nicotine but in a less harmful way. We examine the extent to which NIQ smokers would switch to e-cigarettes, and which policies might encourage switching. We conducted an online survey and accompanying discrete choice experiment on a nationally representative sample of NIQ adult smokers in the US (n=2,000). We estimated preferences for tobacco products (cigarettes, disposable e-cigarettes, and pod e-cigarettes) and five characteristics common to these products: price, flavour, nicotine level, healthiness and usefulness as cessation aid. We modelled preference heterogeneity using a latent class model. We found two broad classes of NIQ smoker: those that had very strong preferences for their own cigarettes (70% of the sample); and those whose preferences for their own cigarettes were much weaker (30% of the sample). The latter group were younger, more educated and were dual users of cigarettes and e-cigarettes. Using choice data from the experiments, we simulated ways in which NIQ smokers could be encouraged to switch to e-cigarettes, for example reducing the price of e-cigarettes and reducing their harm (cigarettes are not harmless). Only the latter class of NIQ smokers seemed to respond to policies. Of these, choices were unresponsive to healthiness or cessation aid properties of e-cigarettes. Flavours and nicotine levels had limited impacts. However, choices were sensitive to the relative prices of tobacco products. This suggests that taxes on cigarettes or subsidies (e.g. by covering the cost fully by health insurance) on e-cigarettes would be most effective in promoting harm-reduction among NIQ smokers. The hardcore smokers' choices did not seem responsive to these policies, which is perhaps a policy concern in itself.

Do Excise Taxes Drive the Market for Heated Tobacco Products?

PRESENTER: **Estelle Dauchy**, Campaign for Tobacco Free Kids

AUTHORS: Shaoying Ma, Ce Shang

Heated Tobacco Products (HTPs) are a new form of tobacco products that heat raw tobacco sticks to generate an aerosol containing tobacco flavor, nicotine, and other chemicals. Because thetobacco essentially is not combusted in HTPs, in contrast to traditional cigarettes, companies have aggressively promoted them as "reduced-risk" products that could help consumers quit cigaretteuse. HTPs have rapidly gained market shares over traditional cigarettes in several countries. Despite the lack of evidence on health impact, most countries that sell HTPs have heavily subsidized the products by subjecting them to lower excise taxes than those imposed on cigarettes. This study constructs a model that describes the demands for two substitutable harmful products, cigarettes and HTPs, where consumers perceive one of the products as reduced-risk and therefore derive a higher marginal utility from it. We construct a unique quasi-panel database for HTPs and cigarettes over 2014-2018. We estimate the model with reduced-form regressions to study the combined demands for cigarettes and HTP in response to taxes and prices. We find that the demand for HTP packs is highly responsive to price changes, especially changes induced by excise tax policy. HTP demand also appears to be much more responsive to price changes than cigarette demand,confirming that cigarette consumption is inelastic. We also find evidence that HTPs and cigarettes are complements rather than substitutes, but only in one direction: cigarettes or HTP prices areinversely related to HTP consumption, but a decrease in either's prices does not significantly affect cigarette demand. This finding suggests that as cigarette companies produce both HTPs and cigarettes and tend to price them at similar levels, higher cigarette prices or taxes would lead to higher HTP prices that subsequently reduce HTP demand.

E-Cigarettes Sales Prices and Price Promotion in Vape Shops

PRESENTER: **Ce Shang**, The Ohio State University Wexner Medical Center

AUTHORS: Shaoying Ma, Shuning Jiang, Jian Chen

Significance: The use of electronic nicotine delivery systems (ENDS) by adolescents has increased dramatically in the last decade. Based on the model of regulating cigarettes, ENDS pricing policies (e.g., taxation an price promotion restrictions) have the greatest potential to prevent ENDS use initiation and escalation. As of July 2020, 23 states, DC, and several local jurisdictions have imposed excise taxes on ENDS. However, tax increases may be offset by price promotions. In addition, research on evaluating pricing policies has been hindered by the lack of price and price-promotion data from vape shops and online stores. Moreover, the lack of vape shop price data is a major limitation in the current e-cigarette literature, particularly studies that focus on assessing the tax and price elasticities of e-cigarette demand. Most of the existing evidence uses Nielsen Retailer Scanner data and taxes and price measures derived from this dataset. This study makes a significant contribution to the novel tobacco products by collecting vape shop price and price data, showing how the prices of products sold in vape shops differ from those sold in Nielsen stores, and assessing how taxes are passed to prices sold in different venues.

Methods: To address the current knowledge gap on the impact of ENDS pricing policies, the goal of this pilot project is to collect ENDS sales prices and price promotion activities from vape shops and online stores, using a hybrid method of web data scraping and crowdsourcing. Data from these sales channels will complement these data collected from grocery, drug, mass merchandiser in the Nielsen Retailer Scanner data. Specifically, we will 1) scrape price and price-promotion data weekly from 200 vape shops. We select the vape shops proportionally to state population, based on the top average reviews on Yelp and Google and on whether prices and product information are listed in their online stores. These data will be aggregated to quarterly measures for analyses; and 2) use Amazon Mechanical Turk (MTurk) and crowdsourcing techniques to collect quarterly price and price promotion of products sold in 3000 vape shops (1500 that also sell products online and 1500 that do not) from the 50 states and DC. Similarly, we scrape ENDS price and price- promotion data quarterly from 50 online stores, including the flagship stores of the 20 leading ENDS brands based on sales in traditional outlets and the 30 most popular ENDS online stores based on Google search results. These leading brands will almost certainly include popular brands such as JUUL and Blu.

Impact: This study makes a significant contribution to the tobacco price elasticity literature by collecting vape shop price data, comparing prices across different stores, and assessing tax pass-through rates by these platforms.

4:30 PM–5:30 PM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ORGANIZED SESSION: Sweetened Beverage Tax Designs across the Globe: Modeling How Beverage Taxes Impact Behaviors, Health, Costs, Revenue and Equity

SESSION CHAIR: **Stephane Verguet**, Harvard T. H. Chan School of Public Health

ORGANIZER: **Shu Wen Ng**, University of North Carolina at Chapel Hill

DISCUSSANT: **Arantxa Colchero**, Instituto Nacional de Salud Pública; **Nicholas Stacey**, SAMRC Centre for Health Economics and Decision Science - PRICELESS SA

The Macro-Economic Impacts of a Sugar-Tax: The Case of the UK Soft Drinks Industry Levy

PRESENTER: **Richard Smith**, University of Exeter

Background: Food and beverage commodities lie at the intersection between human health and economics: production and sale of food/beverages makes an important contribution to most economies and to the welfare of the producers. However, the quantity and nutritional properties of the food consumed profoundly affect human health which sometimes results in a conflict between health and economic interests requiring examination of both perspectives. One example where this conflict has been manifested is the introduction from April 2018 of a Soft Drinks Industry Levy (SDIL) in the UK where drinks with sugar content between 5-7g of sugar per 100ml are taxed at the rate of 18p/litre and drinks with 8g or more sugar per 100ml are taxed at a higher rate of 24p/litre. Studies show that high consumption of sugary drinks leads to increased likelihood of tooth decay, obesity, diabetes and heart disease. Public Health England and the British Medical Association supported the introduction of the SDIL whilst the largely negative response from the soft drinks industry, included claims that the SDIL would "threaten the economic viability of our industry and cost the UK jobs and investment". In order to assess the trade-offs of the SDIL an analysis tool is required which goes beyond standard health economic assessments and captures the impacts of the levy from both the macroeconomic and health perspectives.

Methods: In order to perform assessment of the UK SDIL from a multi-policy perspective, we developed a linked modelling framework. We linked an established sectoral macroeconomic Computable General Equilibrium model (which captures the behaviour of consumers, producers and government and provides true valuations of productive labour impacts over a 20 year period) to the PRIMEtime multi-state life table model of clinical health outcomes and NHS costs. Beverage sectors were disaggregated by sugar content so that 18 and 24 pence/litre producer taxes could be applied to sectors where drinks contain more than 5g and 8g of sugar per 100ml respectively. Changes in consumption of sugar were translated into clinical health effects and healthcare savings via the Primetime model and fed back into the macroeconomic model to yield a holistic assessment of the macroeconomic, health and demographic impacts of the UK SDIL.

Results: Final results are expected in early 2021. Early indications suggest that, excluding health effects, the levy will prove costly to the UK economy in the coming years. However, the SDIL will improve health, resulting in many thousand fewer cases of diabetes and chronic heart disease in the UK. In addition to the gains from the health perspective, there will also be health-related economic gains from reduced health-service costs and health-related increases in labour supply by UK workers.

Conclusions and implications: Diet-related taxes can be effective in reducing consumption of unhealthy goods but may be costly from the macroeconomic perspective. Macroeconomic and health assessments could be valuable in designing tax policies which maximise health gains whilst accounting for the costs to the wider economy.

Cost-Benefit Analyses of Alternative Tax Levels for Mexico's Sugar-Sweetened Beverage Tax: Considerations for Policy-Makers

PRESENTER: **Juan Carlos Salgado Hernandez**, INSP and UNC-Chapel Hill

In response to the high prevalence of overweight and obesity, the Mexican government implemented a volumetric tax of one Mexican peso (MP) per liter of sugar-sweetened beverage (SSB) in 2014. We conducted a cost-benefit analysis of this tax from the perspective of the government, producers, and consumers in urban Mexico for a simulated closed cohort followed up to 75 years after the tax implementation.

For this analysis, we compared the tax-related costs (consumer surplus and profit losses) and economic benefits (health care savings and tax revenue for the government). Moreover, we explored the effect of alternative tax amounts: $0.5 MP, two MP (as recommended by public health experts), and three MP per SSB liter.

All four tested taxes were predicted to generate benefits that will surpass their cost; however, this finding depends on the time horizon of interest. Policymakers should consider this time horizon along with health gains and economic benefits-costs across different stakeholders when assessing the SSB tax effect in Mexico.

Simulating International Tax Designs on Sugar-Sweetened Beverages in Mexico

PRESENTER: **Juan Carlos Salgado Hernandez**, INSP and UNC-Chapel Hill

In response to the high prevalence of overweight and obesity, Mexico implemented a volumetric tax of one Mexican peso (MP) per liter of sugar-sweetened beverage (SSB) in 2014. In contrast to Mexico's volumetric tax design, the United Kingdom (UK) and South Africa (ZA) implemented SSB taxes based on sugar density. This kind of tax is likely to yield larger health benefits than volumetric taxes by imposing a larger tax burden on high-sugar SSB and/or encouraging reformulation. However, sugar-density taxes might yield lower tax revenues.

This study aims to simulate the effect of sugar-density taxes as those in the UK and ZA on SSB purchases (in terms of volume and sugar), SSB prices, and tax revenue in Mexico and compare this effect to its counterpart under the current volumetric SSB tax. Additionally, we simulate the effect of sugar-density taxes under different scenarios of reformulation. We conducted all these simulations based on a structural model of demand and supply using household purchase data for 2012-2015 in urban Mexico.

We found that the one-MP volumetric tax led to an SSB purchase reduction of ≈19% for both volume and sugar and an SSB price increase by MP $1.24. We simulated similar effects under the UK and ZA sugar-density taxes when these taxes were equivalent to the one-MP volumetric tax, and there was no reformulation. When assuming reformulation, the sugar reduction under the sugar-density taxes was up to twice larger than the volumetric one-MP tax. However, we found that the volumetric one-MP yielded the largest tax revenue across all tax designs.

From a public health perspective, sugar-density taxes are likely to be more effective in tackling the overweight and obesity prevalence in Mexico; however, tax revenue might be lower under these taxes. This work has implications for informing of tax designs that countries are considering and provides a way for policymakers to estimate tradeoffs.

4:30 PM–5:30 PM TUESDAY [Supply Of Health Services]

HEALTH WORKFORCE SIG SESSION: Social Preferences, Workforce Engagement and Quality of Health Care

MODERATOR: **Edward Okeke**, RAND Corporation

Social Preferences Pose Challenges for Malaria Microscopy in the Private Sector: A Cross-Sectional, Standardized Patient Study on Laboratory Quality in Kenya

PRESENTER: **Dr. Ada Kwan**, University of California-San Francisco

AUTHOR: Paul Gertler

Introduction: In the last decade, diagnosing malaria in the private sector of low- and middle-income countries has shifted from using clinical judgment to quick diagnostic tests, primarily due to the successful increase in access to malaria rapid diagnostic tests (mRDTs), which are fairly inexpensive and quick and easy to use. More recently, malaria microscopy was introduced as a laboratory diagnostic that detects malaria with higher sensitivity compared to mRDT with a blood sample. In contrast to mRDT, microscopy is carried out in a laboratory and requires careful quality practices and resources for accurate diagnosis. Utilizing standardized patients, who are locally recruited individuals trained to portray pre-scripted case scenarios in health facilities and which are considered the state-of-the-art method to assess actual provider practice in settings where medical records do not exist or are poor quality, we present a novel way to examine laboratory quality in the private sector.

Methods: Between May 6-28, 2020, 29 SPs portraying a pre-scripted acute malaria case scenario conducted N=379 successful SP-provider visits at 200 private clinics located in Kenya. These data are a part of the African Health Markets for Equity (AHME) program's impact evaluation endline activities. A follow-up provider survey was conducted among providers who saw SPs in November-December 2020.

Results: Of the 311 visits that resulted in a malaria test, SPs in 86 (27.7%) visits received a false positive result. Eighty-six (22.7%) of all 379 visits made by malaria SPs resulted in a positive test result regardless of having a test ordered. Among 173 visits that resulted in a malaria microscopy test, 64 (37.0%) resulted in a false positive. Since all SPs portraying the malaria case were confirmed negative at the beginning and end of fieldwork (lasting 22 days), we consider these true false positives. Given the risk of false positives among laboratory diagnostics, providers face a tradeoff in the risks of overtreating patients who test positive for malaria when they do not have it versus undertreating patients who test negative for malaria when they do have it. However, using a modified dictator game to elicit social preferences, we find that the least altruistic providers (which we interpret as the most profit-driven based on SP anecdotes from fieldwork) who were engaged in the AHME program substituted mRDT with microscopy and also had higher false positive rates of malaria microscopy than the altruistic providers. The program helped these providers improve their business outcomes, including profits.

Discussion: In the context of private sector engagement programs, not only do these high false positive rates in laboratory quality for malaria services have potentially harmful consequences for individual and public health, but also that profit-driven preferences among providers explain the effects of high rates of false positives among malaria microscopy is alarming. Since highly competent private providers give lower quality care to patients due to provider social preferences, our findings suggest that profit-driven preferences pose striking challenges to the proper use of malaria microscopy and laboratory quality in the private sector of Kenya.

Social Preferences of U.S. Physicians

PRESENTER: **Dr. Jing Li**, Weill Cornell Medical College

AUTHORS: Lawrence Casalino, Shachar Kariv, Daniel Markovits, Ray Fisman

Are U.S. physicians altruistic? In this study, we provide novel evidence on this classic question which dates back to Arrow (1963) that emphasizes physician professionalism as the remedy for information asymmetry. Apart from their fiduciary duty to individual patients, physicians also have a duty to the society at large to reduce care of low perceived benefit in the interests of improving efficiency in the healthcare system. We study these two components of social preferences—tradeoff between other's interest and self-interest and tradeoff between equality and efficiency—among a sample of about 300 U.S. practicing physicians in Internal Medicine, Family Medicine and Cardiology. To measure social preferences, we employ an (incentivized) economic experiment in the form of a modified dictator game. Specifically, each physician subject was asked to allocate real money between self and an anonymous other from the Understanding America Study (UAS) panel, a panel broadly representative of the U.S. population. The allocation was done on a two-dimensional budget line embedded in a web-based graphical interface. The experimental methodology and graphical interface allows us to collect rich data for each individual subject and measuring both dimensions of social preferences at the individual level.

To benchmark our measured social preferences among physician subjects, we further compare them to those among three other populations using previous identical experiments: (1) a sample of medical students from nine schools around the U.S, (2) a sample of American Life Panel (ALP) respondents broadly representative of the U.S. population, and (3) an "elite" subsample of the ALP respondents.

We find that physicians are more altruistic than all other comparison samples. Among non-physician subjects, general ALP subjects are the closest to physicians in terms of altruism. The physicians in our sample also had a higher degree of equality-orientation compared to all other samples except the general ALP subjects. These comparisons suggest that the social preferences of physicians do not reflect those of a more elite class than the average American. The differences in social preferences between physicians and medical students in our sample are also not explained by age or income differences. Further, we do not find significant differences in measured social preferences among physicians by medical specialty or practice characteristics (ownership and size). We provide possible explanations for the sharp differences in social preferences between physicians and the other samples.

Motivation and Incentive Preferences of Community Drug Distributors and Teachers for Mass Administration of Medicines for Neglected Tropical Diseases in Nigeria: Discrete Choice Experiments

PRESENTER: **Efundem Agboraw**, Liverpool School of Tropical Medicine

AUTHORS: Dr. Maame Esi Woode, Damian Bernsah Lawong, Gideon Kevin Diltokka, Akin Oluwole, Luret Lar, James Yashiyi Nuphi, Oluwatosin Adekeye, Ruth Dixon, Kim Ozano, Laura Dean, Okefu Okoko, Sunday Isiyaju, Rachael Thomson, Eve Worrall

Objectives

The Neglected Tropical Disease (NTD) control programs use community-based drug distributors (CDDs) and Teachers for the implementation of Mass Administration of Medicines (MAM) targeting populations living in endemic areas. However, programme effectiveness is compromised by low motivation and retention of MAM-volunteers. We aimed at improving MAM coverage rates through this study which explored motivation and retention of two cadres of MAM-volunteers; Teachers and CDDs.

Methods

We used discrete choice experiments to estimate preferences of Teachers and CDDs in two states in Nigeria, namely Kaduna and Ogun. We studied the main effects by volunteer cadre (Teacher and CDD) and State, using mixed logit models. We also did the latent class model (LCM) to determine inherent choices per demographic characteristics.

Results

Results of the mixed logit models pointed to the importance of allowances of N3000 (US$8.26) for teachers (0.302*** and 0.456***) and for CDDs (0.115** and 0.366***) in Kaduna and Ogun respectively, during MAM. Extensive information during community sensitization and acceptance was important for teachers in both states (0.186* and 0.416***) while community recognition and respect was important for CDDs in both states (0.086* and 0.393***). The LCM results brought out three latent classes for both Teachers and CDDs whose preferences were significantly determined by demographics such as education, ethnicity and household income. Teachers with higher levels of education preferred being supervised, while CDDs with higher income preferred more CDDs per village and more participatory training done in the local language. ["*" - significant at 1%; "**" = significant at 5%; "*" = significant at 10%]

Conclusions

MAM-Volunteer motivation and MAM program impact could be improved by timely provision of allowances, increased community and parental awareness about MAM, more participatory training methods, recognizing CDDs commitment, time and workload constraints and other non-

financial incentives such as adequate supplies and effective supportive supervision from the health sector. Motivational packages need to be contextualized reflecting the gender, age, experience and reason for volunteering of the CDDS and Teachers. DCE enables the contextual priority setting agenda for NTD implementer action and can be applied in the context of low-income countries to study preferences of volunteers involved in delivery of essential health interventions.

4:30 PM –5:30 PM TUESDAY [Health Care Financing And Expenditures]

Cross-Country Comparisons of Health Financing and Expenditures

MODERATOR: **Adanna Chukwuma**, World Bank Group

Estimating Spending on Family Planning and Maternal Health in 120 Countries, 2000-2017

PRESENTER: **Dr. Angela Esi Micah**

AUTHORS: Steven Bachmeier, Ian Cogswell, Emilie Maddison, Ms. Golsum Tsakalos, Dr. Joseph Dieleman

Background

Globally, 199.4 thousand women die each year during pregnancy, and 561.8 million women have family planning needs that are unmet. In many low- and middle- income countries comprehensive provision of reproductive health services especially for family planning and maternal health is lacking. While there are many reasons for this deficit, a limited availability of financial resources is a key one and understanding how much is being spent is critical input for countries to be able to begin to address the shortages in service availability and provision.

Methods

We estimated spending for family planning and maternal health for 120 UNFPA prioritized countries (all low- and middle- income countries with the exception of Argentina, Barbados, Panama, Qatar, Trinidad and Tobago, and Uruguay) from 2000 through 2017. Each of these components was further disaggregated by source. We extracted data from multiple sources including the UNFPA/NIDI Resource Flows project, national health accounts, FP2020 annual report for 2018, unit cost and utilization data from the RHSC Commodity Gap analysis and the IHME Development Assistance for Health database. In total, we had 2,567 (family planning) and 417 (maternal health) of country years of data that informed our estimates. We standardized extracted estimates across sources. We used a spatio-temporal modeling technique to fill in the missingness and generate uncertainty intervals. We summed up the estimates generated by source to obtain the total spending on family planning and maternal health respectively.

Findings

Between 2000 and 2017, funding for family planning and maternal health totaled $286.1 billion (275.8-298.8). For family planning, by region, Latin America and Caribbean had the highest total spending ranging from $1.0 billion in 2000 to $1.7 in 2017. In 2017, South Asia (0.8) and sub-Saharan Africa (0.7) followed respectively. The lowest total spending in 2017 is observed in Central Europe, Eastern Europe and Central Asia (0.1). Out of pocket spending on family planning dominates the sources of funding in Latin America and Caribbean. In South Asia, government is the main funder of family planning services while in Sub-Saharan Africa development assistance has become the dominant source since 2008. For maternal health in 2017, South Asia and Latin America and Caribbean have the highest spending, $6.1 billion and $4.6 billion respectively with the majority of spending from government and out of pocket sources. Relatively, development assistance makes up marginal contribution to the overall spending on maternal health across the regions, contributing the most in sub-Saharan Africa most recently.

Interpretation

25 years went by quickly since the first International Conference on Population and Development. While some progress was made towards improving the lives of many women and children and helping all to freely exercise their sexual health rights more still remains to be done.

Impact of the PEPFAR Program on Health Indictors 2004-2018

PRESENTER: **Dr. Gary Gaumer**, Brandeis University

This paper estimates the impact of the Pepfar Program on indicators of health in recipient countries. Literature suggests that this 16 year, $100B program has saved the lives of millions around the world (Bendavid 2009, 2012, 2014). But the literature also shows very mixed spillover effects on the non HIV/AIDS aspects of health in these countries (IOM, 2013). Generally, there has been concern that as a large, well endowed donor intervention, Pepfar jobs for clinicians might be attractive for trained locals, crowding out other important local health programs and institutions (Garrett, 2007; Cavali,2009).

Methods

We utilize a panel data set of all 158 low- and middle-income countries (LMICs) for 1990-2018 to estimate the impacts of Pepfar. The data set comes from public use data from the World Bank Indicator data, WHO, UNAIDS, US Foreign Aid Explorer, IHME, OECD, CRS, and the PEPFAR dashboard and web site. Ninety-four of these countries received PEPFAR aid. Impact estimates of PEPFAR are obtained with difference-in-differences econometric models for each of 6 recipient groups (all recipients countries, all low- and medium-income countries separately, the 32 countries submitting annual Operational Plans (COP), 18 countries participating in a Regional Operating Plans (ROP), and 44 other recipients).

We estimate impacts of PEPFAR on 10 indicators of health:

1. All-cause mortality rates
2. Indicators of outcome for the non HIV/AIDS health sector

Maternal mortality rate

Modern contraception usage rates (% of women)

Immunization rates for children (DPT, measles, HepB3, antenatal tetanus for newborns)

3. Indicators of health system equity

Percent of population spending > 10% of income on health care

<5 mortality rate; ratio of Wealth Quintile 5/Wealth quintile 1

Use of antenatal care; ratio of Wealth Quintile 5/Wealth quintile 1

The econometric models utilize covariates including baseline (2004) levels: domestic per capita health spending, percent adults having at least primary education, GNP per capita,

percent urban population, WHO health system ranking (2000), HIV prevalence rate, life expectancy, whether the US provided HIV aid prior to Pepfar, and HIV/AIDS spending by other donors.

The quasi-experimental design with 1990-2018 panel data shows that the program has reduced mortality rates by about 20% over all countries supported, and larger impacts on high burden country segments: Low Income countries (31%), for countries doing intensive annual operations

planning with Pepfar staff (23%), and Other recipients had Pepfar impacts on all cause mortality of only about 9%. There was no impact on Middle income countries.

Our results show that there are some non HIV/AIDS areas where program spillover effects have been consistently good for population health—all 4 childhood vaccinations and Maternal mortality show consistent patterns of **positive** health spillovers of Pepfar.

Other indicators of possible spillovers show no pattern of Pepfar influence, favorable or unfavorable. These indicators include use of % of births using any antenatal care, use rates of modern contraception, and indicators of health system equity including the % of households spending more than 10% of income on health care.

Health Outcomes and Health Care Financing: A Panel Data Study in Low-and Middle-Income Countries

PRESENTER: **Kalam Azad**, University of Ottawa

Background

Healthier countries are more productive and thus contribute more to GDP per capita. Economic growth in healthier countries is enough to provide public health care services because health as a byproduct automatically appear from their economic growth. However, health care financing is a potential barrier in delivering health care services in middle-and low-income countries. Because their economic growth is a far away from enough to maintain health care for all citizens (Sachs, 2002). In addition, health with communicable diseases in these countries reduce economic growth and consequently deteriorate health conditions. Health in these countries can be improved from their own economic growth and a large external financial inflow encompassing the direct foreign transfers into the national health system from outside the country. As the whole health coverage may not be possible, a combination of both can be effective to ameliorate health in middle-and low-income countries. In this paper, we are motivated to find the effects of domestic and external health care financing on health outcomes, although out-of-pocket spending and health insurance can have effects on health outcomes, they are not accounted for.

Objective

In this paper, we address two questions: First, does health care financing from domestic health expenditure per capita have effects on health outcomes in high, middle-and low-income countries? Second, does health care financing from domestic health expenditure per capita and external health expenditure per capita together have effects on health outcomes in middle-and low-income countries?

Data

The main variables we use in this analysis include health financing sources such as domestic health expenditure per capita and external health expenditure per capital; health outcomes such as life expectancy at birth and child mortality under five. This is a big panel data from 181 countries over 1960-2015 used from the World Bank' World Development Indicator (World Bank, 2020).

Model

We employ panel data models. The econometric estimation methods we apply include static fixed effects (SFE), dynamic fixed effects (DFE) and GMM methods.

Results

Using all estimators, the findings show that domestic per capita health expenditure has a significantly positive effects on health life expectancy at birth in high-and middle-income countries. However, it has positive but no significant effect on life expectancy in low-income countries. When the external health expenditure per capita is included in the model, we find considerable and significantly positive effects on life expectancy in low-income countries while the effects for middle-income countries are almost the same as with domestic health expenditure per capita. Also, for all countries, we find significantly negative effects of health spending on child mortality. Results show that when including external health spending, low-income countries have 7 percentage point more effects compared to 1 percentage point in middle -income countries on child mortality. The implication of these results is that middle income countries are very close to meet public health financing from their domestic sources than low-income countries. This is a novel contribution in this literature.

Modeling Health Spending Financial Sustainability

PRESENTER: **Eduardo Costa**, Nova School of Business and Economics

In most OECD countries, health spending has been increasing over the last decades, often surpassing GDP growth. Current challenges faced by health systems – including the current Covid-19 pandemic - pose additional concerns regarding whether societies can sustain a continuous health spending growth. Such problem is particularly relevant in the context of public health spending. In the absence of significant economic growth, the room for further increases in public health spending without constraining other public spending is somewhat limited.

On this paper I study the role of public health spending on producing health and its impact in terms of financial sustainability. I relate the sustainability concept with fiscal space of public finances: increases in health spending not compatible with meeting public finances goals will be deemed unsustainable. I develop an overlapping generation model with two period lived households where health contributes directly both to the second period utility (transforming life expectancy into an endogenous decision) and to the output production function. In this setting, health spending and public goods are both provided by the government, which must respect a budget constraint, creating a trade-off between higher public spending or higher public goods expenditure.

This model suggests that increases on health spending are not necessarily undesirable from a public finances' standpoint. In fact, depending on the health multiplier in the economy, higher levels of health spending, might contribute to higher output – and higher tax revenues. If agents are rational, then public health spending sustainability will always be ensured. However, myopic governments may promote levels of public health spending above such sustainability threshold. Hence, this paper contributes to the debate on whether current increases of health spending are desirable and sustainable over time.

4:30 PM –5:30 PM TUESDAY [Specific Populations]

IMMUNIZATION ECONOMICS SIG SESSION: Pediatric and Adolescent Immunizations

MODERATOR: **Allison Portnoy**, Harvard T.H. Chan School of Public Health

Costs of Human Papillomavirus Vaccination in Tanzania: One-Dose and Two-Dose Estimates Based on National Program Costs

PRESENTER: **Dr. Verena Struckmann**

Background/Objectives: Cervical cancer caused by human papillomavirus (HPV) is the most frequent cancer in women in many low-income countries, including Tanzania. Since 2014 the World Health Organization (WHO) recommends use of a routine two–dose schedule to protect against HPV infections. In 2018 the Tanzania government introduced a quadrivalent HPV vaccine into its immunization programme, targeting all 14 year-old girls with a two-dose vaccination schedule through school and health facility-based delivery. This study aimed to (1) estimate financial and economic costs of the Tanzanian vaccination programme; (2) assess the effect of alternative assumptions for future vaccination coverage rates and delivery strategies on estimated costs of vaccination, and (3) estimate the potential cost reductions resulting from a hypothetical one-dose vaccination schedule.

Methods: The WHO Cervical Cancer Prevention and Control Costing (C4P) tool was used to estimate the incremental financial and economic costs of the national vaccination programme from the perspective of the Tanzanian government. Data were collected from (a) national cost and coverage reports, (b) three costing workshop with stakeholders in Dar es Salaam, (c) interviews with regional, district, and health facility personnel in Mwanza region, and (d) observation of health workers in selected health facilities. Deterministic sensitivity analyses were performed to estimate the effect of alternative assumptions for coverage rates and delivery strategies as well as to assess the impact of a potential one-dose vaccination schedule.

Results (optional): Preliminary results indicate the total financial and economic costs for delivering 4.8 million doses of HPV vaccine in Tanzania between 2018 and 2022 was US$10.9 Million and US$37.2 Million respectively. Costs per dose were US$2.30 (financial) and US$7.78 (economic), and costs per fully immunised girl receiving two-doses of vaccine were US$5.27 (financial) and US$17.84 (economic). Cost estimates were relatively robust to different assumptions for delivery strategies and coverage rates. Costs per fully immunized girl would drop to US$2.56 (financial) and US$8.20 (economic) if one dose of HPV vaccine is found, through ongoing clinical trials, to be sufficient to protect girls from HPV infection.

Conclusions: This is one of the first studies to report national programme costs of an African HPV vaccination programme. Costs of a potential one-dose strategy would be significantly lower than the current two-dose strategies. These estimates of the costs of HPV vaccination are important for future cost-effectiveness analyses.

Use of Utility and Disability Weights in Economic Evaluation of Pediatric Vaccines: A Systematic Review

PRESENTER: **Ms. Nienke Neppelenbroek**

AUTHORS: Ardine de Wit, Kim Dalziel, Nancy Devlin, Natalie Carvalho

Background: The two main outcome measures used in cost-utility analyses (CUA) are quality-adjusted life years (QALYs) and disability-adjusted life years (DALYs). Estimating QALYs and DALYs requires health-related quality of life (HRQoL) weights, (utility or disability weights, respectively), but the level of agreement between them remains unclear. While disability weights are most often drawn from Global Burden of Disease studies, utility weights are derived from different populations and using different instruments and methods, leading to different valuation weights. This study aims to document the use of and agreement between utility weights and disability weights reported in economic evaluations of pediatric vaccinations conducted in high and low- and middle-income countries.

Objective: (1) To describe how utility weights and disability weights have been used to estimate QALY and DALY outcomes in economic evaluations of pediatric vaccines; and (2) To assess the comparability between utility weights and disability weights for the same pediatric health states.

Methods: A systematic review was conducted of economic evaluations of childhood vaccines published between January 2013 and December 2018 that used either utility or disability weights. The review included studies of vaccines for 18 specified infectious diseases for which vaccines are available and is reported according the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. A predesigned data extraction form was used to extract information on the following: vaccine, author, year, title, country, outcome measure, health states and corresponding utility or disability weight (including range), source and/or elicitation method used, and limitations noted by the author. For data synthesis, a descriptive and thematic approach was applied. The comparability between utility and 1- disability weights for the same health states was compared descriptively.

Results: A total of 1740 potentially relevant articles were identified, and 168 economic modelling studies met our inclusion criteria. Of the included studies, 127 studies used utility weights and 41 studies used disability weights in their modelling framework. In QALY studies the source, background and how utility weights have been used were poorly reported. Whether adult's or children's preferences were applied to valuation was often unclear. In DALY studies, the most recent Global Burden of Disease study was most often referenced. The level of agreement between utility and disability weights for the same health states was low. For example, the range of utility weights for cervical cancer was 0.15-0.76 while the range for 1-disability weight was 0.71-0.92. However, differences found between the HRQoL weights were not systematically in any direction.

Conclusions: This review identified considerable gaps in the evidence base of valuation weights used in CUA. This makes it difficult for readers to assess the results in terms of reliability and validity, and limits reproducibility and comparability of the resulting evidence. The current application of non-context specific valuation weights and the demonstrated disagreement between utility and disability weights may lead to different findings in CUAs and could contribute to different policy decisions.

Cost-Effectiveness of a Communication Intervention for Clinicians on Missed Opportunities for HPV Vaccination: Results from a Randomized Controlled Trial in the US

PRESENTER: **Mr. Brayan V. Seixas**, UCLA Fielding School of Public Health

AUTHORS: Peter Szilagyi, Gerald Kominski

Background: Despite the safety and effectiveness of HPV vaccines, uptake among adolescents remains suboptimal. According to 2018 estimates, only half of adolescents aged between 13 and 17 years old were up-to-date for HPV vaccination in the United States.

Objective: To evaluate the cost-effectiveness of an online communication training for clinicians on missed opportunities (MOs) for HPV vaccination among 11-17-year-old adolescents. The intervention consisted of three online educational modules to help participating providers in intervention clinics communicate with parents about HPV vaccine and weekly text messages to reinforce learning goals.

Methods: A longitudinal clustered randomized clinical trial (RCT) was conducted between 2018 and 2019 with 48 primary care pediatric clinics in 19 US states recruited via the Pediatric Research in Office Settings network, from the American Academy of Pediatrics. Clinics were randomly assigned to either standard-of-care or to communication training. The outcome of interest was MOs of HPV vaccination for initial or subsequent doses at well-child care or acute/chronic care visits. Monthly surveys were used by staff at participating clinics to keep track of the number of work hours and resources invested in the intervention. Work hours were converted into monetary terms using 2018 data from the US Bureau of Labor Statistics on national median hourly wages. The 6-month intervention period was compared to a 12-month baseline. The analytical approach consisted of running a grouped logistic regression on clinic-level data with clustering on clinics. Using a difference-in-difference (DiD) estimator, we calculated the predicted probability of missing a vaccination opportunity (MO rate) associated with being in the intervention group during the study period. Then, we obtained the point estimate for the ICER denominator (i.e., mean number of potentially missed opportunities successfully converted into vaccination) by multiplying the DiD estimate of the MO rate by the mean number of total visits in the intervention group during the study period. One-way deterministic sensitivity analysis was conducted to determine the most impactful intervention components on the ICER. Bootstrapping was employed for the probabilistic sensitivity analysis.

Results: The communication training reduced missed opportunities during well-child care visits for initial HPV vaccination by 6.8 percentage points (95% CI: -3.9%, -9.7%), but the intervention had no effect at acute/chronic visits. Intervention costs varied substantially across the 24 intervention clinics (from $369.55 to $6,653.10) with a mean of $2,003.43 (95% CI: $1,376.71, $2,762.24). Cost per visit varied from $0.24 to $4.02, reflecting different levels of effort by varying types of healthcare professionals across clinics. The point estimate for the ICER was $110.31 dollars per potentially missed opportunity converted into successful vaccination. Physician's compensation represented by far the most impactful component on the ICER. All 10,000 bootstrap ICER estimates situated into the northwest quadrant of the cost-effectiveness plane.

Conclusions: This online communication training improved initial HPV vaccination at well-child care at a relatively low cost. The intervention was not effective during acute/chronic care or for subsequent vaccine doses.

4:30 PM–5:30 PM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Environmental Impacts on Health

MODERATOR: **Paul Andres Rodriguez Lesmes**, Universidad del Rosario

Comparing Measurement Techniques: The Impact of Pollution Exposure on Emergency Visits in England across Vulnerable Populations

PRESENTER: **Laure de Preux**, Imperial College London

AUTHOR: Dheeya Rizmie

Ambient air pollution is a complex mixture of pollutants, such as particulate matter, nitrogen dioxide, and ozone that varies spatially and temporally. Exposure to pollution has been linked negatively to various economic outcomes (e.g. health, productivity, learning etc) and has become a major source of concern for public health. While the harmful effects of these pollutants are widely accepted, quantifying these effects requires various considerations that need to be addressed by researchers. Various considerations have to be made with regards to what can influence the dispersion of pollution. Statistical models can account for such uncertainties, to an extent, but it may not be fully known or quantified and will vary by pollutant. High computational dispersion models that typically account for the topography and the pollution sources represent a solution to obtain granular pollution exposure estimates, but their requirements still carries a trade-off between the frequency and granularity of the pollution exposure estimates. Therefore, robust, local and frequent air pollution measures continue to be difficult to estimate.

This paper builds on the growing economic literature by quantifying the measurement error introduced by current exposure assignment techniques. We introduce a different exposure assignment approach, known as land use regression (LUR), to measure pollution exposure that accounts for environmental characteristics, topological variation and atmospheric conditions that influence air pollution. The construction of geographically explicit pollution measures, derived from a land use regression model, allows us to replicate the spatial and temporal conditions imposed on the distribution of pollution. We exploit space and time variation in accident and emergency (A&E) visits covering the entire English population between 2010 and 2011 (N=16,018,120) with meteorological and pollution data. We exploit random daily variation in air pollution for the above pollutants experienced by hospitals. We compare pollution exposure estimates derived from LUR models to the use of a more conventional technique in economics, inverse distance interpolation. The latter approach has the potential to lead to systematic estimation bias, especially with sparse monitoring networks and geographical topological complexity of the country. We consider pollution exposure at the hospital postcode district level, to capture the immediate pollution exposure to an individual. We also control for the pollution exposure at the individual's residential postcode district to account for potential long-term pollution exposure. This allows us to more accurately assign pollution exposure to each individual and improve the identification of pollution effects on health outcomes during adverse health events. We further explore the heterogeneity across effects by socioeconomic status.

Our reduced form estimates account for location and time fixed effects and show that air pollution is positively associated with A&E visits. Our estimates are also dependent on the method of pollution exposure assignment, suggesting that economic estimates are sensitive to measurement error introduced by interpolation. Our contribution shows the need of a method that accounts for the heterogeneity in spatial topography when investigating the economic and social impacts of air pollution. Our results support the planning of targeted and strategic interventions during peak pollution days.

Is Pollution Affecting Your Sleep?

PRESENTER: **Dheeya Rizmie**, Imperial College London

Sleep has many beneficial effects across levels of human behaviour and activity, being essential for health, productivity, cognitive function and psychological well-being. Sleep deprivation has been associated with negative health and social outcomes, including elevated mortality risk and adverse school performance. Lack of adequate sleep can affect judgement and the ability to process and retain information adequately, and can increase the risk of serious or fatal accidents and injury. From the medical and economic literature, impaired sleep appears to have wide-ranging implications and can influence decision making, learning and weaken immune systems.

Sleep may be considered ‘the most common activity in terms of time spent that humans engage in’, and yet there remains considerable gaps in our understanding of it. The causes of sleep deprivation can be broadly categorised into two partially overlapping groups: (1) sleep disorders such as insomnia, sleep apnoea or narcolepsy; and (2) lifestyle related (e.g. irregular sleep schedules, stress). A handful of studies have sought to begin understanding the complex and various factors influencing sleep. With constant daily exposure to pollution it is plausible that exposure may have an impact on our sleep through various channels, such as impairing the lung function or triggering physiological inflammation. Currently, over 90% of the global population live in areas of poor air quality. Investigating the link between air pollution and sleep is crucial in understanding wider societal and economic implications for policy makers.

Several policy initiatives have been implemented in Paris to address the pollution concerns of the city. The pedestrianisation process began under the car-free scheme called *Paris Respire* . Since May 2016, certain roads are closed to vehicular traffic on Sundays and/or public holidays. These roads include, amongst others, those near the River Seine, the Marais and Montmarte. To identify the causal effect of air pollution on sleep, I use personalised health tracker data and exploit a unique campaign, *Paris Respire*, in Paris that intends to temporarily reduce traffic emissions across the city, in a difference-in-differences framework. The study first evaluates the impact of this policy on traffic flows, air pollution and noise pollution levels in Paris. Then exploits a similar identification to understand the implications on sleep. Subsequently, this allows for the understanding the influence of short-term pollution shocks on individuals' quality of sleep and sleep deprivation across Paris between 2015 and 2019 (N=938,386).

Preliminary results see a decrease in vehicular traffic in areas with the policy, suggesting that *Paris Respire* reduced traffic-related air and noise pollution. Preliminary results also see an increase in the number of minutes of sleep among individuals in areas with the policy. Subsequently, preliminary analysis suggest that a reduction in pollution associated with *Paris Respire* confers improved sleep durations.

Health Advances and Public Health Improvements of China Healthy Cities (Counties) Initiative: A Nationwide Quasi-Experimental Study

PRESENTER: **Dr. Dahai Yue**, University of Maryland, College Park

AUTHORS: Xiao Chen, Yuhui Zhu, Qingyue Meng

Background: China has seen the most massive rural-to-urban migration in human history since its 1978 economic reforms, with urbanization increasing from 17.9% in 1978 to 56.1% in 2015. To address these social and environmental risk factors and improve cities' livability, China launched a public health improvement initiative that includes *China Healthy Cities* in 1989 and *China Healthy Counties* in 1997. The initiative resembles the WHO Healthy Cities project and primarily encourages investment in urban infrastructure, sanitation, green space, and environmental protection. Since then, it has been at the forefront of China's public health efforts to counteract the growing health challenges in the urban environment. However, the health impact of the initiative remains unexplored. This study aims the investigate the impact the initiative on under-five mortality rates (U5MR).

Methods: We compiled a nationwide county- and city-level panel data file for the years 1996-2012 from data on U5MR, the list of China healthy cities and counties, and a wide range of socioeconomic variables. We employed a quasi-experimental design that exploits variation in the timing when cities/counties achieved the title of "China Healthy City (County). We estimated a two-step econometric regression model for difference-in-differences analysis comparing changes in U5MR for healthy cities (counties) to non-healthy cities (counties). A panel matching approach was applied to reduce or eliminate the covariate imbalance and differential pre-trends between the two groups.

Results: There were 707 cities included in the *China Healthy Cities* study, and 1631 counties included in the *China Healthy Counties* study. Our results indicate significant reductions in U5MR associated with the public health initiative in China. The association varies across regions with

different socioeconomic statuses. Our results suggest *China Healthy Cities* were associated with 0.7 reductions (95% CI, -1.2 to -0.2; p=0.008) in under-five mortality five years after cities gained the title and 1.4 decreases (95% CI, -2.2 to -0.6; p=0.002) ten years afterward. Cities from western China saw the largest and statistically significant gains with 3.2 reductions (95% CI, -5.7 to -0.8; p=0.013) in child mortality five years later and 7.2 reductions (95% CI, -11 to -3.4; p=0.001) ten years later. *China Healthy Counties* also contributed to significant reductions in under-five mortality eight years after counties achieved the title. It was associated with 2.6 reductions (95% CI, -4.7 to -0.5; p=0.018) in under-five mortality nationwide and 3.8 reductions (95% CI, -6.7 to -0.8; *p*=0.016) in eastern China, but no significant effects were found among counties from central and western China.

Discussion and Implications: We first establish the beneficial effects of China's long-existing nationwide public health initiative on population health. Our results highlight the critical role of public health improvements in health advances. It has great policy implications as more people choose to live in cities, particularly for low- and middle-income countries. Our paper indicates that improving the social and physical living environment in urban settings is a plausibly effective approach for improving population health. Future research could explore differential effects across regions and clarify the underlying causal mechanisms through which the effects emerge.

4:30 PM –5:30 PM TUESDAY [Supply Of Health Services]

Hospital Care Quality

MODERATOR: **Xiao Xu**, Yale University

Quality Provision in Hospital Markets with Demand Inertia: The Role of Patient Expectations

PRESENTER: **Luís Sá**, University of Minho

AUTHOR: Odd Rune Straume

Switching costs and persistent preferences generate demand inertia and link current and future choices of hospital. Using a model of hospital competition with demand inertia, we investigate the effect of *patient expectations* on quality provision. We consider three types of expectations. Myopic patients choose a hospital based on current variables alone, forward- looking but naive patients consider the future but assume that quality remains constant, and forward-looking and rational patients foresee the evolution of quality. We rank quality provision and show that it is higher under naïve than myopic expectations, while quality under rational expectations may be highest or lowest. This result also holds for patients' health gains, suggesting that rationality may hurt patients. Additionally, policies to reduce switching costs lead to lower quality unless patients are rational and cost substitutability between output and quality is sufficiently strong. Finally, we show how optimal price regulation depends on expectations and switching costs.

Does Containing Costs Reduce Hospital Quality?

PRESENTER: **James Gaughan**, Centre for Health Economics University of York

AUTHORS: Laurie Rachet Jacquet, Nils Gutacker, Luigi Siciliani Sici

Introduction To limit the growth in health spending, policymakers aim at containing costs without affecting quality of care. Reducing inpatients' length of stay when appropriate is an important lever to reduce costs and free up hospital capacity. For this reason, strategies to discharge patients on the same day as hospital admission, whereby patients are admitted to a hospital bed, receive the necessary care and are discharged within the same calendar day, have been incentivised for certain low-risk emergency conditions in the English NHS (British Association for Ambulatory Emergency Care, 2014).

However, the evidence around the safety of discharging patients early rather than admitting them overnight remains weak. We investigate the causal effect of being discharged from hospital on the same day as admission, therefore reducing length of stay, on quality of care. We focus on emergency patients admitted with chest pain in England, which is a common reason for attendance at the Emergency Department. Although chest pain often resolves itself within a short timeframe, it can be a symptom of more severe cardiac conditions. Concerns are that discharging patients too early may result in deteriorating patient health (Chen et al., 2010).

Data We use routine hospital records for around 900,000 chest pain emergency admissions to English hospitals between 2010-2014 and measure quality of care, our dependent variable, using patients' emergency readmissions within 28-day of hospital discharge. Control variables include patient clinical and socio-economic characteristics: age, sex, clinical risk factors, comorbidities, and income deprivation.

Methods We implement an instrumental variable strategy to account for possible omitted-variable bias due to unobserved patient severity. We regress emergency readmission against an indicator for being discharged on the same day as admission, while controlling for patient characteristics, hospital and time fixed effects. We instrument the probability of being discharged the same day by patient exposure to a policy which increased the rates of patients discharged on the same day of admission (Allen et al., 2016; Gaughan et al., 2019). From 2012, hospitals were financially incentivized to discharge patients presenting with mild chest pain symptoms before midnight of the calendar day of admission. Patients who arrived at the Emergency Department shortly before midnight were less impacted by the policy, due to the limited possibility of being discharged before midnight. Following a limited but growing literature (Américo and Rocha, 2020; Aouad et al., 2019), we use the variation in the intensity of the policy effect as our instrument.

Results OLS results show that being discharged on the same day is associated with better quality, measured by lower 28-day emergency readmission rates by around 0.8 percentage points (around 10 %). Our instrumental variable approach suggests no causal effect of being discharged on the same day on patient probability of being readmitted within 28 days. The results therefore suggest that reductions in costs can be achieved without affecting quality of care, thus providing novel causal evidence on a much-debated topic on the relationship between costs and quality.

Exploring Heterogeneity of Length of Stay Variation Among Emergency Laparotomy Patients in Ireland: A Quantile Regression Approach

PRESENTER: **Gintare Valentelyte**, Royal College of Surgeons in Ireland

AUTHOR: Prof. Jan Sorensen

Background

Emergency Laparotomy (EL) is a surgical procedure with high mortality risk and long length of stay (LOS). Previous analysis of LOS variation for Irish emergency admissions revealed the presence of heterogeneity. Our objective was to re-analyse the same dataset, and explore the entire LOS distribution, and its heterogeneity effects for this patient group, by applying Quantile Regression as a more advanced econometric approach.

Methods

We analysed national hospital episode data from the National Quality Assurance & Improvement System (NQAIS) for adult episodes discharged in 2014 to 2020 from Irish public hospitals with EL as a primary procedure code. Quantile Regression (QR) analysis was used to explore the heterogeneity effects along the entire distribution of LOS, at different quantiles: 10^{th}, 25^{th}, 50^{th}, 75^{th}, 90^{th} and 95^{th}. The QR estimates were compared with Ordinary Least Squares (OLS) estimates, and statistically significant heterogeneity effects identified. In our estimation, we adjusted for patient case-mix by including the following variables: sex, age group, medical card status, cancer diagnosis, admission source, Charlson Comorbidity Index (CCI) score, Intensive Care Unit (ICU) admission and discharge destination. We identified from which point along the LOS distribution, statistically significant heterogeneity effects were below, within or above the OLS estimates, and addressed potential consequences of this heterogeneity.

Results

We analysed 13,909 hospital episodes. The QR estimates show the presence of statistically significant heterogeneity effects for patients mainly in the long tail of the distribution, from the 75th and 90th quantiles, compared with those in the lower quantiles. LOS was significantly longer ($p<0.01$) for: male patients (by 1.7 days), older patients aged 70-79 years (by 3 days), patients admitted to an ICU (by 40 days), patients with CCI of +10 (by 30 days) and patients discharged to a nursing home (by 38 days). LOS was significantly shorter ($p<0.01$) for: medical card holders (by 7 days), younger patients aged 17-29 years (by 3 days), cancer diagnosed patients (by 8 days) and patients admitted from a nursing home (by 43 days). Statistically significant heterogeneity effects above OLS estimates were observed from the 75th and 90th quantiles for medical card holders, admissions from nursing home, admissions to the ICU, discharges to a nursing home, and cancer diagnosed patients.

Conclusions

The QR approach identified the presence of heterogeneity effects across the entire LOS distribution for EL patients. This suggests that relative to mean OLS estimates, QR is a better method for identifying heterogeneous effects, by considering the entire LOS distribution, and including higher extreme values in the estimation, which OLS tends to ignore. This draws importance to using the correct methodological approach when the outcome of interest does not follow a normal distribution, which is important for generating evidence to inform future policy decisions for emergency hospital services.

The Relationship between Client Satisfaction with Healthcare Services and Contraceptive Discontinuation Among Urban Clients from Three Sub-Saharan African Sites

PRESENTER: **Carolina Cardona**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Philip A Anglewicz, Amy O Tsui, Funmi OlaOlorun

Background

The discontinuation of modern contraceptives is the main contributor to unplanned pregnancies and unwanted births. In developing countries, 44% of pregnancies were unintended between 2010-14, almost two-thirds of which ended in abortion. Although some suggest that family planning service quality may impact contraceptive discontinuation, establishing a causal relationship has been challenging, primarily due to data limitations. In this research, we estimate the effect of client satisfaction with healthcare services on contraceptive discontinuation.

Data

We use longitudinal panel data from client exit interview (CEI), and service delivery points (SDP) from 3,291 female clients interviewed at private and public urban facilities of Kenya, Nigeria, and Burkina Faso from the Performance Monitoring for Action (PMA) Agile Project. Clients were first interviewed in person and received a follow-up phone interview call four months later. Facilities were surveyed at baseline.

Methods

Contraceptive discontinuation was measured as stopping contraceptive use between baseline and phone follow-up. Clients' satisfaction with healthcare services was constructed following three steps using CEI baseline information. First, we used exploratory factor analysis to reduce the dimensionalities of 12-quality-items ranked by clients into two factors, privacy (2-items: visual privacy, auditory privacy) and services (5-items: services available, medicines available, contraceptives available, hours of service, days of service). Second, we computed two non-self-mean variables at the facility level using the items identified in the factor analysis. Third, we transformed these two continuous variables into two binary facility-score variables using the mean of each variable as a threshold. The facility-score variables were merged to the clients' file where a woman obtained family planning services. We specified a bivariate probit model with site fixed effects to estimate the effect of client satisfaction with healthcare services on contraceptive discontinuation, controlling for individual and facility characteristics.

Main Findings

An average of 18.2% of clients using modern contraception at baseline discontinued their method four to six months later. At baseline, nearly 14% of clients reported experiencing a problem with service convenience, nearly 12% with the availability of medicines and contraceptives, and nearly 6% with facility cleanliness and/or staff treatment. We hypothesize that client dissatisfaction and discontinuation are related and estimate a bivariate probit regression model, controlling for individual and health facility characteristics. We find that client perceptions of staff treatment and facility cleanliness inform their expectations about service and contraceptive standards, affecting subsequent contraceptive discontinuation. The predicted probability of discontinuing contraception in the absence of experiencing a problem with facility cleanliness or staff treatment is 17.7%, which increases to 28.3% when clients experience such problems. Examining client dissatisfaction with family planning services can inform the family planning community on needed improvements to increase contraceptive adherence for women in need, which in the long run can prevent unplanned pregnancies and unwanted births.

Conclusions

Our results show that healthcare services may impact contraceptive discontinuation. Examining client's satisfaction with healthcare services will inform the family planning community on how to increase contraceptive adherence for women in need, which in the long run can prevent unplanned pregnancies and unwanted births.

4:30 PM –5:30 PM TUESDAY [Special Sessions]

SPECIAL SESSION: Adam Wagstaff Award

MODERATOR: **Winnie Yip**, Harvard T.H. Chan School of Public Health

DISCUSSANT: **Eddy Van Doorslaer**, Erasmus University; **Damien de Walque**, The World Bank

Cost-Sharing in Medical Care Can Increase Adult Mortality Risk

PRESENTER: **Giancarlo Buitrago**, Universidad Nacional de Colombia

AUTHORS: Prof. Grant Miller, Marcos Vera-Hernandez

Patient cost-sharing in medical care constrains total health spending, presumably with little harm to underlying patient health. This paper re-evaluates the link between cost-sharing and health, studying Colombia's entire formal sector workforce with individual-level health care utilization records linked to payroll data and vital statistics. Given discrete breaks in outpatient cost-sharing imposed at multiple income thresholds by Colombia's national health system, we use a regression discontinuity design and find that outpatient cost-sharing reduces use of outpatient care, resulting in fewer diagnoses of common chronic diseases and increasing subsequent emergency room visits and hospitalizations. Ultimately, these effects measurably increase mortality – and disproportionately so among the poor. To the best of our knowledge, this study is the first to show a relationship between cost-sharing and adult mortality risk, a relationship important to incorporate into social welfare analyses of cost-sharing policies.

Private Hospital Behavior Under Government Health Insurance: Evidence from India

PRESENTER: **Dr. Radhika Jain**, Stanford University

Expanding public health insurance is a key policy strategy to meet the goals of universal health coverage in lower income countries. In India, government insurance programs that entitle low-income households to free hospital care have been scaled up rapidly since 2008. In a major policy shift away from direct public provision of health care, these programs contract the private sector for service delivery and use prospective payment systems, where the hospital is paid a prespecified rate for each type of health service, to contain costs. These programs thus constitute a substantial public subsidy delivered through private agents, but how private hospitals participate within them has not been studied. Using over 1.6

million insurance claims and 20,000 patient surveys, and exploiting a policy-induced natural experiment that increased hospital reimbursement rates, we provide the first largescale evidence on the behavior of private hospitals within public health insurance in India.

We show that: 1) Private hospitals engage in substantial coding manipulation to increase their revenues at the government's expense. In response to changes in reimbursement rates, hospitals reallocate manipulation to services where the relative gains are highest. 2) Hospitals charge patients out-of-pocket for care against program rules. As a result, almost half of all patients pay for care that should be free and these payments constitute a 35% markup over the price the government pays. 3) Increasing reimbursement rates decreases these charges significantly, but hospitals capture approximately half the increased reimbursements. Pass-through is lower in more concentrated markets, and we find no evidence of changes in quality or risk selection that could explain incomplete pass-through. These results imply that balance-billing, where hospitals charge patients to compensate for too-low reimbursement rates can partially explain out-of-pocket charges, but that hospitals are also exploiting market frictions and poor program enforcement to capture a substantial share of the public subsidy as profit. 4) Increased reimbursement induces a supply response, with hospitals increasing monthly service volumes by 2-3% for every INR 1,000 increase in rates. Consistent with theory, the supply response is smaller in more concentrated markets.

These results show that, in contexts of weak oversight, profit-motivated private agents systematically flout program rules to increase their revenues at considerable expense to the government and patients. However, a key insight is that hospital non-compliance partially compensates for prices that are set too low to meet the participation constraints of agents. Prices (reimbursement rates) are a key policy lever that drive agent behavior and simply increasing monitoring, without appropriate price-setting, may increase compliance but decrease service provision. We also show that market structure, a factor rarely taken into account in social policy design in lower income contexts, can affect the extent to which public subsidies benefit citizens. Competition may partially substitute for monitoring by disciplining agents. The findings provide broader insights on contracting the private sector for delivery of health and other social services in settings with limited institutional capacity for monitoring and optimal price-setting.

4:30 PM–5:30 PM TUESDAY [Economic Evaluation Of Health And Care Interventions]

EQUITY INFORMATIVE ECONOMIC EVALUATION SIG SESSION: Addressing Equity Concerns in Economic Evaluation

MODERATOR: **Richard Cookson**, University of York

The Cost-Effectiveness Study of the Long-Term Impact of a Family-Based Economic Empowerment Intervention (Suubi+Adherence) on Suppression of HIV Viral Loads Among Adolescents Living with HIV in Southern Uganda

PRESENTER: **Sooyoung Kim**, New York University

AUTHORS: Ms. Ariadna Capasso, Sicong Sun, Torsten Neilands, Christopher Damulira, Flavia Namuwonge, Gertrude Nakigozi, Ozge Sensoy Bahar, Proscovia Nabunya, Claude A. Mellins, Mary McKay, Fred M. Ssewamala, Yesim Tozan

Background: A recent randomized controlled trial conducted in southern Uganda for 24 months (publication under review) presented evidence on the short-term effects of a family-based economic empowerment (EE) intervention, Suubi+Adherence, in improving adherence to antiretroviral therapy (ART) among the adolescents living with HIV (ALWHIV). This is suggestive of the potential longer-term benefits of EE interventions on the health of ALWHIV living in resource-poor settings; however, an assessment of such has not been conducted yet. In order for policy-makers to consider the integration of family-based EEs as part of routine HIV care programs, further assessment of the longer-term benefits and economic value of the intervention will be crucial.

Methods: Using a Markov model, we will assess the cost-effectiveness of a family-based EE program in a hypothetical cohort of ALWHIV in southern Uganda (n=702) in comparison to bolstered standard of care (BSOC) over a 10-year period. The model will include five mutually exclusive health states: under ART/viral load not suppressed; under ART/viral load suppressed; lost-to-follow-up/not under ART; lost to follow-up/under different care; and deceased. Costs, transition probabilities and the intervention effectiveness will be derived from the Suubi+Adherence trial and the relevant literatures where applicable. Intervention costs will be estimated from the healthcare provider perspective. All costs will be adjusted to and presented in 2019 US dollars. Deterministic and probabilistic sensitivity analyses will be performed to assess the uncertainty in the model parameters and the robustness of the cost-effectiveness results.

Expected result: Incremental cost-effectiveness ratios (ICER) in terms of cost per disability-adjusted life (DALY) year averted will be estimated and presented with 95 % confidence intervals. Estimated ICERs will be assessed using a country specific cost-effectiveness threshold that reflect the opportunity cost of committing resources to a specific intervention.

Expected conclusion: This study will provide an assessment of the longer-term economic value of a family-based EE intervention, which aims to improve ART adherence and outcomes among ALWHIV living in resource-poor settings. The findings will inform resource allocation decisions and help policy makers assess the impact and feasibility of integrating family-based EE interventions in routine HIV care programs in these settings.

Improving Health Equity and Ending the HIV Epidemic in the US: A Distributional Cost-Effectiveness Analysis

PRESENTER: **Cassandra Mah**, Simon Fraser University

AUTHORS: Amanda Quan, Emanuel Krebs, Xiao Zang, Siyuan Chen, Bohdan Nosyk

Background

In the United States, Black and Hispanic/Latinx Americans continue to be disproportionately impacted by the human immunodeficiency virus (HIV). In order to meet targets of the national 'Ending the HIV Epidemic' initiative, upfront investment to scale-up HIV-related services will be required to achieve such impact. We hypothesized that the greatest value and epidemiological impact will be derived from policies explicitly addressing racial/ethnic inequities. We aimed to determine the cost-effectiveness and distributional impact of two distinct combination implementation HIV approaches that either maintain service access inequities or attempt to correct them.

Methods

We adapted a previously-calibrated dynamic, compartmental HIV transmission model to characterize HIV microepidemics in six diverse US cities: Atlanta, Baltimore, Los Angeles, Miami, New York City, and Seattle. We considered combinations of 16 evidence-based interventions to prevent, diagnose, and treat HIV according to previously-documented levels of scale up. We then solved for optimal combination strategies for each city, with the distribution of each intervention implemented according to 1) existing service levels (proportional services approach) and 2) the racial/ethnic distribution of new diagnoses (between Black, Hispanic/Latinx, and white/other individuals; equity approach). We estimated total costs, quality-adjusted life years (QALYs), and incremental cost-effectiveness ratios of strategies implemented from 2020-2030 (health-care perspective; 20-year time horizon; 3% annual discount rate). We identified city-specific optimal bundles as the strategy that produced the highest health benefit while remaining cost-effective ($100,000/QALY threshold). We estimated three measures of population health inequality (Between-Group Variance, Index of Disparity, and Theil Index), incidence rate ratios, and incidence rate differences for the selected strategies under each approach. Results were summarized based on probabilistic sensitivity analysis.

Results

In all cities, optimal combination strategies under the equity approach generated more QALYs than those with proportional services, ranging from a 3.1% increase (95% Credible Interval [CrI]:1.4%-5.3%) in New York to more than double (101.9% [75.4%-134.6%]) in Atlanta. Compared to proportional services, the equity approach delivered lower costs over 20 years in 5/6 cities; lower cost differences ranged from $22.9M (95%CrI: -$5.3M-$55.7M) in Seattle to $579.8M (95%CrI: $255.4M-940.5M) in Atlanta. The equity approach also reduced incidence disparities and health inequality measures in five of six cities.

Conclusions

Equity-focused HIV combination implementation strategies that improve service equity for Black and Hispanic/Latinx individuals can not only reduce population health disparities, but can also provide significant health gains, reduce costs, and drive progress toward Ending the HIV Epidemic in America.

Treatment of Malaria in Under-Five Children in Nigeria: A Model-Based Extended Cost-Effectiveness Analysis

PRESENTER: **Mr. Rishav Raj Dasgupta**, Duke University
AUTHORS: Wenhui Mao, Osondu Ogbuoji, Gavin Yamey

Background: Nigeria accounts for a quarter of global malaria deaths.[1] Children under the age of five make up nearly 90% of Nigeria's malaria mortality.[2] The majority of these deaths occur in the most socioeconomically disadvantaged groups, largely due to high cost of treatment.[3] Artemisinin-based combination therapy (ACT), the recommended first line of treatment with proven efficacy, is highly underutilized on account of financial barriers.[4] Moreover, the poorest Nigerians use ACT at about half the rate of the richest[5]. With exceptionally high under-five mortality in the poorest groups, Nigeria has the worst child health equity among low and middle-income countries, stressing the need to evaluate how benefits of health interventions are distributed across socioeconomic lines.[6,7,8] This study aims to investigate the health and economic effects of government subsidization of malaria treatment for under-five children in Nigeria, and it is the first of its kind to study these effects across socioeconomic lines.

Methods: Our study population was all under-five children at risk of malaria. Using a static disease model and TreeAge decision analysis software, we conducted an extended cost-effectiveness analysis to estimate the number of malaria deaths averted, out-of-pocket (OOP) expenditure averted, and cases of catastrophic health expenditure (CHE) averted by employing three different intervention scenarios: (1) 50% subsidy of direct medical costs, (2) 100% subsidy of direct medical costs, and (3) 100% subsidy of all direct medical and indirect costs of treatment (i.e., income forgone to caregiving). For our model parameters, we sourced demographic and epidemiological data from the 2018 Nigeria Demographic and Health Survey and costing and other relevant data from published literature. Costs were calculated in 2020 USD. We determined distributional effects across socioeconomic lines by disaggregating results by wealth quintile.

Results: Fully subsidizing direct medical costs and instating a voucher system covering non-medical and indirect costs would annually avert over 19,000 under-five deaths, 8,600 cases of CHE, and US$205.2 million in OOP spending. Per US$1 million invested, this corresponds to an annual reduction of 76 under-five deaths, 34 cases of CHE, and over US$800,000 in OOP expenditure. On account of low initial treatment coverage in poorer socioeconomic groups, health and financial-risk protection benefits would be pro-poor, with the poorest 40% of Nigerians accounting for 72% of all deaths averted, 55% of all OOP expenditure averted, and 74% of all cases of CHE averted. Subsidies targeted to the poor would see greater benefits per dollar spent than broad, non-targeted subsidies.

Conclusion: Subsidizing case management of under-five malaria for the poorest and most vulnerable would reduce illness-related impoverishment and child mortality in Nigeria while preserving limited financial resources. This study is an example of how focusing a targeted policy-intervention on a single, high-burden disease can yield large health and financial-risk protection benefits in a low and middle-income country context and address equity consideration in evidence-informed policymaking.

Addressing Equity Concerns in Child Health Economic Evaluations: A Review of Distributional Cost-Effectiveness Analyses

PRESENTER: **Anton Avanceña**, University of Michigan School of Public Health
AUTHOR: Lisa Prosser

Background:

In cost-effectiveness analyses (CEAs), health gains are typically weighed equally regardless of who benefits, but there has been increasing attention to questions of weighting by age, and in particular for pediatric populations. The last 15 years have seen the introduction of novel approaches for valuing health utility for children, including generic instruments such as the CHU-9D and EQ-5D-Y. However, separate questions remain as to whether and how to weight outcomes to reflect societal preferences for prioritizing child health that have been observed in person trade-off and other preference valuation studies.

Distributional CEAs (DCEAs) are a type of CEA that provide information on the efficiency and equity of health interventions, and they hold promise in addressing equity concerns present in child health economic evaluations. In particular, distributional CEAs can help evaluate and compare the distribution of health outcomes through equity weighting and other means. In this study, we catalogue and characterize published DCEAs that include pediatric populations and evaluate how the distribution of child health outcomes have been evaluated.

Methods:

Following PRISMA guidelines, we searched MEDLINE (via PubMed) for English-language, peer-reviewed CEAs published on or before May 31, 2020. We included CEAs that (1) evaluated two or more alternatives; (2) used at least one equity-relevant characteristic in their analysis (e.g., age, disease severity); and (3) used one DCEA approach. We then identified the subsample of studies that included children ≤18 years in their analysis. We extracted data on selected study characteristics and described how equity concerns in child health economic evaluations were addressed or incorporated. We also assessed the reporting quality of the included studies using the CHEERS checklist.

Results:

Twenty-nine DCEAs published between 2011 and 2019 involved children or adolescents and were included in the final descriptive analysis. Only eight DCEAs out of 29 met the entire CHEERS checklist.

Most child health DCEAs evaluated prevention and health promotion: immunization programs (n=15) and health education (n=6). The equity-relevant characteristics addressed in these analyses were socioeconomic status (n=20), geography (n=9), race or ethnicity (n=6), and sex or gender (n=1). None of the analyses specifically addressed child age as an equity-relevant characteristic.

Five out of the 29 DCEAs weighted health outcomes differently for children, although this was not explicitly cited as an intentional goal of the study. These five DCEAs used DALYs that were calculated using age-weighted disability weights; these weights give greater preference for life years gained among young working-age adults (ages 15-40). Only one of these five DCEAs presented DALYs with and without age weights, and the study found that use of age weights did not change the results.

Conclusion:

DCEAs of child health interventions are growing in number and diversity, but they have not specifically addressed equity concerns of prioritizing child health. In addition to equity-relevant characteristics included in DCEAs, child age is a potential equity-relevant characteristic that could be addressed using DCEA methods to incorporate societal preference for prioritizing children. Additional research and innovation are needed in this area.

6:00 PM–7:00 PM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ORGANIZED SESSION: Women Health Care Work: Towards a New Social Contract That Fast Tracks Gender Equality in Global Health Systems

SESSION CHAIR: **Ana Langer**, Women & Health Initiative, Harvard School of Public Health

ORGANIZER: **Beverley Essue**, Institute of Health Policy, Management and Evaluation, University of Toronto

Women and Health: An Updated Estimate of the Economic Value of Women's Health Care Work

PRESENTER: **Dr. Felicia Knaul**, University of Miami

Felicia Knaul, Hector Arreola-Ornelas, Xiaoxiao Jiang, Oscar Mendez Carniado, Julio Rosado, Beverley Essue

Background and objectives:

Across the globe, women have critical, yet unrecognized and undervalued, roles as healthcare providers. Not only do women make up the majority of paid members of the healthcare industry, they also carry a disproportionate share of unpaid work compared to men. Women are essential to health and to social and economic development -before, during and post COVID-19. Yet, guaranteeing that women can achieve their full potential and are able to deploy their myriad contributions is hampered and crippled by the persistent gender inequality that plagues our world and seriously limits their capabilities. This paper presents an update to the landmark Lancet Commission on Women and Health, published in 2015. This study estimates the current and true global value of women's paid and unpaid health care work, accounting for the value of persistent gender discrimination faced by women in global health systems. We also estimate the impacts of COVID-19 on women's work within and alongside the health system.

Methods:

This study builds on the methodological approach that was developed for the Lancet Commission on Women and Health. To estimate the value of paid work, hours and wages of all health care occupations were identified using Labour Force Survey data from XX countries. The estimate of unpaid work was calculated using the total hours per week spent doing unpaid health care, health-related and health-promoting work, identified using Time Use Survey data from 50 countries, using both the average wage of the population and the average wage of paid caregivers in each country. Gender discrimination was accounted for using male wages as well as estimated using the Heckman selection and Oaxaca decomposition models. All wages were adjusted to account for the value of social benefit packages in each country.

Results:

The 2020 updated estimate of the value of women's health care work includes data from over 50 countries, representing over 70 percent of the world's population across low, middle and high income countries. The value of women's health care work accounts for a substantial share of global gross world product as well as a large percentage of the gross domestic product (GDP) for each category of country income level. When health promotion hours are accounted for, the value increases by two to three fold, using conservative measures. Unpaid work accounts for a substantial share of the total value of women's health care work. While COVID-19 slowed the market economy, the unpaid care economy was accelerated, exacerbating and gender inequalities in the provision of unpaid care.

Conclusions:

Since publishing the 2005 Lancet Commission on Women and Health, progress has been slow in advancing gender transformative reforms within health systems to value women's work and achieve gender equality. Women continue to be the motors of economic growth & produce most of the health care and caregiving. COVID may provide the opportunity to re-engineer health systems to enable and empower women. Gender transformative policies are essential to harness these opportunities.

Unpaid Health Care and Caregiving: A Gendered and Hidden Yet Indispensable Subsidy to Economic and Social Development

PRESENTER: **Beverley Essue**, Institute of Health Policy, Management and Evaluation, University of Toronto

Beverley M. Essue, Hector Arreola-Ornelas, Xiaoxiao Jiang, Oscar Mendez Carniado, Julio Rosado, Felicia Marie Knaul

Background and objectives:

The dual paid and unpaid roles that women play supporting and promoting the health of others are essential for maintaining healthy populations. This work collectively supports the sustainability of healthcare systems and has been critical for economic development. The global COVID-19 pandemic has magnified and reinforced the critical role of women as providers of health and health care across the globe. In these unprecedented times, women are shouldering the response to the pandemic across health systems as well as in homes and communities. But, women's full contributions to health remain undervalued in part, because much of this time is unpaid and underrecognized. This study was conducted as part of an update to the Lancet Commission on Women and Health. It aims to estimate the value of the hidden subsidy to families, communities and broader society that is provided by unpaid health and caregiving work and is predominantly carried out by women.

Methods:

This study builds on the methodological approach that was developed for the Lancet Commission on Women and Health. Total hours per week spent doing unpaid health care, health-related and health-promoting work were identified using Time Use Survey data from 50 countries. The value of unpaid work was estimated using two approaches: a replacement value (i.e. average wage of the population) and a 'social justice' value (i.e. the market value for similar work). Gender discrimination was accounted for using male wages as well as estimated using the Heckman selection and Oaxaca decomposition models. All wages were also adjusted to account for the value of social benefit packages in each country.

Results:

The updated estimate incorporates new data from over 50 countries which represent over 70 percent of the world's population, including low, middle and high income countries. Across each country income level, women consistently spend more hours per week than men doing unpaid health care, health-related and health promotion work. Women's work accounts for a substantial share of the total value of unpaid health care and care-giving. But, approximately 20% of this value reflects gender differentials in the wages that should be associated with this work, with a much larger gender wage gap estimated for low and middle income countries. The additional caregiving responsibilities brought on by COVID-19 have worse impacts on women's wellbeing and productivity than men's by disproportionately encroaching on women's available time.

Conclusions:

Unpaid health care and caregiving is unaccounted for, unrecognized and deprofessionalized and continues to provide a precarious and fragile foundation for global health and for the development of health systems. A new social contract would value women's unpaid health care as decent work and compensate it using a fair wage. Stronger and more fair labour and social welfare policies are needed, especially in low and middle income countries to better support families to balance care responsibilities and to shift the cultural norm about who is responsible for caregiving work.

Addressing Women's and Girls' Disproportionate Unpaid Care Work: Will COVID-19 be a Catalyst for Change?

PRESENTER: **Megan O'Donnell**, Center for Global Development

Megan O'Donnell

Centre for Global Development

The COVID-19 pandemic and resulting global recession have brought to light – and in some contexts exacerbated – the disproportionate childcare and domestic responsibilities that women and girls shoulder. As schools and childcare centers close or limit their operations, children have spent more time at home, increasing the time parents and other caregivers need to supervise them, prepare meals, and assist with schoolwork. Increased care work may mean an increase in total work burdens (should caregivers' paid work be maintained or increase), or perhaps a maintenance of total work burdens, as increased unpaid work may occur in simultaneity with reductions in caregivers' paid work. Because women and girls still perform the lion's share of unpaid care and domestic work in households, a significant proportion of these increased responsibilities have fallen to them – and have resulted in women's disproportionate exit from the labor force during the pandemic.

It is worth noting, however, that the evidence available on COVID containment measures increasing households' unpaid care work has largely focused on high-income, formal workforce populations. More evidence is needed to unpack this effect in lower-income settings, where fewer households follow a nuclear model, and caregiving responsibilities are often shared by older sisters, grandmothers, and other relatives and community members, thus requiring a distinct policy approach.

Using literature review methods, this presentation will examine 1) what the evidence suggests have been the impacts of the COVID-19 pandemic, recession, and associated policy response measures on the unpaid care burdens of women and girls in low- and middle-income countries, with an emphasis on lower-income populations; 2) the extent to which donor institutions and governments have risen to the challenge of reducing and redistributing unpaid care work; and 3) what else must be done to promote a care economy that supports children and caregivers alike.

Compensation Models for Community Health Workers: Comparison of Legal Frameworks across Five Countries

PRESENTER: **Madeleine Ballard**, Icahn School of Medicine at Mount Sinai

Compensation Models for Community Health Workers: Comparison of Legal Frameworks across Five Countries

Madeleine Ballard, Carey Westgate, Rebecca Alban, Nandini Choudhury, Rehan Adamjee, Ryan Schwarz, Julia Bishop, Meg McLaughlin, David Flood, Karen Finnegan, Ash Rogers, Helen Olsen, Ari Johnson, Daniel Palazuelos, Jennifer Schechter.

Background:

Despite the life-saving work they perform, community health workers (CHWs) have long been subject to global debate about their remuneration. There is now, however, an emerging consensus that CHWs should be paid. As the discussion evolves from whether to financially remunerate CHWs to how to do so, there is an urgent need to better understand the types of CHW payment models and their implications.

Methods:

This study examines the legal framework on CHW compensation in five countries: Brazil, Ghana, Nigeria, Rwanda, and South Africa. In order to map the characteristics of each approach, a review of the regulatory framework governing CHW compensation in each country was undertaken. Law firms in each of the five countries were engaged to support the identification and interpretation of relevant legal documents. To guide the search and aid in the creation of uniform country profiles, a standardized set of questions was developed, covering : (i) legal requirements for CHW compensation, (ii) CHW compensation mechanisms, and (iii) CHW legal protections and benefits.

Findings:

The five countries profiled represent possible archetypes for CHW compensation: Brazil (public), Ghana (volunteer-based), Nigeria (private), Rwanda (cooperatives with performance based incentives) and South Africa (hybrid public/private). Advantages and disadvantages of each model with respect to (i) CHWs, in terms of financial protection, and (ii) the health system, in terms of ease of implementation, are outlined.

Conclusions:

While a strong legal framework does not necessarily translate into high-quality implementation of compensation practices, it is the first necessary step. Certain approaches to CHW compensation - particularly public-sector or models with public sector wage floors - best institutionalize recommended CHW protections. Political will and long-term financing often remain challenges; removing ecosystem barriers - such as multilateral and bilateral restrictions on the payment of salaries - can help governments institutionalize CHW payment.

6:00 PM–7:00 PM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Chronic Conditions and Health Care Use

MODERATOR: **Robert Dubois**, National Pharmaceutical Council

Macroeconomic and Educational Externalities of the PEPFAR Program, 2004-2019

PRESENTER: **Dr. William Crown**, Brandeis University

PEPFAR is a US assistance program to help fight the HIV/AIDs program in low- and middle-income countries (LMICs). Since initiated in 2004, the program has spent about $100 billion dollars to assist poor countries in buttressing health care systems, including purchasing drugs and supplies, local labor, utilities, facility construction, various contracted and local program management services, medical equipment, and other products and services. While the public health impacts of PEPFAR have been studied extensively there are few studies of the economic impact on recipient countries' economies, and little is known about the nature of the economic impact, including impacts on economic equity.

This paper estimates the impact of PEPFAR on 3 indicators of the macro economies of recipient countries. The existing literature on this topic is very limited. But understanding the impacts of large donor assistance programs on recipient country economic development is an important issue for both donor countries and recipients. The limited literature shows that PEPFAR increases employment levels of males (Wagner, 2015), economic growth rates (Kim, 2017), and levels of GDP per capita and labor productivity (Daischel and Frist, 2018).

Methods

We utilize a panel data set including 158 low- and middle-income countries for 1990-2019 to estimate the impact of PEPFAR. The data set comes from public use data from the World Bank Indicator data, WHO, UNAIDS, US Foreign Aid Explorer, IHME, OECD, CRS, and the PEPFAR dashboard and web site. Ninety-four of these countries received PEPFAR aid, the others did not. Impact estimates of PEPFAR are obtained with a difference-in-differences econometric model that utilizes an indicator of PEPFAR participation after 2004. Impact estimates are made for each of 4 groups of PEPFAR countries that represent different approaches to policy planning and different levels of funding (all PEPFAR recipients, Country Operational Planning Process participants, Regional Operational Process participants, and secondary PEPFAR participants).

We estimate impacts of PEPFAR on the macroeconomic measures including measures of growth and debt levels, as well as the socioeconomic variable of female educational parity. The econometric models utilize covariates including baseline (2004) levels: % urban population, WHO health system ranking (2000), HIV prevalence rate, life expectancy, whether the US provided HIV aid prior to PEPFAR, and spending for HIV/AIDS by other donors (per capita).

The results indicate that PEPFAR has had positive impacts on GDP growth as well as the reduction in debt levels as a percentage of GDP. In general, these impacts are greatest in COP countries receiving the most PEPFAR assistance, as well as in low-income countries. There is some

evidence that PEPFAR has improved female educational parity but this result is significant only for all PEPFAR countries as a whole. Although the magnitudes of the coefficients in the various PEPFAR subgroups are fairly similar, none of these subgroup effects are statistically significant--suggesting that the smaller samples in the subgroups may be responsible. We also analyze the data over three time periods--2005-2009, 2010-2014, and 2015-2019--and find that the cumulative effect of PEPFAR increases over time, although at a decreasing rate.

Estimation of the Association between Chronic Obstructive Pulmonary Disease, Working, and Household Income in Three LMIC's: Uganda, Nepal, and Peru

PRESENTER: **Maria Kathia Cardenas**, Universidad Peruana Cayetano Heredia

AUTHORS: Trishul Siddharthan, Shumonta A. Quaderi, Suzanne L. Pollard, J Jaime Miranda, William Checkley, John Hurst

Introduction:

Chronic Obstructive Pulmonary Disease (COPD) is a chronic respiratory disease that affects 174.5 million people worldwide . In Low- and Middle-Income Countries (LMICs), where COPD is under-diagnosed and under-treated, COPD affects both quality of life of people and the ability of to continue working inorder to generate income. This research aims to estimate the association between COPD and work-related outcomes (paid work and household income) in three locations: Nakaseke, Uganda (semi-urban), Bhaktapur, Nepal (rural), and Lima, Peru (urban).

Methods:

This is a cross-sectional study a sub-sample from Global Excellence in COPD outcomes (GECo) project, where people aged ≥40 years were randomly selected to participate. 1230 heads of households under the age of 75 was used in final analysis. COPD was assessed using the spirometry (gold standard test). The dependent variables were working in paid employment (in the last 4 weeks) and household income per capita including all household members' contributions from different sources. The methodology includes: i) a descriptive and bivariate analysis of the main variables, ii) a multivariate regression using a logit model of the probability of working, and iii) an ordinary least squares estimation of the relationship between household income and COPD.

Results:

Uganda is the country with the highest proportion of working population (87% of participants without COPD and 84% of those with COPD). In Peru, the proportion of people working was also high (73% of participants without COPD and 70% of participants with COPD). However, in Nepal while 76% of those without COPD work, only 58% of those with COPD reported working. This research shows that COPD is negatively associated with the probability of working in Nepal ($p<0.05$), but no association was found in Uganda and Peru. In Peru, there is evidence that having COPD negatively affects the household income per capita ($p < 0.01$), but no association was found for the other countries. Moreover, having COPD in Peru decreases the household income per capita by 25.7%, after adjusting for household size and characteristics of the head of household like working status, sex, age, and education, compared to not having COPD.

Conclusion:

This study provides evidence that despite having COPD, people in the selected LMICs need to continue working to contribute economically to their households. This is particularly important considering that in all three countries there is a lack of an appropriate social protection system for people unable to work due to a chronic disease such as COPD, and there is limited access to the pension system. This research contributes to the literature on work-related outcomes of COPD focusing on three LMICs, where the evidence has been scarce.

Heterogeneity Among Women with Stroke: Circumstantial, Acute Care and Life Quality Differentials

PRESENTER: **Dr. Molly Jacobs**, East Carolina University

Background: Although men are more likely to have a stroke, women have a higher lifetime risk and are more likely to die from a stroke. Despite this increased severity, most studies focus on male/female differences in stroke onset, care and outcomes. Given that stroke presents differently in men and women, these mixed gender studies fail to account for the within gender heterogeneity among female stroke victims. This study examines the differences in circumstantial, health status, receipt of care, demographic and quality of life among young (<65) and old (≥65) women with stroke.

Methods: Cohorts of young and old women were identified from a pooled sample of 2014 through 2018 National Health Interview Survey (NHIS), a nationally representative sample of US adults. Within each cohort, women with stroke were matched to women without stroke using a pseudo-randomized matching function. Difference-in-different analysis was used to evaluate the social, acute care and health status differentials between young and old stroke victims.

Results: Diabetes, high blood pressure, high cholesterol and cigarette smoking are associated with increased risk of stroke among young women. Young women spend fewer nights in the hospital than their older counterparts but are less likely to take prescription medication. Young women who experience stroke are also less likely to be married and more likely to have low educational attainment.

Conclusions: Young women who experience stroke are less likely to utilize health services and received preventative care. These findings suggest that receipt of health services is essential for preventing stroke in both young and old women and that providers need to screen all patients for risk factors regardless of age.

6:00 PM –7:00 PM TUESDAY [Supply Of Health Services]

HEALTH WORKFORCE SIG SESSION: Shortage and Retention of Health Workforce

MODERATOR: **Sisira Sarma**, Western University

As Long As You Engage Me: Panel Data Evidence on Staff Engagement and Workforce Retention in the English NHS

PRESENTER: **Dr. Giuseppe Moscelli**, University of Surrey

AUTHORS: Melisa Sayli, Marco Mello

Background.

Over the last decade, the English National Health Service (NHS) has been facing increasing demand pressures coupled with constrained resources, resulting into an ongoing hospital workforce retention crisis. Differently from other businesses or insurance-based healthcare systems, the English NHS works always close to full capacity, and thus high workforce turnovers can be detrimental, both for the staff working life and the care provided to patients. Indeed, the average retention of nurses (doctors) in the same hospital over a one year horizon is 84.68% (85.49 %), i.e. half of the nursing (medical) workforce in a given hospital is completely changed over 4.2 (4.4) years.

Objectives.

It is often suggested that the lack of employee engagement may contribute to high turnover among the clinical workforce, although there is scant evidence to support this hypothesis in the existing literature. Through this study we aim to fill this gap: we investigate the relationship between clinical staff engagement and their retention, by focusing on doctors and nurses working in English NHS Acute and Mental Health hospitals between 2009 and 2019. While doing so, we investigate also complementarities in clinical staff retention within the same hospital, e.g. how the retention of nurses affects the retention of senior doctors (and vice versa).

Methods.

We construct a panel of English NHS hospitals including rich information on measures of retention and engagement at staff group level (i.e. doctors, nurses) and controls for healthcare provider characteristics (e.g. number of rival hospitals within a fixed radius, workforce age profiles). The measure of workforce retention is the official definition used in the NHS, i.e. stability indices for nurses and doctors computed as the share of individual workers by staff group remaining in their position between two consecutive years.

We estimate Blundell&Bond dynamic panel data models and unconditional quantile regression models (with hospital fixed effects) for the yearly hospital workforce retention as a function of NHS senior doctors' and nurses' staff engagement, own and complementary workers group retention in past years.

Results.

An increase by a 1 standard deviation (SD) in nurses' engagement results in a increase in their retention equal to 20.4% of a SD in nurses' stability index, while senior doctors' retention is not affected by their own engagement level.

Instead, occupational complementarities matter a lot for senior doctors: an increase by a 1 standard deviation in the previous year nurses' stability index withing the same hospital leads to an increase in doctors' retention equal to 15% of a SD of their stability index.

Finally, the effects of own engagement and occupational complementarities are much more pronounced at lower quantiles of the unconditional retention distribution.

Conclusions.

A feasible strategy to improve the overall hospital workforce retention in hospital care systems like the NHS is focusing first on increasing the engagement of nurses, as this has a direct and positive effect on their own retention, and in turn nurses' retention has positive spillover effects on senior doctors' retention.

Stand By Me: The Impact of the NHS Improvement Retention Programme on Nursing Staff Retention in the English NHS

PRESENTER: **Melisa Sayli**, University of Surrey

AUTHORS: Dr. Giuseppe Moscelli, Jo Blanden, Chris Bojke, Marco Mello

In many hospital care systems, nursing staff are recognised as a major input for the delivery of hospital care. In the English National Health Service (NHS), there are approximately 680 thousand professionally qualified clinical staff, with an almost 3:1 ratio of nursing staff to doctors. While the nursing staff is a significant component of the clinical workforce, English NHS has witnessed increasing leavers rates for nursing staff from 12.3% in 2012/13 to 15% in 2016/17. This has a direct impact on the organisation of work and, indirectly, on patient outcomes that have been highlighted in official policy documents.

A key policy response was the launch in July 2017 of the Retention Direct Support Programme (RDSP) by NHS Improvement (NHSI), which is a governing body responsible for overseeing the NHS Trusts, providing leadership and support to wider NHS. This programme aimed to reduce turnover rates and to improve retention of nursing staff in Acute Trusts and clinical staff in Mental Health Hospital Trusts. The RDSP was rolled out in 5 cohorts at different times, and Trusts were allocated to cohorts based on their past turnover rates and trends. The programme required Hospital Trusts to come up with their own retention strategies in an action plan, which was agreed upon with NHSI. NSHI monitored each Trusts' progress in the 12 months following the start and provided targeted support where needed.

We use Electronic Staff Records from 2015 to 2019, and exploit the differential timings of the programme start dates to evaluate the RDSP's effectiveness on nursing retention by implementing recent methodological advances in the difference-in-difference literature with staggered treatment adoption, i.e. Callaway and Sant'Anna (2020) and Sun and Abraham (2020) estimators.

Overall, we find that the programme has improved nursing retention by 0.76 percentage points (pp), i.e. it helped to retain on average 1,660 nurses and midwives who would have left their Trust otherwise, and also that the RDSP had an increasing effect in the 12 months after its launch. Trusts in Cohort 1, having the lowest average retention in the past 5 years, benefited the most from the programme with an average 0.90 pp increase in nurses' retention. Surprisingly, Cohort 4, which had the highest past retention among the treated cohorts, has experienced the second-highest improvement in retention by 0.85 pp in 12 months. RDSP improved the retention of Trusts in Cohort 2, but we do not find any significant impact on Trusts allocated to Cohort 3.

Our findings suggest that non-monetary interventions in the form of support programmes can lead to improvements in hospital workforce retention in English NHS. The RDSP impact might be limited in alleviating the nursing workforce challenges in the long run, but programmes like the RDSP provide viable and sustainable ways to prevent the 'heating' of workforce pressures in publicly funded healthcare systems.

When a Doctor Falls from the Sky: The Impact of Easing Physician Supply Constraints on Mortality

PRESENTER: **Edward Okeke**, RAND Corporation

To what extent are bad health outcomes a result of bad providers? This paper describes the results of a unique policy experiment designed to answer this provocative question. In this experiment, which was conducted in coordination with the Nigerian government, some communities were randomly selected to receive a new doctor. These doctors were posted to the public health center serving the community to work for a year. Prior to their arrival, health care was provided by mid-level health care workers. To separate the effect of (ostensibly higher) quality from that of quantity, another group of communities was provided with an additional mid-level health care worker. A third group of communities received no additional workers. No other inputs were provided. I find that, over the duration of the posting, newborn infant mortality dropped by more than 20 percent in communities assigned a new doctor. These mortality gains can be traced to significant improvements in the quality of medical advice and treatment. I estimate that a scaled-up version of the program would conservatively return about $5 for every dollar spent.

Registered Nurse Supply and Demand in California during the COVID-19 Pandemic

PRESENTER: **Prof. Joanne "MC" Spetz**, University of California-San Francisco

During the first nine months of the COVID-19 pandemic, numerous issues about the nursing workforce were reported. As states prepared for potential surges of patients, there was concern about shortages of registered nurses (RNs) prepared to work in intensive care units. Soon thereafter, nursing education programs reported that their students were not able to continue their clinical education due to worries about infection risks within hospitals. At the same time, anecdotal reports suggested that some RNs near retirement were choosing to retire early to reduce the risk of infection with SARS-Cov2. These changes could lead to shortages of RNs in both the short-run and long-run.

This study uses data from multiple surveys conducted in California to assess the current and future supply and demand of RNs, and to learn how the coronavirus pandemic affected this essential workforce. Data sources include: (1) the biennial Survey of California Registered Nurses, and (2) the Board of Registered Nursing Annual Schools Survey.

Preliminary data from the Survey of California Registered Nurses indicate changes in employment by age group, with nurses aged 60 years and older having lower employment rates and nurses aged 30 years and younger being less likely to work compared with 2018. Nurses aged 55 to 64 years were more likely to report that they intend to retire or quit nursing within two years as compared with 2018. Analysis of open-ended responses to the question "How has the coronavirus pandemic affected your nursing work?" indicate that many older nurses who are not working chose to leave the workforce due to concerns about their health and/or the health of family members. In contrast, younger RNs often reported that they could not find work due to their lack of experience in nursing. Ongoing analyses will examine differences in employment rates by education level, region of California, local COVID-19 case rates at the time of survey completion, and wages.

Preliminary data from the Annual Schools Survey indicate that about 10% of registered nursing programs skipped enrolling a new cohort of students in fall 2020. However, many of these programs were relatively small and thus total statewide enrollment did not decline substantially.

Programs reported challenges maintaining agreements with hospitals for clinical training of students, which were more often an issue for two-year publicly-funded community-college based programs as compared with four-year privately-funded programs.

The results of these two surveys will be compiled to update projections of future RN supply and demand in California. The supply projection is based on a stock-and-flow model, drawing parameters from the Survey of RNs and Annual Schools Survey, as well as other data on the RN workforce in California. The demand projection is benchmarked from multiple data sources to consider an array of scenarios. The sensitivity of supply to changes in wages will be considered, as well as whether employment rates appear associated with COVID-19 infection rates. As the pandemic abates, we will assess the potential for long-term labor RN market effects.

6:00 PM –7:00 PM TUESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Substance Use and Abuse

MODERATOR: **Terence C Cheng**, Harvard T.H. Chan School of Public Health

The Effect of State EITC Expansions on Alcohol and Cigarette Purchase

PRESENTER: **Dr. Xiaoxue Li**

The Earned Income Tax Credit (EITC) program is the largest anti-poverty program in the U.S. Numerous studies have evaluated the effect of EITC on low-income households and have found that EITC is associated with improvements in their wellbeing. In particular, EITC expansion is shown to be associated with improvements in physical and mental health (Hoynes et al., 2015; Gangopadhyaya et al., 2019; Baughman and Duchovny, 2016; Boyd-Swan et al., 2016), a decrease in suicide (Lenhart, 2019), an increase in educational attainment (Michelmore 2013), and a decrease in recidivism (Agan and Makowsky, 2018).

This study adds to the evaluation of EITC by looking at its effect on risky health behaviors, particularly the consumption of alcohol. On the one hand, EITC benefits are a form of additional income, which may lead to an increase in the purchase of alcohol and cigarettes if they are normal goods. On the other hand, EITC is associated with improved mental wellbeing (particularly a reduction in the onset of depression), which may lead to less use of alcohol and cigarettes.

To establish causal relationships, we use state-by-year variation in EITC benefits caused by expansions in state EITC programs. We use a difference-in-differences (DD) specification focusing on households with children and with low educational attainments, namely those with no household heads having any college education. We supplement the DD specification with triple differences models using households without children as an additional control group. The main data come from Nielsen homescan consumer panel data in years 2004-2016, which provide detailed information on daily purchases.

We find that state EITC expansion is associated with a significant decrease in alcohol purchase. Notably, the decrease in alcohol purchase does not appear to be concentrated in months with EITC payments, but is consistent throughout the year. The estimates are robust to different modeling specifications and the inclusion of extensive state-level controls.

A limitation of the Nielsen homescan consumer panel data is that the dataset does not include purchases that are not brought home. For example, it does not include alcohol purchases in restaurants or bars. Our next step is to supplement the analysis using data from the Consumer Expenditure Survey, which provides self-reported expenditures on alcohol and cigarettes regardless of the place of consumption.

Healthy People 2030 Countdown: How to Achieve the 5% Smoking Prevalence Target Among the US Population

PRESENTER: **Dr. Nigar Nargis**, American Cancer Society

Background

Smoking cigarettes causes illnesses among more than 16 million adults and half a million deaths annually in the US. Current national cigarette smoking prevalence is 14% with state-level variation from 7.9% in Utah to 23.8% in West Virginia. The Healthy People 2030 goal is to reduce current adult cigarette smoking prevalence to 5% by 2030. There is, however, no state-level quantification on policy measures necessary to achieve the target rate of decline.

Objective

In this study, a US cigarette tax model was constructed to project how much cigarettes tax increase would be required at the state level over 2022-2030 to reduce smoking prevalence to 5% by 2030 that would help reduce diseases and deaths caused by smoking.

Methods

State-specific linear trends in smoking prevalence over 2011-2019 were determined using fractional logit regression and compared with the desired linear trends for achieving 5% smoking prevalence by 2030 in individual states and the District of Columbia. The gaps between expected and desired trends were used in a simulation model for identifying state-specific systematic annual increases in average cigarette prices based on state- and year-specific price elasticity of smoking prevalence, maintaining the status quo in other non-tax tobacco control measures. The required tax increases were determined based on the assumption of full pass-through of tax increases to price increases. The baseline scenario includes state-wise cigarette smoking prevalence and price and tax per pack of cigarettes in 2021. The state-wise trends in smoking prevalence were determined based on data from the Behavioral Risk Factor Surveillance System over 2011-2019. State level cigarette tax and price data were drawn from the Tax Burden on Tobacco database, 2011-2021.

Results

There is wide spatial disparity in smoking prevalence across states that has persisted since the beginning of the observation period in 2011. The linear trend estimates over 2011-2019 show that there is remarkable variation in the annual rate of decrease in smoking prevalence across states from -1.01 percentage points (pp) in the District of Columbia (DC) to -0.32 pp in New Hampshire. The trends in smoking prevalence observed over 2011-2019 exceed the desired trends for achieving 5% smoking prevalence target by 2030 in only five states (e.g., Utah, Massachusetts, Maryland, Connecticut, Virginia) and the DC. It suggests that U.S. will miss the target smoking prevalence at the current rate of reduction in smoking. 45 states would need systematic annual increases in cigarette excise tax rate in a range of $0.02 to $1.53 per pack over 2022-2030 to meet the target. The desired prices in 2030 indicate that 37 states are required to raise the average cigarette price above $10 by the end of this decade. The desired tax rates in 2030 fall in the range of $5 to $10 for most states.

Conclusions

The feasibility of reaching the Healthy People 2030 goal would critically depend on the acceleration of progress in tobacco control. Tax increases tailored to the needs of individual states combined with scaled-up non-tax tobacco control policy interventions can help achieve the desired progress.

Recreational Marijuana Laws and the Use of Opioids: Evidence from NSDUH Microdata

PRESENTER: **Chandler McClellan**, US Agency for Healthcare Research and Quality

AUTHORS: Mir Ali, Ryan Mutter, Daniel Rees

Recent studies have concluded that legalizing medical marijuana can reduce deaths from opioid overdoses. Using the National Survey on Drug Use and Health from 2004-2018, a survey uniquely suited to assessing drug misuse, we examine the relationship between recreational marijuana laws

(RMLs) and the use of opioids. Standard difference-in-differences estimates provide strong evidence that RMLs encourage the consumption of marijuana by adults. By contrast, the results with regard to opioid abuse are decidedly mixed: several reasonable specifications do not produce evidence of a negative relationship between RMLs and the misuse of prescription pain relievers such as OxyContin and Vicodin; likewise, there is no evidence of a negative relationship between RMLs and the use of heroin. We conclude that legalizing recreational marijuana may not be a viable strategy for combating the opioid overdose crisis.

6:00 PM –7:00 PM TUESDAY [Specific Populations]

IMMUNIZATION ECONOMICS SIG SESSION: Biases and Inequities in Resource Allocation Decisions and Access to Immunization

MODERATOR: **Dr. Logan Brenzel**, Bill & Melinda Gates Foundation

The Vaccine Economics Research for Sustainability & Equity (VERSE) Toolkit: A New Approach for Assessing Multidimensional Inequities in Healthcare Access & Outcomes

PRESENTER: **Bryan Patenaude**, Johns Hopkins Bloomberg School of Public Health
AUTHORS: Elizabeth Watts, Gatien de Broucker, Cristina Garcia, Deborah Odihi, Salin Sriudomporn

Background:

Following a call from the World Health Organization in 2017 for a dashboard to monitor immunization coverage equity in line with the 2030 Agenda for Sustainable Development, this study proposes a new methodology and toolkit for measuring and tracking multidimensional vaccine-related equity in coverage, economic impact, and health outcomes. This work builds upon existing equity methods and toolkits by expanding the outcomes assessed and providing a method for aggregation across multiple dimensions of inequity including socio-economic, gender-based, and regional to create a composite equity metric that is trackable over time and comparable between settings.

Methods:

The VERSE composite vaccination equity assessment metric is derived from literature on the measurement of socio-economic equity by Wagstaff and Erreygers combined with measures of direct unfairness in healthcare access outlined in the works of Fleurbaey, Schokkaert, Cookson, and Barbosa. The metric takes the form of a concentration index of vaccination coverage, where instead of ranking individuals by income, individuals are ranked by multidimensional unfairness in access. The direct unfairness measure is the predicted vaccination coverage from a logistic model based upon multiple dimensions of fair and unfair sources of variation in vaccination coverage. Fair sources of variation in coverage may include whether the child is underage to receive the vaccine according to the national immunization schedule. Unfair sources of variation may include sex of the child, maternal education, or socio-economic status. The direct unfairness healthcare metric is then assessed as the predicted probability of vaccination, holding the fair determinants at reference levels and allowing the unfair determinants to vary. This metric is then utilized as the ranking variable in a concentration index alongside vaccination coverage to compute the composite coverage equity metric. Vaccine coverage can be replaced with DALYs averted, cost-of-Illness averted, or out-of-pocket expenditure, respectively, to compute multi-dimensional inequity over these alternative outcomes. Each of these multi-dimensional concentration indices can be decomposed to determine the percent contribution of each determinant to overall composite inequity. The resulting analysis can be conducted separately for individual vaccines as well as over a coverage indicator for zero-dose or fully immunized. Finally, the VERSE toolkit permits the examination of equity-efficiency tradeoffs through the presentation of an equity-efficiency plane, which pairs the composite metric with a coverage-based or production function-based measure of efficiency to examine the relative performance of subnational geographic units on the dual goals of equity and efficiency.

Results:

Results from the application of the VERSE methodology will be available in 2021 for Bangladesh, India, Nigeria, China, and Uganda.

Conclusions:

Our work builds upon existing toolkits by providing a method for aggregation across multiple dimensions of inequity. It also allows policymakers to determine the relative magnitude of drivers of overall inequity in vaccine outcomes rather than simply the drivers of socio-economic inequity. Additionally, the toolkit expands the available outcomes for inequity analysis from coverage to include financing and health outcomes. This framework could be adapted to generate a composite health system equity metric to track equitable progress toward Universal Health Coverage (UHC) beyond the vaccine space.

An Evaluation of the Drivers of Inequity in Zero-Dose Vaccination Status in India: Results from a Multidimensional Inequity Analysis

PRESENTER: **Bryan Patenaude**, Johns Hopkins Bloomberg School of Public Health
AUTHORS: Elizabeth Watts, Gatien de Broucker, Cristina Garcia, Deborah Obehi Odihi, Salin Sriudomporn

Background:

Gavi, the Vaccine Alliance defines zero-dose children as children who have not received a single dose of DTP vaccine by age 5. This study examines the multidimensional inequity in zero-dose status of children in India, as well as the primary drivers of inequity, using data from the 4th round of the National Family Health Survey (NFHS-IV). This work is an application of the Vaccine Economics Research for Sustainability & Equity (VERSE) toolkit, created by the authors in collaboration with country researchers, to assess multidimensional equity in vaccine coverage, cost-of-illness, and health outcomes.

Methods:

Data is from the NFHS-IV conducted in 2015-2016. The VERSE composite vaccination equity metric is derived from literature on the measurement of socio-economic equity by Wagstaff and Erreygers and measures of direct unfairness in healthcare access outlined in the works of Fleurbaey, Schokkaert, Cookson, and Barbosa. The metric takes the form of a concentration index of vaccination coverage, where instead of ranking individuals by income or socio-economic status (SES), individuals are ranked by multidimensional unfairness in access. The direct unfairness measure is the predicted vaccination coverage from a logistic model over multiple dimensions of fair and unfair sources of variation in vaccination coverage. Fair sources of variation in DTP1 coverage include whether the child is underage to receive the DTP1 vaccine according to India's national immunization schedule. Unfair sources of variation include sex of the child, maternal education, SES, health insurance coverage, state, and urban designation. The direct unfairness healthcare metric is assessed as the predicted probability of DTP1 vaccination, holding the fair determinants at reference levels and allowing the unfair determinants to vary. This metric is then utilized as the ranking variable in a concentration index alongside vaccination coverage to compute the composite coverage concentration index. The multi-dimensional concentration index is then decomposed to determine the percent contribution of each determinant to overall inequity, rather than only SES inequity.

Results:

The overall concentration index for the multidimensional equity measure is 0.195 (SE: 0.003) indicating that those with higher levels of unfair advantage are statistically significantly more likely to be vaccinated with DTP1 than those with lower levels of unfair advantage. The primary driver of unfair advantage in not having a zero-dose child is maternal education accounting for 24% of the inequality in zero-dose status, followed by socio-economic status contributing 20% and health insurance coverage contributing 3%. Fair determinants of healthcare, being underage for DTP1 according to the national immunization schedule, explains 5% of the overall inequity in vaccination.

Conclusions:

Most equity analyses only examine the decomposition of socio-economic inequity. Our study measures and decomposes multi-dimensional inequity and finds that maternal education contributes more to overall inequity in zero-dose status than does socio-economic status. Our analysis and the VERSE toolkit can allow policymakers to determine the relative importance of drivers of overall inequity in vaccine outcomes to better target programs. This framework could be adapted to generate a composite health system equity metric to track equitable progress toward Universal Health Coverage (UHC) beyond the vaccine space.

How Are Mathematical Models of Vaccine Preventable Diseases Used, or Not, By Decision Makers at a Global Level?

PRESENTER: **Paula Christen**, Imperial College London

AUTHOR: Lesong Conteh

Vaccine preventable diseases in low- and middle-income countries are a global concern. International agencies such as the World Health Organization, and Global Health Initiatives such as the Global Fund and the Global Alliance for Vaccination and Immunization (Gavi, the Vaccine Alliance), play a prominent role in supporting countries with financial resources, capacities to strengthen health systems and the provision of guidelines. Decisions on where, whom and what to allocate resources to result from a multitude of factors. Key funding agencies invest substantially into research efforts, suggesting that evidence is a critical factor informing investment decisions. Despite numerous global initiatives to enhance knowledge utilization, the understanding of how burden of disease and vaccine impact estimates are used by decision makers at a global level is limited. Therefore, in this study, we aim to examine how those involved in modelling and commissioning burden of disease and vaccine impact estimates understand the use of evidence from mathematical models in informing resource allocation decisions for vaccine preventable diseases at a global level.

Twelve semi-structured interviews were conducted with mathematical modelers (evidence producers) and employees at international organizations, who are involved in decision making processes (evidence consumers) at a global level. Information was collected on stakeholders' experiences and perceptions of the use of mathematical models at global level. All mathematical modelers were purposively sampled by their extensive vaccine modelling experience at a global level. Data from interviews were mapped to Carol Weiss' framework, which acknowledges the spectrum of evidence use typologies.

Burden of disease and vaccine impact estimates are used concurrently for different purposes. We found that burden of disease and vaccine impact estimates serve for accountability and advocacy purposes to solicit funding from partner organizations. "Negative research", i.e. research that does not create a compelling case in line with decision-makers' expectations, is less likely to be regarded as useful. In this context, evidence is not commissioned to solve problems or to support innovative science. We found that resource allocation decisions are the result of many different factors to which scientific evidence contributes. Its use to inform decisions is strongly influenced by social interactions and relationships among evidence producers and consumers.

This research suggests that commissioned evidence is mainly used symbolically for advocacy purposes by agencies that provide donor assistance for health to low- and middle-income countries. Burden of disease and vaccine impact estimates are not used in a clear and justified way in resource allocation decisions of international agencies. Rather than leading resource allocation decisions, research evidence is commissioned to justify global actors' pursuit in the complex policy-making venue around vaccines. We conclude that there is a lack of transparency on resource allocation decision-criteria and their weighting. To what extent research evidence is explicitly used in resource allocation decisions at global level remains unclear. This is likely to affect national resource allocation decisions and the use of evidence to inform these, as priorities of global funding agencies have been found to have a significant impact on national funding priorities in developing countries.

Systematic Review of Costs for Beneficiaries and Caregivers to Seek and Reach Vaccination Sites

PRESENTER: **Tatenda Yemeke**, UNC Chapel Hill

Abstract

Introduction: Understanding the costs to identify under-vaccinated populations, as well as costs incurred by beneficiaries and caregivers for reaching vaccination sites, is essential to improving vaccination coverage. However, there have not been systematic analyses focused specifically on documenting such costs for beneficiaries and caregivers seeking vaccination.

Methods: We conducted a systematic review to estimate these costs. We searched PubMed and the Immunization Delivery Cost Catalogue (IDCC) in 2019 for the costs for beneficiary and caregiver to 1) seek and know how to access vaccination (i.e., costs for social mobilization and interventions to increase vaccination demand), 2) take time off from work, chores, or school for vaccination (i.e., opportunity and productivity costs), and 3) travel to vaccination sites. We assessed if any of these costs were specific to populations that faced other non-cost barriers, based on a framework for defining hard-to-reach and hard-to-vaccinate populations for vaccination.

Results: We found 53 studies describing information, education, and communication (IEC) costs, social mobilization costs, and the costs of interventions to increase vaccination demand, with the mean cost per dose at $0.41 (standard deviation (SD) $0.83), $20.72 (SD $52.77) and $28.28 (SD $76.08) in low-, middle-, and high-income countries, respectively.. Only one study described productivity losses incurred by beneficiaries and caregivers seeking vaccination. We identified five studies on travel costs incurred by beneficiaries and caregivers attending vaccination sites. Eight studies described hard-to-reach barriers to vaccination. Two studies reported costs per dose specific to hard-to-reach populations, which were 2–3.5 times higher than the costs for the general population.

Conclusion: Across all country groups, social mobilization/IEC costs were well-characterized, although there is limited evidence on costs incurred by beneficiaries and caregivers getting to vaccination sites. Understanding the potential incremental costs for populations facing barriers to reach vaccination sites is essential to improving vaccine program financing and planning.

6:00 PM–7:00 PM TUESDAY [Special Sessions]

Student 2020 and 2021 Prize Winning Papers 1

MODERATOR: **Tinna Laufey Asgeirsdottir**, University of Iceland

ADHD Misidentification in School: Causes and Mitigators

PRESENTER: **Jill Furzer**, University of Toronto

ADHD diagnoses increase discontinuously by a child's school starting age, with young-for-grade students having much higher ADHD diagnosis rates. Whether these higher rates reflect over-diagnosis or under-diagnosis of older peers remains unknown. To decompose this diagnostic discrepancy, we exploit differences in parent and teacher pre-diagnostic assessments within a school starting age regression discontinuity strategy. We show that being young-for-grade or male generates over-assessment of symptoms. However, under-assessments of the oldest students in a grade, especially the oldest females, account for a large part of the observed school starting age assessment gap. We argue that this difference by sex and higher school starting age effects in lower-income schools may aid known gaps in educational attainment by gender and socioeconomic status. Importantly, we demonstrate that teacher special education training mitigates these age-based assessment errors.

The Long Run Effect of Medicaid on Receipt of Public Assistance

PRESENTER: **Dr. William Schpero**, Cornell University

State and federal policymakers have articulated concerns about the budgetary implications of expanding Medicaid eligibility, arguing that investments in Medicaid could induce "benefit lock," whereby recipients of Medicaid become dependent on the program and other forms of public assistance. In this study, we examine the long-run effect of receiving Medicaid as a child on the receipt of means-tested public assistance in adulthood. We conducted a regression discontinuity analysis, leveraging quasi-random exposure to increased Medicaid eligibility in childhood by birthdate. We found that the increase in Medicaid eligibility in childhood was not associated with significant changes in receipt of medical, cash, or

non-cash public assistance in later life. At most, subgroups exposed to the greatest increases in Medicaid eligibility exhibited later life decreases in non-cash assistance of 2 to 3 percentage points.

Health Insurance Reform and Retirement: Evidence from the Affordable Care Act

PRESENTER: **Kevin Wood**, FDA

The Affordable Care Act has provided millions of Americans with medical insurance but may have led to an increase in retirement among older individuals who are utilizing the newly available coverage options as a substitute for employer-provided insurance. Using data from the American Community Survey from 2009–2016, this hypothesis is tested by estimating the effect of the premium subsidies and Medicaid expansions of the ACA on retirement transitions for the non-Medicare eligible cohort of older Americans aged 55–64. Research results indicate a 2% and 8% decrease in labor force participation resulting from the premium subsidies and Medicaid expansions, respectively. Slightly larger estimates are found among a subgroup of adult couples. The study also finds suggestive evidence of crowd-out of employer-sponsored insurance by subsidized marketplace plans but finds no such effects from the Medicaid expansions.

Medical Schools, Access to Doctors, and Health Outcomes: Evidence from the One Prefecture, One Medical School Policy in Japan

PRESENTER: **Kisho Hoshi**, University of British Columbia

Geographical inequality in access to doctors has been a long-standing problem in many countries. Even though various policies have been implemented to provide more doctors to doctor-scarce areas, empirical evidence on the effectiveness of such policies is at best mixed, and we know surprisingly little about the impacts of these policies on health outcomes. In this research, taking advantage of a unique policy intervention in Japan called the "One Prefecture, One Medical School Policy" implemented in the 1970s, I investigate the effects of establishing a medical school and an associated university hospital on access to doctors and mortality rates in targeted prefectures. To estimate causal effects, I use newly digitized prefecture-level panel data from 1960 to 1999 and employ an event study and the difference-in-differences method. My findings are two-fold. First, the establishment of a medical school and a university hospital together increased the number of doctors per capita in treated prefectures, closing 87% of the gap that existed between treated and control prefectures before the policy intervention. Second, the mortality rates in treated prefectures began to decline, not when a university hospital was established but when new medical graduates began to work as interns at the hospital, closing 26% of the pre-intervention gap between the treated and control prefectures. Cause-specific mortality analyses further indicate that such mortality effects were limited to acute and intractable diseases. My results suggest that opening medical schools in rural areas is a potential policy to mitigate geographical disparities in access to doctors. My results also indicate a possibility that the new medical graduates played an essential role in decreasing mortality rates.

6:00 PM –7:00 PM TUESDAY [Evaluation Of Policy, Programs And Health System Performance]

ORGANIZED SESSION: Health System Performance Assessment: Implications for Health Reform in the State of Odisha, India

SESSION CHAIR: **William Hsiao**, Harvard T.H. Chan School of Public Health

ORGANIZER: **Anuska Kalita**, Harvard T.H. Chan School of Public Health

DISCUSSANT: **Rahul Sankrutyayan Reddy Kadarpeta**,

Private Sector Pharmaceuticals and Poor Financial Risk Protection in the State of Odisha, India

PRESENTER: **Annie Haakenstad**, Harvard T.H. Chan School of Public Health

Background

Financial risk protection in the Indian state of Odisha is poor. The rate of catastrophic heath expenditure (CHE) was 24% in 2018, the second-highest across India. Nearly 70% of health spending was sourced from out-of-pocket (OOP) payments, of which 66% was disbursed on drugs alone, despite government policy that drugs be provided free-of-charge at public facilities. Furthermore, India is the third-largest producer by volume of pharmaceuticals worldwide, potentially making drug prices lower than countries that need to import them but also increasing the potential impact of supplier-induced demand and other shaping of consumer preferences. The question, thus, is whether the problem of high drug OOP spending in Odisha is due to lack of supply in the public sector or, alternatively, whether consumers bypass public sector drugs because they prefer to purchase brand name drugs in the private sector.

Methods

We collected data from 7,550 households and 30,654 individuals. We use Shapley decomposition to analyze variation in OOP as a share of consumption expenditure according to why and where care was sought, what OOP was disbursed for, and underlying sociodemographic characteristics. We link users of healthcare with a health facility survey in which we collected information about the drugs in stock and other health facility characteristics. Using the linked data, we assess whether government health facility users with substantial OOP spending on drugs faced drug stock-outs or whether users instead bypassed the free drugs in stock at public pharmacies for private pharmaceuticals. Finally, we assess whether high OOP drug costs and public sector stock outs were associated with the market for private sector drugs, measured by the number of private pharmacies surrounding government health facilities.

Results

At each visit in the 15 days prior to the survey, individuals obtained 2.6 drugs, 86% of which were obtained in the private sector. At visits to government facilities, 2.9 drugs were obtained, 72% of which were purchased in the private sector with 51% of OOP spending disbursed to purchase drugs. More than half of all CHE among government health care users was due to OOP drug spending alone. Among public health care users, 62% of all variation in OOP as a share of consumption expenditure was explained by whether drugs were purchased in the private sector, and 14% was explained by the number of drugs obtained. Users of health care at public facilities were more likely to obtain drugs from the private sector when overall drug stocks were low. Average stocks were lower where the density of private sector pharmacies was higher.

Conclusion

Spending on drugs in private sector pharmacies is a major contributor to the poor financial risk protection observed in the state of Odisha. Public health facilities may be relying on the private sector to fill gaps in supply of drugs. To reduce CHE, the government must consider the market for private sector drugs and the supply of drugs in the public sector, including whether patients prefer the private sector to the public sector for obtaining pharmaceuticals.

Who Goes Where, and Why?

PRESENTER: **Jan Cooper**, Harvard T. H. Chan School of Public Health

Background

One goal of health systems reform is to ensure that access to care will generated improved population health outcomes while reducing the financial risks associated with using health services. Yet the interrelated and complex dynamics of a health system make it challenging to pinpoint which reforms will ensure that health care is well organized and delivered effectively, and that scarce resources are distributed efficiently and fairly. How, and how effectively, citizens access care provides important insights for reforming a health system.

Access to care is shaped by the demand for health services and how these services are supplied by the health sector. Interventions (for example, information campaigns or incentives programs) have had some success at improving the uptake of health services. However, access to care is only effective at improving a health system's end goals (i.e. good health outcomes among satisfied citizen who are protected from the financial risks of health care) if it takes place in a context of high-quality care by providers in facilities that work efficiently. Here, we analyze how citizen's access to

care is situated within the broader ecosystem of health providers. Looking at access to care in the context of the mix of public and private providers, organizational efficiency and quality can highlight the types of reform options needed for a more effective health system.

Methods

Our analysis is based on a cross-sectional household survey conducted in six districts of Odisha. We link household surveys to surveys of facilities where respondents sought care, and map the ecosystem of providers in a region. We use descriptive analyses of health seeking among key demographic subgroups of the population. We situate these patterns of health seeking within the mix of public, private and informal providers within a region and draw on analyses of how efficiently facilities provide care and the quality of care provided.

Results

Preliminary analyses indicate that while the majority of respondents report access to health services, there is significant variability in availability and use of public versus private providers. Our analysis will explore over-use or foregone care across demographic subgroups and within the landscape of private and public providers in each region.

Conclusion

Linking care-seeking patterns to analyses of provider quality and efficiency provides insights on new ways the health system can achieve its end goals. Furthermore, analyzing the relationship between access to care and provider characteristics in the context of a region's mix of public and private providers can help disentangle the complex dynamics within the health system, and point to new opportunities for reform.

Quality for Care in India: An Assessment of Competence Among Public and Private Sector Providers in Odisha, India

PRESENTER: **Anuska Kalita**, Harvard T.H. Chan School of Public Health

Background

Evidence confirms that health systems with strong primary care are more likely to achieve better health outcomes, more equity in health, and greater efficiency. India's health system faces many challenges in achieving these goals. As an effort to address gaps in primary care, the government's Ayushman Bharat program (2018) aims to build Health and Wellness Centers (HWCs) – public sector facilities that are envisioned to deliver primary care. While this is an ambitious endeavor, it is important to examine this program in the context of the quality of healthcare services in India. For primary care programs to successfully improve the population's health outcomes and achieve health system goals, timely and correct treatment delivered by providers is critical. Poor competence of primary care providers to correctly diagnose and treat patients could lead to delayed care that results in preventable complications, often requiring several healthcare visits, expensive hospitalizations, and wasted spending on unnecessary treatments.

In this paper, we assess the competence of primary care providers in both public and private sectors in the state of Odisha in India; and examine differences between these two types of providers on three parameters: competence to make a correct diagnosis, knowledge of the diagnostic process, and competence to provide correct treatment.

Methods

We use data from a survey of 110 providers in public and private sectors who were administered clinical vignettes on five illness conditions. The survey was undertaken in six districts of Odisha, one of the poorest states in India. The public sector providers included physicians at government-run primary health centers, and the private sector providers included those engaged in solo-practice, irrespective of medical qualifications.

Results

We find that competence of both public and private providers is poor. Overall, only around half the providers could correctly diagnose the conditions presented in our vignettes. Public sector providers showed poorer competence to both correctly diagnose and treat most common conditions, compared to private sector providers. A majority of providers from both sectors prescribed a high number of incorrect and unnecessary drugs, with public sector providers prescribing more number of drugs for each condition. Further, providers, especially those in the public sector, did not refer patients even for conditions that mandatorily require referrals for appropriate care. The widespread misdiagnosis of common conditions, the prescription of a high number of unnecessary drugs, and a lack of referrals raise concerns for meaningful access and health expenses in a context where primary care is uninsured.

Conclusion

Most programs in India have focused on expanding coverage and access. Given the abysmally low competence of primary care providers in general and public sector providers in particular, India's policy efforts towards improving access to primary care need to be re-examined. It is time that these programs go beyond access to include *access with quality*. Our findings have relevance for health systems like India's with healthcare markets with little de facto regulation and significant market failures arising out of information asymmetry.

Understanding the Organizational Structure of Healthcare Facilities in Odisha, India

PRESENTER: **Bijetri Bose**, Harvard T.H. Chan School of Public Health

Background

Health systems in many low- and middle-income countries suffer from the inefficient use of resources in the form of low curative care bed ocupancy rates; shortage, absenteeism, and low productivity of healthcare workers. A standard solution has been to implement monitoring and reward schemes for providers. However, such reforms are often met with limited success because they fail to address the insufficient incentives inherent in the organization of healthcare facilities. For example, in an experimental study in India where nurses' absence in government health facilities was recorded and punished, the authors found that the administration undermined the scheme. Such experiences have led to the increasing acknowledgment of organizational reforms as an essential part of health systems reforms. Therefore, it is crucial to examine the organizational structure of healthcare facilities as a significant determinant of their behavior.

In this paper, we seek to study the organizational structure of public healthcare facilities and examine whether these are associated with the indicators of efficiency. We follow the framework developed by Preker and Harding, in which five elements of hospitals' organizational structure have been identified. These are the allocation of decision rights, distribution of residual claims, degree of market exposure, the structure of accountability mechanisms, and provision for social functions. The framework also highlights the importance of considering three factors that are external to the facilities - the relationship between the government and facilities, input and output market environments, and funding and payment systems - when examining the organization structure.

Methods

Using organizational level data from a survey of health care facilities conducted in six districts of Odisha, India, we provide a descriptive analysis of each of the five elements. Officers-in-charge at government hospitals at all levels of care were asked detailed questions on the facilities' internal administration, management, finances, decision-making autonomy, accountability mechanisms, market exposure, and others. These questions allow us to measure the degree to which the five organizational elements in public facilities depart from the private sector's incentive regime. A review of government documents and the literature is used to supplement the survey data and provide information on externals environments. Further, we exploit detailed facility-level data to assess the relationship between the elements and the efficiency outcomes.

Results & Conclusion

Our analysis highlights the inconsistencies in the five organizational elements within and across public healthcare facilities in the state. We also find that the inefficiency problems observed in the health system are associated with some of the organizational elements. An analysis of each element is necessary to formulate an appropriate reform package that corresponds to the internal and external environment of facilities. Although specific aspects of each organizational element have been explored individually, this study takes a comprehensive approach to study the role of organization structure in healthcare providers' underperformance. In doing so, it contributes to the understanding of efficiency.

6:00 PM –7:00 PM TUESDAY [Health Care Financing And Expenditures]

FINANCING FOR UNIVERSAL HEALTH COVERAGE SIG SESSION: Financing and Fund Pooling for Universal Health Coverage

MODERATOR: **Nirmala Ravishankar**, ThinkWell

Social Health Insurance Programs Consolidation and Urban-Rural Inequality in China

PRESENTER: **Di Yang**, Pennsylvania State University

AUTHORS: Yubraj Acharya, Xiaoting Liu

Background. Inequality in healthcare access and outcomes is a pressing development challenge in many low- and middle-income countries. In response, countries have formulated reforms to consolidate different public health care programs into fewer unified programs. Although such efforts have the potential to improve efficiency and reduce inequality between different segments of the population in theory, the empirical evidence on the magnitude of such effects is lacking. In 2016, China consolidated two of its insurance programs that previously catered separately to rural and urban populations, thus offering an opportunity to fill this important gap in the literature.

Methods. We use publicly available data from the China Family Panel Survey, a nationally representative survey that collects data on health, socio-economic factors, and demographic characteristics of the Chinese population every two years. For our main analysis, we utilize a sample of 15,264 individuals for whom data on insurance type was available in both 2014 (pre-consolidation) and 2018 (post-consolidation). Our identification approach relies on an augmented difference-in-differences analysis whereby we compare the two programs that were consolidated—New Cooperative Medical Scheme (NCMS), the Urban Resident Basic Medical Insurance (URBMI)—to a different program that was not consolidated (Urban Employee Basic Medical Insurance (UEBMI)), before and after the consolidation. Following previous literature, we examine the policy's effect on gaps in total and out-of-pocket medical expenditure, and reimbursement between rural and urban residents. County and municipal governments in China have the latitude to customize healthcare schemes within their jurisdiction. Therefore, in our main specification, we include county fixed effects, thus estimating the effect of consolidation based on within-county variation in outcomes for individuals with different insurance types.

Key findings. We find that the urban-rural gaps in medical expenditure and total reimbursement *widened*, and by large amounts, as a result of the consolidation. The urban-rural difference in total medical expenditure increased by 58%, while the difference in reimbursement increased by 208%. These findings are robust to multiple modeling approaches, including accounting for clustering of values near zero and sample attrition between survey years. The results also do not seem to be due to differential trends in the gaps before the consolidation of the two programs, at least for one of the outcomes for which sufficient data to assess the trends were available.

In exploring possible mechanisms, we find that the widening of the urban-rural gap is due to a sharp increase in expenditures and utilization among population that initially had URBMI (consolidated program catering to urban residents). This, in turn, seems to due to the urban-rural differences in access to care and the lack of gatekeeping in the Chinese healthcare system—both of which benefited the urban population disproportionately after the consolidation.

Policy implications. Efforts toward universal health care, such as consolidation of various programs, have the potential to exacerbate inequality, at least in the near term. In the context of China, our findings point to the need to address supply-side constraints in rural areas and promote an integrated delivery system based on primary health care.

Does More Pooling of Health Revenues Guarantee More Equity? A Warning to Countries Setting up New SHI Systems

PRESENTER: **Dr. Daniel Cotlear**, The Palladium Group

Introduction: Greater pooling of health revenues is a standard recommendation made to governments. It is expected to improve equity by redistributing in progressive ways. All forms of health insurance redistribute from the healthy to the sick; pooling revenues in social/national health insurance is expected to also contribute to equity by redistributing from the better off to the vulnerable. While the logic is clear, little empirical evidence from developing countries exists showing that the directioin of redistribusion is progressive. Despite this lack of evidence, many countries in Africa and Asia are creating new SHI systems that pool together funds to provide health care for civil servants and for vulnerable populations (e.g. Ghana, Ethiopia, Nigeria, Indonesia). This paper aims to shed a light into the black box of social/national health insurance pools by developing a simple methodology to measure redistribution within the pool. Using evidence from Peru, it shows that the distribution of benefits does not run automatically from the better off to the vulnerable. Who gains and who loses is influenced by politics; Ministries of Finance are parties to the politics with a bias towards civil servants.

Methods: Using administrative data (commonly available in most SHI agencies), the paper identified the three main populations covered by the Peruvian SHI: private sector workers, public sector workers, and pensioners and their families. It then measured the revenues and expenditures of each individual covered by the insurance and identified the redistributive flows across the three populations. This produces a measure of the implicit subsidies and implicit taxes paid by each population. The political economy of the health sector and its relationship with the Finance Ministry is described and used to explain the findings.

Results: Redistributive flows between the three subpopulations are very large. While in terms of demography and income the public and private sector workers are similar, the system works in a way that taxes the private sector workers heavily. This tax is then used to subsidize the public sector workers and their families and the pensioners.

Conclusions: While greater pooling of health revenues can potentially improve equity, this does not happen automatically. There is a risk that the health financing pool be used by governments to promote policies that are unfinanced and are unrelated to health. A special risk occurs when civil servants are pooled together with other populations, as Ministries of Finance often use the pool to subsidize civil servants. A clear social policy framework, transparency and accountability mechanisms must be in place to advance towards better health and equity.

The Impact of Health Financing Systems on Health System Outcomes: A Regression Analysis across 124 Countries, 2000-2017

PRESENTER: **Jacopo Gabani**, Centre for Health Economics at the University of York

AUTHORS: Sumit Mazumdar, Marc Suhrcke

INTRODUCTION

UHC is widely recognised as a key component of the global development agenda. A well-designed health financing strategy is considered a major factor in achieving UHC objectives of improving population health, equity, and financial risk protection. Several low- and middle-income countries (LMICs) are considering health financing systems reforms (e.g., social health insurance (SHI) introduction) to accelerate progress towards UHC. However, empirical evidence of the actual contribution of health financing systems to health system outcomes is scarce, in particular for LMICs.

METHODS

We assign country-year observations to one of three health financing systems (i.e., predominantly OOP, SHI- or government-financed), using clustering, a machine learning method, based on out-of-pocket (OOP), contributory SHI and non-contributory government financing as percentage of health expenditure. Intermediate outcomes are (total) health expenditure and immunization coverage. Health system outcomes are life expectancy (LE), under-5 mortality, maternal mortality, catastrophic health expenditure (10% threshold). We estimate the effect of health financing systems via fixed effects regressions. We control for several contextual factors, and interact relevant ones (e.g., informal sector size) with health financing system variables.

RESULTS

We find that transitions to SHI-predominant health financing systems resulted in increased health expenditure. However, transitions to government-predominant systems are associated with better results than SHI-predominant ones for most outcomes (government-predominant HFS effect on LE (+1 year, $p<0.1$), under-5 mortality (-9%, $p<0.05$), catastrophic health expenditure (-2.9 percentage points, $p<0.05$)). Larger informal sectors worsen health financing systems effects. Results are largely robust to several checks.

DISCUSSION

While SHI health financing systems resulted in increased health expenditure, it is more likely that proportional increases in non-contributory government health expenditure is associated with expanded services coverage, and ultimately improved health system outcomes. Possible reasons are: SHI coverage being contribution based, SHI implementation costs, SHI tendency to favour secondary/tertiary care expenditure, SHI ability to decrease OOP expenditures, and SHI heterogeneity. These findings do not mean that non-contributory, government-predominant health financing systems are *always* better than contributory SHI-predominant health financing systems. However, these results issue a warning for policy-makers considering SHI reforms to reach UHC.

Wednesday

4:00 AM –5:00 AM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Educational Impacts on Own and Others' Health

MODERATOR: **Ravindra Rannan-Eliya**, Institute for Health Policy

The Spillover of Sibling Education on Own Health in China

PRESENTER: **Lei Lei**, Research Institute of Economics and Management, Southwestern University of Finance and Economics

This paper studies the spillover effects of sibling's education on one's education, health, and health behavior. I use the introduction of a compulsory schooling law around 1986 in China which leads to exogenous variation in sibling's years of schooling, since the policy effect varies depending on the calendar year in which a child is born. I find positive sibling spillover effects in education. I also find positive spillovers in health and health behavior. The heterogeneity analysis provides suggestive evidence supporting the mechanisms of sibling interaction and health information transmission, other than only through the positive spillover in education. This non-negligible externality of education policy suggests that using education policy as an instrument to improve population health is more effective than we used to think.

Long-Term Health Impact of Education in Developing Country: Evidence from Massive Primary School Construction Program in Indonesia

PRESENTER: **Muhammad Fikru Rizal**, Centre for Health Economics, Monash University

AUTHORS: David Johnston, Nicole Black, Rohan Sweeney

Educational attainment is often considered as a key input into good health, particularly where modifiable behaviours are involved. Consequently, high quality evidence on the effect of schooling has important public policy implications for improving population health and its associated economic returns. Despite the increasing burden of chronic non-communicable diseases in low- and middle-income countries, studies from these settings are generally focused on HIV risk and maternal and child health outcomes, and there remains a paucity of evidence on long-term health outcomes. Recent evidence from high-income countries, mostly using natural experiments such as changes in compulsory schooling laws, find that only small or zero long-term health gains can be achieved with additional years of high school attainment. Differences in epidemiological profile, information diffusion, technological advancement, and demographic profiles, including average baseline education level could all compromise the relevance of this evidence for policy-makers in low and middle-income countries.

We contribute to this evidence gap by estimating the long-term health effects of a massive primary school construction initiative in the 1970s, the Sekolah Dasar (SD) INPRES program, in Indonesia. We compare differences in objectively measured health outcomes between older cohorts (born in 1957-1962) and younger cohorts (born in 1968-1972) who were differentially exposed to the program because of the timing and the varying levels of program intensity across districts. We link the historical record on the number of primary schools built and other pre-program characteristics of each district with around 2 million individuals aged 40 years old or older from the last seven waves of the Indonesia National Socioeconomic Survey (SUSENAS) and more than 200,000 individuals from the 2018 National Basic Health Survey (RISKESDAS).

We confirm previous findings of a positive and significant effect of the INPRES program on years of schooling and probability of finishing primary school, but identify that these effects are specific to individuals born in Non-Java districts where the population density is lower. Focusing on this affected sub-population, we find that exposure to an additional INPRES primary school per thousand children in each district increases the likelihood of women being overweight (BMI $\geq$ 25 kg/m2) and centrally obese (waist circumference >80 cm) by 1.6 and 1.3 percentage points, respectively. Meanwhile, there is no effect on the probability of being obese (BMI $\geq$ 30 kg/m2) or having high blood pressure. Our further analysis suggests that higher consumption of packaged and takeaway meals might explain the observed findings. However, in terms of self-reported health outcomes, we find a small reduction in the likelihood of having at least one health complaint in the past month and using outpatient care in the past 6 months, indicating a non-immediate effect of being overweight on subjective health.

Effects of College Education on Family Formation, Birth Weight, and Lifetime Fertility in East Asia: Evidence from a Japanese Zodiac Superstition

PRESENTER: **Rong Fu**, Waseda University

AUTHORS: Mr. Yichen Shen, Dr. Haruko Noguchi

Highlight

This study aims to investigate college education's effect on family formation, age of first-time parents, birth weight, and lifetime fertility. We obtain the causal inference by using an instrumental variable (IV) approach. One novelty comes from the IV, a peer reduction effect of a Japanese zodiac superstition in 1966. Another is from showing the causal inference across various life stages by using a dataset over 40 years. Our findings build on the literature on how education would affect family-related outcomes and provide valuable implications to family policies among industrialized countries aiming to stimulate the birth rate.

The Zodiac Superstition

Japanese believe women born a special year, named "the firehorse year," are particularly dominating and thus shorten their husbands' lives. Consequently, the Japanese avoid having children in such a year, leading to an abnormal decline in firehorse years' birth rate. The latest "firehorse year" was 1966, the birthrate of which declined by 25.4% compared to 1965.

Method

With fewer peers, the cohort born in 1966 (the firehorse cohort) is supposed to experience a much lower competition to enroll in colleges. However, the firehorse cohort, in particular those females, may also experience disadvantages in the marriage market due to superstition. To disentangle the causality between the education and family-related outcomes, we should construct an IV for the firehorse cohort that associates only with college enrollment but not with the marriage market.

Accordingly, we exploit a mismatch between the calendar year and the Japanese school year to construct the IV. Given that the Japanese school year starts in April, three months later than the calendar year starts in January, individuals born from January to March in 1967 (the mismatched cohort) are sorted into the firehorse school year but are not affected by the superstition. Put differently, this mismatched cohort experienced only the lower competition of college enrollment without the confounders of the superstition. We thus leverage this mismatch as the IV to a college education.

Data

We use three administrative records in this study. The first is the marriage and divorce records of Vital Statistics from 1974 to 2016, based on which we investigate the effect of college education on family formation. The second is the birth records of Vital Statistics in Japan from 1974 to 2016, in which birth weight of newborns, parents' birthdate and socioeconomic statuses are reported. We use it to examine the effect of college education on birth weight. The last is the Japanese census from 1980 to 2015, based on which we trace the fertility for the mismatched cohort over various life stages.

Results

We find that college education postpones family formation and leads to a greater age of first-time parents. Furthermore, we find evidence that mothers' college education results in lower birth weight, whereas the fathers' college education has no effects on birth weight. Finally, we find that lifetime fertility is higher among individuals with a college education, for both men and women.

4:00 AM –5:00 AM WEDNESDAY [Supply Of Health Services]

Ownership

MODERATOR: **Michelle Tran**,

Ownership Status, Prices and Quality of Nursing Homes in Australia

PRESENTER: **Jongsay Yong**, University of Melbourne

AUTHOR: Dr. Ou Yang

Background:
Countries have increasingly turned to privatisation and market forces as a way to improve efficiency and contain rising expenditures in aged care. Australia is no exception. Since the introduction of the Aged Care Act in 2013, Australia has introduced a series of policy reforms to inject more competition and consumer choice in aged care. Concomitantly, private for-profit providers have experienced increasing market share in the sector.

Objectives:
This paper investigate whether quality of care differs by ownership status, specifically whether quality of care is higher in facilities that are private for-profit, government-owned, or profit not-for-profit. An ancillary objective is to gauge the extent to which prices and the employment of registered nurse (RN) hours (as key inputs to the production process) contribute to the difference in quality. The focus on price and RN hours, and the use of comprehensive and never-before available data are unique contributions of this paper.

Methods and Data:
We consider nursing homes to maximise a mixture of revenue and social welfare by choosing quality, price and key inputs (represented by registered nursing hours). We estimate a series of three-equation systems consisting of quality, price, and registered nurse hours using data in the collection of the Royal Commission into Aged Care Quality and Safety. In total 10 quality measures covering a wide range of quality domains are used, including indicators based on the outcome monitoring system proposed by the Registry of Senior Australians (ROSA) and measures constructed from administrative data. The former include casemix adjusted rates of: (1) Antipsychotic use, (2) premature mortality, (3) adverse medication, (4) dementia hospitalisation, (5) emergency department presentations, (6) falls, (7) pressure injuries; in addition, measures based on administrative data include: (8) Complaints per resident, (9) assaults per resident, (10) total care hours per resident per day.

Results:
Preliminary results indicate that government-owned nursing home facilities provide better quality of care, charge lower prices and employ more RN hours than private for-profit facilities. Of the 10 quality measures, government-owned facilities are found to perform better than private for-profit homes in 7 measures, no difference in two (premature mortality, assaults), and poorer in one (antipsychotic use). Government-owned homes are also found to charge lower prices and provide more RN hours than for-profit and not-for-profit facilities.

Conclusions:
Recent policy reforms in Australia have been promoting consumer choice and competition in aged care, resulting in an increase in private sector participation. However, despite their higher prices on average, for-profit nursing homes are found to provide lower quality of care in most quality domains than government-owned homes. Policymakers should focus on addressing sources of market failures in aged care, specifically on improving public reporting of quality information and increasing price transparency.

A Supply Side Perspective: Health Facility Readiness to Deliver HIV Testing and Treatment Services to Pregnant Women in Indonesia

PRESENTER: **Rabiah Adawiyah**, The Kirby Institute, UNSW

AUTHORS: David Boettiger, Tanya Applegate, Rebecca J Guy, Ari Probandari, Virginia Wiseman

Background: In 2015, more than 1.4 million pregnant women were infected with HIV, and mother-to-child transmission (MTCT) of HIV led to over 150,000 infant cases. In response, prevention of Mother-to-Child Transmission (PMTCT) programmes commenced in Indonesia in 2006, and in 2016 Indonesia's introduced a strategy for the elimination MTCT by 2022. Yet in 2018, the coverage of HIV testing among pregnant women was only 48%, and treatment coverage among women who tested positive was also 48%. We measured supply-side constraints to the delivery of Indonesia's PMTCT programme and whether availability and readiness were associated with the uptake of HIV testing in pregnant women.

Methods: Three main datasets were used: (i) The World Bank Quantitative Service Delivery Survey (QSDS) which involved 268 public facilities (Puskesmas) and 289 private facilities (GP clinics, single and multi-practitioners) across 22 districts and 11 provinces; (ii) the Indonesian Ministry of Health's HIV/AIDS surveillance database (SIHA); and (iii) annual reports of the district health offices. We measured the availability and readiness to deliver HIV testing and treatment in pregnancy based on 11 indicators related to: staff and training; guidelines; equipment and infrastructure; and diagnostics and medicines. We used univariate and multivariate analysis to explore the association between the coverage of HIV testing and health facility readiness and a range of other explanatory variables including geographic location, availability of HIV trained counsellors, and number of midwives.

Findings: 60% of public and 14% of private facilities provided HIV PMTCT services on site. HIV rapid tests were available in 44% of public facilities and 0.3% of private facilities. Option B (+), the recommended treatment for expectant mothers living with HIV, was available in 2.2% of public facilities and no private facilities. Only 9% and 0.3% of public and private facilities had maternal antiretroviral prophylaxis. HIV testing uptake was more likely to occur in facilities who had a higher readiness index (OR= 2.54, CI= 1.27 to 5.06) and less likely in facilities located outside of Java (OR= 0.13, CI= 0.03 to 0.52) or those that relied more heavily on village midwives to deliver maternal care (OR= 0.82 CI= 0.67 to

0.99). Key gaps in supply-side readiness for PMTCT HIV include shortages in the supply of rapid tests and treatments, trained staff including experienced counsellors, the provision of PMTCT guidelines and private spaces for consultations and counselling.

Conclusion: Our findings confirm that quality delivery of HIV MTCT care relies on range of structural, staffing, training, and system factors. To achieve Indonesia's 2022 target for the elimination of HIV MTCT, strengthening the capacity of primary health care providers and better integration of private providers into the Indonesian health system must be a priority.

Why Do Public Hospitals Have Higher Management Quality Than Private Hospitals in China? An Examination of Internal and External Mechanisms

PRESENTER: **Shijiao Deng**, School of Public Health, Fudan University

AUTHORS: Min Hu, Hao Zhang, Shuqi Zhang, Wen Chen, Winnie Yip

High quality of hospital management has been shown to positively affect hospital performance. In China, contrary to many western countries, public hospitals are often perceived to have higher management quality. It is of academic interest and policy relevance to examine whether this perception is true empirically, and if so, to understand what factors contribute to the different management quality between public and private hospitals. Previous literature has found hospital management to correlate with both internal and external factors. Therefore, both mechanisms are examined in this study.

We conducted County Hospital Survey (CHS) and World Management Survey (WMS) to public and private county hospitals in rural Guizhou province, China in 2015 and 2018. CHS collected detailed hospital information including leadership, operations, finances, human resources, and policy and market environment. WMS conducted interviews of hospital managers using a double-blind survey technique, where managers were not told they were being scored and interviewers were not told about hospital performance. Scores were then obtained on four dimensions and aggregated into an overall management score. Pooling data on 128 hospitals from 2015 and 72 hospitals from 2018, we examined whether public hospitals were better-managed than private hospitals and what factors explained the difference.

First, we estimated reporting bias by interviewee characteristics utilizing the fact that two managers were interviewed from each hospital. We found systematic reporting bias by interviewee age, sex, and education. After correcting for the bias, we found public hospitals to be substantially and significantly better-managed overall and in all four management dimensions. The differences were largely explained by hospital size. More investment in management in public hospitals also explained part of the differences. In contrast, the degree of centralization in internal management, government evaluation of the hospital director, and market competition did not explain the differences.

Private Choices, Public Costs: Evaluating Cost-Shifting between Private and Public Health Sectors in New Zealand

PRESENTER: **Erin Penno**, University of Otago

AUTHORS: Trudy Sullivan, Robin Gauld, Dave Barson

Background

New Zealand's health system is typically characterised as publicly-funded and provided. However, individuals may opt to purchase private health insurance and receive care in the private system or pay for privately-provided health care out-of-pocket. The private system is not publicly subsidised and is generally considered to operate in parallel with the public system. Yet, financial boundaries between the public and private sectors are not well defined and patients receiving privately-funded care may subsequently seek follow-up care within the public health system, in effect shifting costs to the public sector. This study evaluated this phenomenon, examining whether cost-shifting between the private and public hospital systems is a significant issue in New Zealand.

Methods

We used inpatient discharge data from 2013/14 to identify private events with a subsequent admission to a public hospital within seven days of discharge. We examined the frequency of subsequent public admissions, the demographic and clinical characteristics of the patients and estimated the direct costs of inpatient care incurred by the public health system.

Results

Approximately 2% of private inpatient events had a subsequent admission to a public hospital. Overall, the costs to the public system amounted to NZ$11.5 million, with a median cost of NZ$2800. The most common reasons for a readmission from the private to the public sectors related to sequalae of a procedure, including hemorrhage, infection and disorders of the circulatory and digestive system. Primary diagnoses clearly linked to complications accounted for a third of the total readmissions and cost the public sector NZ$3.26 million.

Implications

Within the context of overall health spending in New Zealand the costs being passed from the private to the public health sector are relatively small. Nevertheless, our study implies substantial sums may be being diverted to deal with acute follow-up care for patients, many of whom will have arguably bypassed the reasonably stringent prioritisation processes for elective care within New Zealand's public health system. It also indicates that greater uptake of private health insurance has the potential to both increase pressure on acute services within the public health system and crowd out or divert funding away those less able to afford private care – in effect, further compounding existing inequities in access to health care and outcomes. Our research adds to the debate and the evidence base surrounding patterns of use and the impact of private sector provision on efficiency and equity of access in dual health care systems. As New Zealand considers the future of its health system, these findings highlight the need for greater understanding and discussion around the interface and interactions between the public and private health systems.

4:00 AM –5:00 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: The Burden of Mental Disordersand Cost-Effectiveness of Interventions to Prevent Mental Disorders in Young People

SESSION CHAIR: **Matthew Hamilton**, Orygen

ORGANIZER: **Mary Lou Chatterton**, Deakin Univeristy

DISCUSSANT: **Cathy Mihalopoulos**, Deakin University

Burden and Health State Utility Values of Mental Disorders in Adolescents: Results from a Population-Based Survey

PRESENTER: **Long Khanh-Dao Le**, Deakin University

AUTHORS: Lidia Engel, Mary Lou Chatterton, Cathy Mihalopoulos

Background and Aim: Mental disorders including depression, anxiety, conduct disorders and ADHD are associated with high economic and disease burden. There is little information regarding the health state utility values (HSUVs) of mental disorders and subthreshold mental disorders according to their clinical severity using comparable instruments in adolescents. This study reports HSUVs for mental disorders and subthreshold mental disorders using data from a population-based survey.

Methods. Data from 2,967 adolescents aged 11-17 years who participated in the second Australian Child and Adolescent Survey of Mental Health and Wellbeing were analysed. An interviewer-led parent/carer questionnaire was administered for demographic variables. The Diagnostic Interview Schedule for Children (DISC-IV) completed by parents was used to identify mental disorders experienced by adolescents during the previous 12

months. HSUVs were derived from the Child Health Utility-9D (CHU-9D) and analysed by disorder classification (depression only (DEP), anxiety-related only (ANX), conduct disorder (CD) only, ADHD only, comorbidities and subthreshold mental disorders. Results were weighted to represent the Australian general 11-17 years old population. The adjusted Wald test was applied to detect statistically significant differences of weighted means.

Results. In total, 1348 (45%) individuals met criteria for a 12-month mental disorders or subthreshold mental disorders. The mean HSUVs of mental disorders and subthreshold mental disorders was 0.78 (SD = 0.20) compared to 0.81 (SD=0.18) for no mental disorders. Specifically, HSUVs for DEP, ANX, CD, ADHD and comorbidities were 0.66 (SD = 0.29), 0.69 (SD = 0.25), 0.75 (SD = 0.26), 0.75 (SD=0.19), and 0.67 (SD = 0.23), respectively. Individual with subthreshold mental disorders had HSUVs of 0.78 (SD = 0.19). There were statistically significant differences of HSUVs between mental disorders or subthreshold mental disorders and no mental disorders except CD. No differences in utility values were observed between disorders within disorder groups.

Conclusions. HSUVs of adolescents with mental disorders or even subthreshold mental disorders were statistically significant lower than those with no mental disorders, which highlight the burden associated with mental disorders. The derived utility values can be used to populate future economic models.

Health State Utilities of Transgender and Gender Diverse Children and Adolescents

PRESENTER: **Lidia Engel**, Deakin University

AUTHORS: Ishani Majmudar, Ken Pang, Michelle Tollit, Cathy Mihalopoulos

Background: Trans and gender diverse individuals experience higher rates of mental health problems, such depression and anxiety, as well as various physical health issues, all of which negatively impact upon their lives. Many also experience gender dysphoria, which is the distress that arises due to incongruence between one's gender identity and birth assigned sex. To our knowledge, not a single study has assessed the health state utilities of this cohort. The aim of the study was to examine the health state utilities of trans or gender diverse children and adolescents and to draw comparisons to established population norms in Australia.

Method: Data were derived from a prospective cohort study (Trans20) of children and adolescents first seen at the Royal Children's Hospital Gender Service (Melbourne, Australia) between February 2017 and February 2020. Health state utilities were measured using the Child Health Utility 9D (CHU-9D), which is commonly used to generate quality adjusted life years (QALYs) in economic evaluations in a paediatric population. Preference weights for the CHU9D were obtained from Australian adolescents aged 11 to 17 years using profile case best worst scaling methods. Data collection also comprised demographic information, gender-related characteristics (gender identity and gender dysphoria); health information (mental and physical health problems); and risk factors (suicidality, bullying, health risk behaviors). Data were analyzed using descriptive statistics and Wilcoxon rank-sum test to test for group differences.

Results: The cohort comprised 577 children and adolescents aged 3 to 17 years, mean age: 12.9 (SD= 3.51), with 69% assigned sex at birth being female. Most of the participants reported a binary gender identity (52% transgender masculine identify and 22% transgender feminine identity); only 15% reported a non-binary gender identity. The mean CHU-9D score was 0.46 (SD=0.26), with the highest proportion of problems reported on the domains feeling tired, feeling sad, problems with schoolwork/homework, and not being able to join in activities. CHU-9D scores were statistically significantly lower ($p \leq 0.001$) for adolescents aged 13-17 (0.41; SD=0.24) compared with children aged 3-12 (0.61; SD=0.25). Adolescents' scores were also statistically significantly different to mean CHU-9D of national Australian adolescents aged 11-17 (0.81; SD=0.16). Lower utility scores were observed for those reporting mental health problems (0.40 vs 0.53), physical health problems (0.41 vs 0.48), being bullied (0.38 vs 0.52), and those at risk of suicide (0.27 vs 0.43).

Conclusion: This study, for the first time, explored the health state utilities of gender diverse children and adolescents, with results showing lower scores compared with population norms. There is a need to help facilitate better health advocacy and resource allocation for this vulnerable group.

Return on Investment for Interventions to Prevent Mental Health Problems in Australian Youth

PRESENTER: **Yong Yi Lee**, Deakin University

AUTHORS: Long Khanh-Dao Le, Anita Lal, Lidia Engel, Cathy Mihalopoulos

Background: Depression and anxiety are both highly prevalent mental health conditions among adolescents and can adversely impact health, education, economic and social wellbeing. This study evaluates the cost-utility and return-on-investment of two school-based interventions targeting adolescent students: (1) a face-to-face, universal psychological intervention to prevent depression; and (2) the internet-based MoodGYM intervention to prevent anxiety.

Method: Markov models were developed to evaluate the population cost-effectiveness of delivering two school-based interventions to prevent the onset of depression and anxiety among Australian students aged 11-17 years, relative to 'no intervention'. A partial societal perspective was adopted to enumerate costs and impacts due to health and productivity. The study conducted: (1) a cost-utility analysis to estimate an incremental cost-effectiveness ratio (ICER) where net intervention costs were divided by quality-adjusted life years (QALYs); and (2) a return-on-investment (ROI) analysis to estimate a ROI ratio that divides intervention cost savings (due to health care cost savings and productivity gains) by total intervention costs. Costs, expressed in 2016 Australian dollars (A$), and health impacts were both modelled over a 10-year time horizon and discounted at 3% per annum. Uncertainty analysis was used to produce model outputs with 95% uncertainty intervals (95% UI). One-way sensitivity analyses were done to test the robustness of input parameters and assumptions.

Results: Both the cost-utility analysis and ROI analysis indicated that universal psychological intervention and MoodGYM were likely to represent good value for money. The universal psychological intervention resulted in an ICER that was dominant (95% UI): dominant–$57,605 per QALY) and a ROI ratio of 1.19 (95% UI: 0.33–3.87). The dominant ICER indicated that the intervention jointly produced positive health benefits and net cost savings, while the ROI ratio denoted a return of A$1.19 for every A$1 invested. MoodGYM similarly resulted in an ICER that was dominant (95% UI: dominant–dominant) and a ROI ratio of 3.06 (95% UI: 1.33–7.85).

Conclusion: Delivering a universal psychological intervention and/or MoodGYM to Australian school students aged 11-17 years is likely to produce net cost savings over the medium-to-long term and should be considered for widespread adoption across schools in Australia. However, any prospective implementation of the universal psychological intervention should bear in mind the additional teaching load that would be placed on teachers who would be responsible for intervention delivery. Similarly, there may be accessibility issues in delivering MoodGYM to schools in rural/remote locations with poor internet connectivity.

Cost-Utility Analysis of Online Education to Prevent Substance Use and Mental Health Problems in Australian Youth

PRESENTER: **Mary Lou Chatterton**, Deakin Univeristy

AUTHORS: Joahna Perez, Louise Birrell, Cath Chapman, Nicola Newton, Tim Slade, Steve Allsop, Nyanda McBride, Leanne Hides, Maree Teesson, Cathy Mihalopoulos

Background: The Climate Schools Combined Study trialled individual and combined approaches to universal prevention of mental health and substance use problems in adolescents through school-based online educational intervention. This paper reports on a cost-utility analysis undertaken from the societal perspective.

Method: An economic evaluation within a cluster randomised controlled trial was conducted with 6,386 participants aged 13.5 years at baseline. Schools were randomly assigned to one of four groups; (1) Climate Schools–Substance Use, focusing on prevention of alcohol and illicit substance use only; (2) Climate Schools–Mental Health, focusing on prevention of depression and anxiety only; (3) Climate Schools–Combined, focusing on the prevention of alcohol and illegal substance use, depression, and anxiety; or (4) usual education (control). Intervention costs included program subscription costs and teacher time to deliver Climate Schools' modules as reported in teachers' logbooks. The cost of usual education was calculated separately for substance use and mental health lessons and included teacher time to deliver lessons reported from teachers' logbooks.

Resource use questionnaires, completed by students at five-year follow-up, captured health care utilisation (i.e. physician visits, medications) and lost productivity over the previous 12 months. Health care services were valued with standard Australian unit costs. Lost productivity was valued using the human capital approach. The Child Health Utility 9D (CHU-9D), a paediatric multi-attribute utility measure, was collected at baseline and six follow-up periods over five years. Quality adjusted life years (QALYs) were calculated using the area under the curve method. A discount rate of 5% was applied to both costs and outcomes occurring beyond one year. The average incremental cost and QALYs for each preventive intervention group was compared to the comparable usual education group through incremental cost-utility ratios.

Results: Preliminary analysis of participants with complete results over 5-year follow-up (n=696) showed intervention delivery costs were lowest for Climate Schools–Mental Health ($10 per student), and highest for Climate Schools–Combined ($28 per student). For the control group, usual mental health education costs were lowest ($6 per student) and highest in the combined substance use and mental health usual education group ($17 per student). Average QALYs over the 5 year period was highest in the Climate Schools–Combined group (mean 3.68 QALYs 95% CI 3.54 – 3.82) and lowest for the Climate Schools–Mental Health group (mean 3.38 95% CI 3.23 – 3.52). Average QALYs in the control group were 3.45 (95% CI 3.34 – 3.56). The Climate Schools–Substance Use and Combined interventions achieved ICERs under $100/QALY compared to usual education. Climate Schools–Mental Health was dominated by the mental health usual education intervention.

Conclusion: This preliminary analysis suggests that the Climate Schools interventions provide value-for-money considering the Australian willingness to pay threshold of $AUD 50,000/QALY.

4:00 AM –5:00 AM WEDNESDAY [Cross-Cutting Themes And Other Issues]

COVID Health Outcomes and Inequalities III

MODERATOR: **Firdaus Hafidz**, Department of Health Policy and Management, Faculty of Medicine, Universitas Gadjah Mada

Preliminary Descriptive Comparisons of Health and Economic Impacts of New Zealand's Elimination Strategy Towards the COVID-19 Pandemic

PRESENTER: **Jennifer Summers**, University of Otago
AUTHORS: Nick Wilson, Leah Grout, Nhung Nghiem, Michael G Baker

Background

As with a number of other jurisdictions in the East Asia and Pacific region, New Zealand (NZ) adopted very tight border controls and other control measures in response to the COVID-19 pandemic. However, NZ has been the only country to actually articulate an unambiguous elimination strategy and to have achieved this. We aimed to provide an initial description of the health and economic impacts of the NZ approach to inform decisions around ongoing controls (until vaccination is available), and to inform response to future pandemics (including more severe ones that could arise from developments in synthetic biology).

Methods

We made health and economic impact comparisons between NZ and with other OECD countries which all took an alternative mitigation/suppression approach to the pandemic. Mortality data for COVID-19 were from the Worldometers website for probable and confirmed deaths. Data on quarterly GDP changes were from the OECD and the NZ Treasury; GDP forecasts from the IMF; and unemployment data were from the OECD.

Results

As of 22 November 2020, NZ had the lowest cumulative COVID-19 mortality in the OECD (25 deaths, 5 per million population vs a 36-OECD-country average [excluding NZ] of 406 per million). Assuming an average of 16 lost life-years per death from COVID-19 in high-income countries, this represents the prevention of around 2000 deaths and a saving of 32,000 life-years in NZ compared to the OECD average. A fuller accounting of the beneficial health impacts is not yet possible but would include: (i) the marked reduction in overall mortality observed in relation to the lockdown (eg, from reduced seasonal influenza); (ii) the prevention of long-term consequences of infection ("long COVID"); and (iii) the prevention of anxiety in the population from the reduced threat of infection. But there are also the health harms from the adverse impacts of the lockdown on delayed healthcare, and the rise of unemployment on both mental health and potentially increased cardiovascular disease risk.

NZ's tight border restrictions (impacting international tourism) and stringent lockdown in response to the initial outbreaks in March/April 2020 resulted in an overall economic downturn for NZ in the first half of the 2020 year. But there was a marked rebound in the third quarter (Q3) for NZ (estimated at +12%) vs +9.0% (OECD, albeit not all countries had data). Further increases in consumer confidence have been seen in the fourth quarter in NZ (preliminary data). For 2020 overall, the IMF prediction for GDP was -6.1% (NZ) and -6.3% (OECD). The Q3 unemployment levels were 5.3% (NZ) and 7.6% (OECD), potentially helped by the NZ Government's wage subsidy and other interventions to ease the economic impacts.

Conclusions

A fuller accounting of health and economic impacts probably needs to await until vaccination is sufficiently available and all border restrictions are lifted for New Zealand. However, to date it appears that the elimination strategy used in this country has prevented a substantial burden on health while experiencing slightly below average economic harm relative to the other OECD countries which used mitigation/suppression strategies.

Cost-Effectiveness of Pandemic Preparedness: Global Health Security Agenda Investments and the Global Health Security Index

PRESENTER: **Matt Boyd**, Adapt Research
AUTHOR: Nick Wilson

Background

The Global Health Security Index (GHSI) assesses 195 countries' preparedness for biothreats. GHSI authors concluded the world needs greater investment in health security. The COVID-19 pandemic confirmed this. Published estimates of the investment needed to bring the world up to a minimum appropriate level of health security range from US$1.9–3.4 billion (b) per year over 5 years (World Bank), to $100b over five years for 67 low and middle-income countries (WHO). In this study we compared US global health security agenda (GHSA) investments with GHSI scores. We aimed to determine the relationship between GHSI scores, investments through the GHSA program, and deaths due to communicable diseases.

Methods

Using Global Burden of Disease Study data, we correlated national aggregate communicable disease outcomes with GHSI scores. Multiple linear regression models examined associations while controlling for key global macro-indices. We compared GHSI scores for countries that received US GHSA investment with control countries matched by WHO region and GDP per capita. Finally, we estimated the cost-effectiveness of investments in global health security by extrapolating these results globally to estimate the cost of bringing the world up to an average GHSI score of 75/100. Return on investment estimates were based on conservative cost-data for biological threats.

Results

GHSI scores showed moderate correlation with proportion of deaths due to communicable diseases (rho =-0.56, $p<0.0001$). A multiple linear regression model found a significant regression equation ($F(3, 172)=22.75$, $p <0.0001$), with an $R2$ of 0.28, while controlling for GDP per capita and population size. The proportion of the population dying from communicable diseases decreased 4.8% for each ten-point rise in GHSI.

Recipient countries of the GHSA (n=31) had GHSI overall scores +6.0 (p=0.0011) points higher than matched controls. The 'Detect' aspect of the GSHI scores showed the largest difference (+9.9, p=0.0062). In regression models, the GHSI increased three points for each US$10,000 rise in GDP per capita, and 0.8 points for each 1% extra proportion of GDP spent on health.

The US invested $850 million (m) into GHSA across 2014–2018. The 31 recipient nations scored a total of 186 points higher in GHSI overall score, equating to $4.6m per GHSI point difference. Extrapolating, it would cost $31b to bring all 195 countries up to GHSI of 75/100 (or $93b over five years assuming 50% annual maintenance costs). GHSI of 75/100 is 34.8 points higher than the current global mean of 40.2. The regression model suggests that this would equate to a 16.7% reduction in the proportion of deaths due to communicable diseases. The return on investment ranges from 334–1672% for assumed reductions to the impact of biothreats of 10–50%.

Conclusions

Our results suggest a minimum standard of health security is within reach, at a cost comparable to previous estimates. The impact of COVID-19 and threat of other future pandemics underscores the urgency of this project. The associations among GHSA, GHSI and deaths from communicable diseases hint at a possible mechanism through which appropriate investment can be made by expanding existing programs.

The Cost of COVID-19 Management in Secondary and Tertiary Care Setting

PRESENTER: **Ryan Rachmad Nugraha**, USAID Health Financing Activity/ThinkWell
AUTHORS: Wahyu Nugraheni, Ery Setiawan, Andhika Nurwin Maulana, Catherine Connor

Introduction. As of mid-December 2020, Indonesia had 598,933 cases of COVID-19, posing a burden on hospitals to care for COVID-19 patients in addition to other cases. Government of Indonesia (GoI) regulation requires COVID-related costs to be covered by the MOH because it is a pandemic. Once declared endemic, treatment will be covered the National Health Insurance. The MOH quickly established an innovative system to pay hospitals for COVID-19 treatment. The hospital is paid fee-for-service for per-diem and other costs. However, there are concerns about the cost of this payment system and its effect on the national health budget. Since COVID-19 is new, there is limited understanding of which factors drive treatment costs and no cost standards. Evidence of actual costs is needed to develop a standard cost for a COVID-19 treatment package for transition to the National Health Insurance.

Methodology. We analyze COVID-19 treatment costs incurred from March to August 2020 from a sample of 42 hospitals in 9 states representing different hospital class levels and regional characteristics. Data sources included medical records, claims, and provider interviews. The Activity-Based Costing method is used to estimate the cost per case, consisting of both medical and non-medical inputs including supplies and equipment, per diem, and labor. The cost is based on the identification of the clinical pathway in the hospital aligned with the national standard. Cases were classified into one of four severity categories based on different ranges of length of stay. The severity criteria, national pathway, and other clinical standards are based on MOH guidelines

Ethical clearance was secured from MOH Agency of Health Research and Development (NIHRD) of the Ministry of Health, GoI.

Result. There are huge variations in costs of treatment. In public hospitals, the cost ranges between US$ 24.9 – 5,139.74 for mild case, US$ 136.95 – 6,349.83 for moderate case, US$ 120.79 – 6,388.3 for severe case, and US$ 120.79 – US$ 6,494 for critical case. For private hospital, cost ranges between US$ 13.98 – 5,391.67 for mild case, US$ 47.84 – US$ 5,770.57 for moderate case, US$ 128.16 – US$ 6,843.34 for severe case, and US$ 639.26 – US$ 7,656 for critical case. All costs were found aligned with the clinical pathway within each hospital sites.

Discussion and Policy Implications. COVID-19 treatment costs vary by severity, region, hospital class, and ownership (public vs. private).The wide range is also associated with different standards of care in each hospital despite the national guideline, regional practices, and the commitment of regional health officials to combat the pandemic . The results point to the need to narrow the variation of treatment and cost standards. When the status of COVID-19 changes from an emergency pandemic to endemic, the GOI must be prepared to add hospital COVID-19 care to the benefit package of the National Health Insurance. The government can use this evidence to engage in an informed discussion for pricing hospital COVID-19 care and developing a sustainable financing policy for treating COVID-19.

Is COVID-19 a Leveler? An Analysis of Consumption Shocks in Rural India

PRESENTER: **Dr. Simantini Mukhopadhyay**, Institute of Development Studies Kolkata
AUTHOR: Achin Chakraborty

Background

According to the 2011 Census, over 450 million Indians had migrated within the country. Studies show that a large proportion of these migrants are younger men from disadvantaged social groups who possess no or marginal landholdings and have moved out of their villages to find employment in cities. The sudden lockdown imposed by the Indian state during the initial stage of COVID-19 led to huge job losses and massive reverse migration, arguably the largest mass migration since the country's partition in 1947.

Studies analyzing previous epidemics in different countries have shown how existing social inequalities aggravate and reinforce each other during complex emergencies. This paper draws on that literature and challenges the understanding of the COVID-19 as a leveler.

Research Question

The paper asks if the public health emergency has differentially affected the social groups in rural India.

Objectives

1. To explore the magnitude of consumption shocks faced by the rural population in India during the lockdown
2. To investigate how migration status, social group affiliation (religion and caste), occupation and access to state relief (cash and food grains) were associated with the likelihood of facing consumption shocks during the lockdown

Data and Methods

The paper uses data from World Bank's Survey on COVID-19-Related Shocks in Rural India 2020. We construct a binary variable to indicate if a household has faced consumption shock during the lockdown. The variable takes the value one if during the lockdown a) the household reduced portion size or meals, b) the household ran out of food, c) someone was hungry and didn't eat or d) someone went without eating. It takes the value zero otherwise, indicating that the household did not experience consumption shock. We run probit regression of consumption shock on migration status, social group affiliation, occupational status, and access to state relief, controlling for background characteristics. To avoid endogeneity issues we also run instrumental variable probit regression, instrumenting migration status of the household with the migration status of the primary sampling unit.

Preliminary Results

More than a third of the households in rural India experienced consumption shocks during the lockdown. Households that report cultivation being their main occupation are more robust to the shock, compared to those who report the major occupation to be agricultural labor or non-agricultural occupations. 30% of the households report that at least one member was a migrant worker. About 95% of them returned to their villages during the lockdown. These households were more likely to be experiencing consumption shocks, compared to households that did not have any migrant. Within the caste-based Hindu-society, the two historically disadvantaged groups (Scheduled Castes and Scheduled Tribes) were more likely to face shocks. Muslims too were more exposed to consumption shocks, compared to the upper caste Hindus. Corroborating evidence from other studies, we find that access to state relief was not associated with lower risks of facing consumption shocks.

Conclusion

Much like the previous epidemics in other countries, COVID-19 seems to have exacerbated the already existing and deep-rooted structural inequalities in rural India.

4:00 AM –5:00 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Necessity As the Mother of Invention: Locally Adapted Health Technology Assessment As a Driver of Methodological and Institutional Innovation.

SESSION CHAIR: **Stephen Jan**, The George Institute for Global Health

DISCUSSANT: **Melanie Bertram**, ; **Francis Ruiz**, Imperial College London; **Rabia Khan**, The George Institute for Global Health

Early HTA: Soft Robotic Sock Intervention for Robot-Assisted Ankle-Foot Mobility in Post-Stroke Patients in Singapore

PRESENTER: **YI WANG**, National University of Singapore

AUTHOR: Yot Teerawattananon

Patients with stroke who are unable to walk are at risk of developing deep vein thrombosis (DVT) especially during the inpatients' period. Subsequently, DVT can cause a fatal condition, pulmonary embolism (PE). Intermittent pneumatic compression (IPC) is an inflatable device that can improve venous circulation in the limbs of patients. It was found to be effective in preventing DVT in some studies. Spasticity is another common stroke complication, which could lead to joint contracture and functional impairment. Physiotherapy, such as manual movement to stretch the soft tissue, can be offered; however, its effectiveness is unclear.

An innovation team developed a new soft robotic sock, aiming to prevent DVT and ankle contracture for stroke patients. The innovator collaborated with Health Intervention and Policy Evaluation Research (HIPER) at Saw Swee Hock School of Public Health (the researcher) to conduct **early health technology assessment** (early HTA) before their first clinical trial in human subjects. The objectives of the study are to 1) identify relative importance of key characteristics of the devices contributing to its value for money; 2) understand the data gap and information needed to collect in the clinical trial and possible future studies; and 3) demonstrate the role of early HTA to inform medical product development.

Three consultation sessions were arranged between the innovator and the researcher. During the first session, the researcher obtained detailed information of the technology, understood the objectives and requests from the innovator, and narrowed down the scope of the study. The researcher then developed the model and collected relevant information independently. During the second session, the researcher discussed the study setup and model with the innovator. Subsequently, the researcher revised the model according to the comments from the innovator. Deterministic analysis, sensitivity analysis, threshold analysis and value-of-information analysis were conducted. In the third session, the researcher presented the results and suggested a list of key parameters. The innovator revised their expectation on the technology based on the results, considered potential modification of the technology and required additional results. The researcher then revised the analysis and generated the final results.

One important feature of the study is the continuous interaction between the innovator and the researcher. For example, the innovator lowered their expectation on price of the technology during the study. Compliance rate of the technology was found to be important in determining the outcomes. The researcher suggested the innovator to incorporate an electronic monitoring system in the technology to measure the compliance rate in the trial which was agreed by the innovator.

Early HTA can be useful in guiding the innovation process in medical technology development. However, early HTA is currently underutilised due to the lack of awareness among innovators, inadequate skills and experience of researchers, and no guidance for the approach. This case study draws lessons learnt for both innovators and researchers to maximise the use of early HTA in the near future. This will improve efficiency of product development and assure health impact from technology investment.

Adaptations and Innovation in Economic Methods of Health Technology Assessment in Australia

PRESENTER: **Colman Taylor Tayl**, The George Institute for Global Health

Health Technology Assessment (HTA) has a long history in Australia with guidelines first being established for submissions to the Pharmaceutical Benefits Advisory Committee (PBAC) around two decades ago. Patient insights and preferences are becoming increasingly important in healthcare decision making and current HTA guidelines include recommendations for willingness-to-pay (WTP) studies such as discrete choice experiments (DCEs).

The objective of this study was to review two DCE studies submitted to the PBAC.

Case study 1

The PBAC considered tobramycin for the treatment of pseudomonas aeruginosa infection in a patient aged 6 years or older with cystic fibrosis. The primary analysis presented was derived from a DCE which was used to estimate consumer surplus for the new formulation. The Sponsor also included two supplementary analyses including a cost-utility study and a cost-offset analysis.

The PBAC considered the DCE approach provided an upper-bound estimate of the consumer surplus associated with the new formulation being included on the PBS. However, the PBAC did not agree that the median consumer surplus provided an appropriate basis for determining the price premium for a product. In this context, the PBAC noted that a price premium equivalent to the median consumer surplus would result in a deadweight loss to society. Further, if the price premium is set at the median consumer surplus, this, in effect, transfers all the welfare gains from listing to the Sponsor. While any price premium in the context of the PBS implies some level of deadweight loss, the PBAC agreed with the ESC that the price premium should reflect an appropriate distribution of the welfare benefits from listing between patients and the sponsor without resulting in a net welfare loss to society (paid by the government). The PBAC agreed with the ESC that if a price premium is accepted, the value of the welfare benefits and welfare loss should be shared by all stakeholders.

Case study 2

The PBAC considered exenatide (once weekly administration) as a replacement for twice weekly administration – for patients with type II diabetes mellitus. A DCE was used to derive a consumer surplus as the basis for a price premium for the once weekly preparation.

The PBAC considered that the DCE study provided evidence that there would be a perceived benefit to patients from listing the simplified once weekly regimen. However, the PBAC considered that the DCE did not provide a sufficient basis for quantifying the price advantage that should be paid for this benefit due to: 1. flaws in the methodology for estimating the consumer surplus; 2. small sample size, which provided a very uncertain basis for estimating population benefit; 3. the WTP estimate for patients switching from oral therapies would be driven by distaste for injections, which is likely to be transient.

Conclusion

These previous examples show the PBAC has accepted WTP thresholds derived from DCEs as a basis to determine pricing for innovative pharmaceutical products. However the PBAC does not use the full consumer surplus as the basis for a price premium.

Developing Reference Case for HTA in India –Adaptation in the Drugs and Devices Programs

PRESENTER: **Dr. Shankar Prinja**, Post Graduate Institute of Medical Education & Research

Health Technology Assessment in India (HTAIn) was established in India in 2018 to guide evidence-based policy making for universal health coverage. Considering the wide heterogeneity in methods for conducting health economic evaluations, the need to develop a reference case to guide assessors was felt early on. Consequently, a review of the reference case and methodological guidelines used by HTA agencies globally was undertaken. The findings of this review were then presented to an expert group to develop a consensus-based reference case which specified a set of generic methods for the conduct of health economic evaluations.

The reference case developed based on this consultative exercise was used by about 13 studies commissioned by the HTAIn. Following this, it was decided to assess the methodological adaptations adopted by researchers to make studies more suitable to inform 'real-world' decisions for policy and program. These HTA studies considered decision problems which predominantly included medical devices, and strategies for implementation of health programs. In-depth interviews were conducted with the HTA researchers, members of the HTAIN Technical Advisory Committee, scientists in the HTAIn Secretariat and policy makers. Each of the guiding principles of the reference case, as well as aspects which needed greater detailing were discussed during the interviews. Areas of HTA design and conduct which needed further guidance and refinement for individual decision problems were also identified.

It was found that the researchers used a variety of different methods for estimating the cost of new technology and services involved thereof. These included use of the national health system cost database, conducting primary data collection, eliciting expert opinions and use of secondary financial records. Similarly, researchers used different methods for valuing the utility values of different health states, which ranged from use of published evidence, collection of primary data, and expert opinion. While utility values were available for some health states, researchers used different assumptions to derive utility values for other health states in the decision model. The data from large scale household surveys such as National Sample Surveys on health care utilization and coverage of services from national family health surveys were used quite often, to derive realist findings of the HTA studies. There was hardly any use of routine clinical records, or registry datasets which lack in completeness and quality in order to comprehensively assess either costs or consequences. Another area where standard methods were adapted was the structure of decision models. In majority of the instances, lack of appropriate data to populate a model lead to adaptation of model structure.

Overall, majority of the HTA studies were undertaken for medical devices or other health interventions – screening or therapeutic, in the context of health programs. There were not significant differences in methods used by researchers between those which were typically a device or a drug or program. However, significant adaptations to standard methods were applied mostly as a result of issues of data availability.

4:00 AM –5:00 AM WEDNESDAY [Demand And Utilization Of Health Services]

Health Care Utilization for Non-Communicable Diseases

MODERATOR: **Marshall Makate**, Curtin University

An Economic Framework for Exploring the Impact of Non-Communicable Diseases on Healthcare Utilisation

PRESENTER: **Dr. Danusha Jayawardana**, The University of Queensland, Centre for the Business and Economics of Health
AUTHOR: Brenda Gannon

Background

Non-communicable diseases (NCDs) are a substantial global health issue accounting for almost 71% of global deaths, yet the economic burden has not been adequately explored. We fill this gap by developing a new economic framework based on the theoretical model proposed by Grossman (1972) to explore the effect of NCDs on healthcare resource utilisation. In particular, we apply this framework to (i) quantify the intensive margin of NCDs on healthcare use (ii) identify which NCDs are associated with higher healthcare use and (iii) estimate the effect of multimorbidity on resource utilisation.

Data and methodology

We use nationally representative survey data from the Australian Longitudinal Study on Women's Health (ALSWH). To identify the effect of NCDs on healthcare utilisation we employ several empirical models including interval, pooled OLS, Poisson and panel fixed-effects regression models. The use of fixed-effects account for an important source of endogeneity arising from unobserved individual heterogeneity. For instance, personal preferences and attitudes may be associated with healthcare use that differ across individuals but yet these are unobserved. Following Andersen & Davidson (2007) we also control for a range of observed characteristics that are classified as predisposing factors, enabling factors, need characteristics and health behaviours. Additionally, we apply the Blinder-Oaxaca decomposition methodology to estimate the contribution of these explained and unexplained factors to the resource use gap between women with and without NCDs.

Results

We find that women with one or more NCDs have approximately three more visits to a general practitioner (GP) and one more visit to a specialist doctor per year, compared to those without NCDs. Controlling for other observable confounders and individual fixed-effects reduces the effect to 0.6 and 0.3 extra visits to a GP and a specialist doctor respectively, suggesting the importance of observed and unobserved heterogeneity in explaining the variation in resource use. Comparing across various NCDs, we further show that women with heart disease and breast cancer have a higher number of visits to a GP or specialist doctor. All coefficients are statistically significant at 1% level.

Discussion

Our findings clearly show how the estimates of NCDs on healthcare use change once we account for potential confounding effects. By comparing base estimates of NCDs with those controlling for observed and unobserved heterogeneity, we find that the base effect of NCDs is overestimated by approximately 75 percent. Policy-wise, our results show that both observed and unobserved effects are important factors that determine the utilisation of healthcare services among women with NCDs. In contrast to previous studies, we find that the use of healthcare services depends on an extensive set of observable characteristics. Specifically, it depends not only on predisposing factors but also on a range of enabling, need and behavioural factors. Additionally, we find that unobserved effects have a substantial impact on healthcare use. This implies that identifying the nature of these unobserved characteristics is necessary to derive accurate estimates and predictions on the effect of NCDs on healthcare utilisation.

Impact of Cardiovascular Diseases and Multimorbidity on Health Care Utilization Among Older Population in Indonesia

PRESENTER: **Royasia Viki Ramadani**, Center for Health Economics and Policy Studies Universitas Indonesia
AUTHORS: Sven Hassler, Budi Hidayat, Nawi Ng

As the leading cause of death in Indonesia, cardiovascular diseases (CVDs) accounted for 35% of the total mortality in 2017. CVD can also lead to disability requiring extensive health care services. Despite its coverage and potential, the National Health Insurance (NHI) database has not been used to provide information on health care utilization among individuals diagnosed with CVD and multimorbidity. This study aims to investigate the impacts of CVD and multimorbidity on health care utilization among older population in Indonesia and to analyse the heterogeneity of the effects across the 513 districts in Indonesia.

This study has a cross sectional design using data registered in the NHI database, covering a national representative sample of 1,697,452 individuals in 2015-2016. The study included all individuals aged >=30 (n=662,529 individuals) in the analysis. CVD was ascertained based on the ICD-10 diagnosis codes in the NHI claim database. Health care utilization was measured based on outpatient and inpatient visits, length of stay for inpatient visit, and direct medical spending associated to chronic disease's diagnoses. Based on their CVD and multimorbidity, the population was categorised into five groups: (i) healthy individuals as the reference group; (ii) individuals with single chronic morbidity not related to CVD; (iii) individuals with chronic multimorbidity but not related to CVD; (iv) individuals with only single CVD morbidity, and (v) individuals with CVD and chronic multimorbidity.

We model the effect of CVD and multimorbidity on: (i) health care utilisation using the negative binomial regression; and (ii) health care spending using linear regression. We employed a three-level multilevel regression, using individual at the 1st level, primary health care at the 2nd level and district at the 3rd level. We will calculate the Interclass Correlation to estimate the amount of variations in health care utilization and spending among older people with CVD and multimorbidity that could be attributed to the primary care and district level.

The preliminary results showed that the group with CVD and multimorbidity had on average a higher degree of outpatient and inpatient visits, longer length of stay, and higher health care spending compared to the healthy population and those with only CVD diagnosis. Individuals with CVD and multimorbidity had, on average, spent 81 USD more for inpatient visits and 33 USD more for outpatient visits compared to those with only CVD between 2015-2016. This study will provide insights on how CVD and multimorbidity among older people affect the health care utilization and spending and how these affects varies between primary health care facilities and districts. These findings will therefore be useful in guiding the roll-out of the National Health Insurance in the decentralised-setting in Indonesia.

Bypassing Primary Care Facilities: Health-Seeking Behavior of Middle-Aged and Older Adults in China

PRESENTER: **Mr. Changle Li**, Inner Mongolia Medical University
AUTHORS: Mahmud Khan, Dr. Zhuo Chen

Introduction: With economic development, aging of the population, and improved insurance coverage, bypassing primary healthcare facilities appear to have become more common. Chinese patients tend to visit the secondary or tertiary healthcare facilities directly leading to overcrowding at the higher-level facilities. This study attempts to identify factors associated with bypassing the local primary care providers by the middle-aged and older adults in China.

Methods: Random effects logistic models were employed to analyze factors affecting patient bypassing behavior stratified by rural-urban residence. Data from 2011-2015 China Health and Retirement Longitudinal Study survey were used. From the datasets, only the individuals who sought outpatient care during the previous four weeks prior to the date of interview were selected. The final sample consisted of a total of 10,061 individuals in all the three waves of data collection.. In this study, the bypass behavior was defined as patients choosing to skip the primary healthcare system for obtain care from a secondary or tertiary level.

Results: Overall, around two in five mid-aged and older patients in China bypassed primary care facilities to obtain care from upper-level health care providers.Urban patients were nearly twice as likely as rural patients to bypass primary care centers. Regardless of rural-urban residence, our analysis found that relative increase in travel time to primary facilities compared to upper-level facilities increases the likelihood of bypassing. Higher educational attainment was found to be associated with increased probability of bypassing primary care. In rural areas, patients who reported their health as poor or those who experienced an inpatient hospitalization had a higher probability of bypassing primary care. In urban areas, patients 65 years old or older were more likely to bypass than others. Patients with chronic conditions like diabetes also show higher probability of bypassing primary care.

Conclusions: In the context of universal healthcare coverage and the aging of the population in China, the results identify a number of approaches that may be considered to strengthen local level primary care facilities and to help improve the overall efficiency and effectiveness of the health system. Improving service quality, providing comprehensive patient-centered health care, focusing on the health care needs of the whole family and making important diagnostic services available at the primary level will encourage utilization of services locally with significant improvements in fair financing.

4:00 AM–5:00 AM WEDNESDAY [Supply Of Health Services]

HEALTH WORKFORCE SIG SESSION: Health Care Workers' Financial Incentives

MODERATOR: **Giovanni van Empel**, Monash University

Unintended Impacts of Insurance Benefit Removal on Physician Behaviour.

PRESENTER: **Olukorede Abiona**, Centre for Health Economics Research and Evaluation (CHERE), University of Technology, Sydney (UTS)
AUTHORS: Philip Haywood, Jane Hall, Maryam Naghsh Nejad, Dan Liu, Kees van Gool

Background: The Australian government provides public insurance through subsidising 5700 Medicare Benefit Scheme (MBS) items. In 2010, the government implemented regulatory policies which included removal of MBS items from the scheme. While the main aim of the removal of the selected MBS items was to curtail government spending on the benefit system, it reduced the income streams of affected physicians depending on the composition of their health service portfolio. We focus on the removal of the joint injection services from the benefit scheme for homogenous group of physicians.

Aim: In this paper, we examine the unintended impacts of the removal of an item from insurance benefit scheme on provider behaviour, using general practitioners (GPs) as a case study. We examine whether GPs change their billing practices and fees charged to compensate for potential policy-induced income losses from one part of their income stream.

Methods: We employ a difference-in-difference model to compare the change in billing practices, out-of-pocket costs, fees charged and benefit paid for affected GPs with those charged by other GPs who were not affected by the policy change. We benchmark the unaffected GPs by comparable MBS items to the joint injection services. This includes diagnostic biopsy, abscess removal and haematoma removal. We measure our effects both at the claims level and for bundled-episode of care setting using same day and three days composition of all MBS claims submitted. To uncover further potential heterogeneity, we examine whether GPs with a higher composition of joint injection services responded differently to those with lower composition before the policy change. We use the Sax Institute's 45 and Up study of 260,000 residents living in New South Wales, Australia. This study is linked to administrative data that provides us with an accurate picture of charging patterns by providers before and after the policy. This study links MBS claims to steroid prescription data of joint injection physicians in the Pharmaceutical Benefit Scheme (PBS).

Results: The results show that compared to unaffected GPs, affected GPs substantially increased claims for medium and long consultation/attendance items. There is also some evidence that they increased their fees for services and claimed benefits from the government. GPs with larger proportion of joint injections exhibited a higher fee increase response than low-proportion GPs. Responsive increase in benefits claimed is an important policy highlight for the counteracting impact of the policy on government health expenditure. Importantly, the GPs showcase their altruistic nature by not responding through the out-of-pocket costs of their patients.

Conclusions: Provider responses are an important consideration in evaluating the impact of insurance change. Our results indicate that physicians are generally capable of redistributing their fee structures in alignment with government policy designs. In this case, the change led to unintended consequences of billing practices and charging patterns that may impose counteracting burden on government health expenditure without increasing patient out of pocket payments. Our result has important implications on the wider issue of insurance design and the unintended consequences of reforms.

The Impact of Fee Schedule Reform on Healthcare Spending and Physician Behaviour

PRESENTER: **Dr. Dajung Jun**
AUTHOR: Anthony Scott

Under fee-for-service payment schemes, a major way to control health expenditures and to improve the provision of value-based healthcare is the reform of physician fee schedules to ensure that subsidies from governments and insurers are based on evidence of their effectiveness and cost. We evaluate the impact of a major reform of Australia's Medicare Benefits Schedule (MBS), the first since Medicare began in 1984. Medicare is Australia's tax-financed universal health insurance scheme, and the MBS subsidises medical services provided by General Practitioners and other Specialists outside of public hospitals. In an effort to improve the evidence-base unerpinning the MBS, the MBS Review Taskforce established

around 70 clinically-led committees that reviewed all 5,700+ items on the MBS. The government implemented changes to fees, removal of items, introduction of new items, and changes to the rules by which items can be claimed. Implementation of changes occurred at 15 different time points between November 2016 and 2020 when the Review ended. A staggered adoption difference-in-difference design is used, with the changes affecting 29% of items claimed by our sample of doctors, and affecting 33.4% of doctors in our sample. We use unqiue data on every claim made between 2012 and 2019 for around 2000 doctors who had also completed the Medicine in Australia: Balancing Employment and Life (MABEL) panel survey (around 6 million claims per year). The overall effect of the reforms on government expenditure on Medicare Benefits is examined, as well as effects on doctors' revenue, fees charged, the number of services provided, and out of pocket costs for patients. Though the objectives of the reforms were not to reduce spending, preliminary results suggest that government spending on Medicare benefits fell by 12.1% per affected doctor between 2016 and 2018. Further analysis will examine if this was offset by increases in fees or volumes of services, and will also examine spillover effects on items not affected by the reforms.

Freezing in Australia? Funding Freeze, Competition and Physicians' Behaviours

PRESENTER: **Dr. Susan J. Mendez**, University of Melbourne

AUTHORS: Tor Iversen, Dr Kushneel Prakash, Anthony Scott

How does government funding affect physician behaviour? To answer this question, we consider how general practitioners (GPs) adjust their fees, quantity and quality of care to a four-year freeze in the indexation of subsidies that the Australian government pays for medical services provided by GPs.

The Australian healthcare system is tax financed and offers universal coverage through Medicare. GPs are paid by fee-for-service with each service (e.g. consultations) subsidised through the Medicare Benefits Schedule (MBS). The government sets a fixed subsidy for services and GPs are free to set prices at or above the level of the subsidy. If fees are set at the level of the subsidy there is zero out of pocket cost for the patient (bulk billing). If fees are set above the subsidy, the gap represents the out-of-pocket cost to the patient. As part of a budget savings plan, the Australian government imposed a freeze on the indexation of subsidies paid for GP services starting in 2013, originally introduced as a temporary measure, the freeze was extended and only started to be lifted in 2017.

GP markets in Australia are competitive, with no patient enrolment, no control over GP practice locations, and prices being freely set by GPs. Using a quasi-experimental continuous difference in difference design, we test if the fee freeze was more likely to influence GPs facing more competition before the fee freeze was introduced. Government payments are more relevant for GPs' incomes when their bulk billing rates are higher but decreasing their bulk billing rates affects negatively their demand, especially in more competitive areas. If GPs in more competitive areas increase prices, reduce bulk-billing, increase the volume of care provided (also through working more hours), or reduce practice costs, then we expect to see no change in overall earnings.

We use eleven waves (2008 to 2018) of detailed individual doctor-level panel data from a representative sample of over 5,000 GPs from the Medicine in Australia: Balancing Employment and Life (MABEL) panel survey. This includes self-reported data on prices, volume and bulk-billing. Additionally, we link survey information with administrative data from the Medicare Benefits Schedule (MBS) for a subsample of 1,000 GPs that includes high-frequency data on prices charged, volume, and bulk-billing for every service billed between 2012 and 2019.

Preliminary results from the survey data show no difference in GPs' earnings in more competitive areas, but some evidence of higher fees and lower bulk-billing rates for GPs facing more competition. GPs were able to adjust their fees to maintain their earnings, suggesting that the fee freeze led to GPs increasing out of pocket payments for patients and reducing access to primary care.

5:30 AM –6:30 AM WEDNESDAY [Specific Populations]

MENTAL HEALTH ECONOMICS SIG SESSION: Early Life and Family Determinants of Health and Mental Health

MODERATOR: **Sonja de New**, Monash University

Affluence in Childhood, Polygenic Risk Factors and Mental Health Outcomes in Adulthood

PRESENTER: **John de New**, University of Melbourne

AUTHORS: Sonja de New, Clement C. Wong, Nicolau Martin Bassols

With more than one in ten people living globally with a mental health disorder, the prevalence of mental health issues is high in the general population (James et al 2018). Mental Health disorders severely impact the lives of people affected by these conditions. It has been estimated that the associated loss of productivity of depression and anxiety is equivalent to USD 1 Trillion (Chrisholm et al 2016). Mental health has not only a strong genetic component involving multiple genes, but is also associated with environmental components, such as adversity in childhood. It is unclear the extent to which childhood adversity, in particular socioeconomic disadvantage, can buffer the impact of the genetic predisposition for mental illness. Understanding the potential role of such gene-by-environment (GxE) interactions is important as it allows for policy interventions that can reduce the prevalence or severity of mental illness even despite a genetic predisposition.

We use the Health and Retirement Study (HRS), which collected saliva specimen biannually between 2006-2012 from random subsamples of households, and provides polygenic risk scores for depression, anxiety and well-being. The data is ideally suited for the analysis as it also collects corresponding information on mental illness using the Center for Epidemiologic Studies Depression scale (CESD-8), five items from the Beck Anxiety Inventory (BAI) and the 5-item Satisfaction with Life Scale (SWLS) (Diener et al. 1985). Furthermore, detailed information on childhood socioeconomic status is available, as measured for example by whether someone's family was well off financially between birth and age 16.

We find that those coming from well-off families, or high Socio-Economic Status (SES) experience on average lower levels of depression and anxiety and higher levels of subjective wellbeing, even whilst controlling for the positive and significant polygenic risk score (PGS) for depression and anxiety. Further, the interaction of SES and PGS is negative and significant for the level and prevalence of serious depression and anxiety, indicating a sizable and economically significant mitigating effect of SES on the genetic predisposition for mental health issues.

We further shed light on the transmission channels, that might explain the moderating impact of a high socioeconomic status. To do this, we investigated the role of childhood adversities, such as whether the father was jobless, family had to ask for help, parents used alcohol or drugs, or whether the person was abused by parents during childhood. We also examined the role of parenting styles, such as parental warmth and attention, as well as whether the respondent had a good relationship with their parents. None of these factors sufficiently reduce the mitigating role of SES on the effect of the polygenic risk score.

Thus having had more resources in childhood is associated with better mental health outcomes as measured by depression and anxiety and most importantly, these resources can substantially and significantly mitigate even the negative role of genetic predispositions for these mental illnesses. This suggests the potential for the existence of a role for policy to ensure minimal levels of resources available to children.

Family Spillover Effects of Health Shocks: Evidence from Breast Cancer Diagnoses

PRESENTER: **Henri Salokangas**, Turku School of Economics

AUTHORS: Mika Kortelainen, Prof. Petri Böckerman, Dr. Maria Vaalavuo

While there is abundance of economic research on the detrimental effect of health shocks on an individual's own labor market outcomes, the potential spillover effects of health shocks on spouses is less well known. We contribute by examining the indirect effects of breast cancer diagnosis on the labor market and the psychiatric outcomes of the spouses and children of the breast cancer patients. Especially we are interested in examining the heterogeneity of the impact in terms of socioeconomic background of the family.

Parents of the household tend to coordinate their labor supply decisions. Therefore the changes in the employment and health of the spouse potentially affect individual employment. Empirical evidence suggests that individuals may increase their labor supply when their spouses encounter negative health shocks and decrease their labor supply. We explore whether this added worker effects is present in Finland where the generous social security program cushions against negative shocks on labor income. Additionally we examine to what extent the mother's health shock affects the psychiatric outcomes of the spouse and children.

The research leverages from rich Finnish administrative data on health, family and employment. We identify all breast cancers diagnosed in Finland 2000-2019 and use this information to form the study population that consists of families whose mother is has been diagnosed with breast cancer. We collect information on the labor market performance, schooling, psychiatric drug prescriptions, psychiatric admissions and cohabitation during 1995-2019 to study the family spillovers of breast cancer. To reduce the confounding related to receiving the breast cancer diagnosis, we exploit variation in the timing of the first breast cancer diagnosis to estimate the spillover effects of breast cancer. In effect, we estimate the immediate changes in the labor market and the psychiatric outcomes using a dynamic difference-in-differences framework and show that the treatment group and the control group exhibit parallel trends in outcomes before the diagnosis.

While breast cancer diagnosis leads decreases labor supply and mental health, we do not find any effects on the labor supply of the spouses and children. Therefore, we do not find evidence of added worker effect in Finland, which may be due to the relative generosity of the social security system. However with regard to mental health, we find that the spouses are more likely seek psychiatric treatment after the breast cancer diagnosis. We suggest that future research should pay attention to both financial and the psychological impacts of health shocks to gain a more complete picture on the spillover effects.

5:30 AM –6:30 AM WEDNESDAY [Supply Of Health Services]

Equity and Access

MODERATOR: **Richard Norman**, Curtin University

Health Service Availability and Health Facility Readiness of Routine Antenatal Screening for Sexually Transmitted Infections in Papua New Guinea

PRESENTER: **Olga Saweri**, The University of New South Wales

AUTHORS: Andrew Vallely, Neha Batura, Virginia Wiseman

Background Untreated sexually transmitted and genital infections in pregnancy can result in adverse birth and pregnancy outcomes, such as miscarriage, stillbirth, and low-birth weight. In Papua New Guinea (PNG), nearly 50% of pregnant women suffer from sexually transmitted and genital infections in pregnancy. Adequate investment in the provision of accessible and effective maternal health services, especially in high-burden low-income settings, strengthens health systems and improves the quality of health care and associated adverse outcomes. Yet, little emphasis is placed on the capacity of the health sector to deliver essential services, which is key to reducing adverse outcomes. This study aims to evaluate health service availability and readiness with respect to antenatal testing and treatment of HIV and syphilis to identify structural inputs and processes available to implement effective antenatal screening for STIs across PNG to improve adverse birth outcomes.

Methods This study uses data from the PNG national department of health's national health indicator survey and a health efficiency survey conducted in 73 health facilities in 2015. Health service availability encompasses the physical presence of service delivery, including infrastructure, core health workers and service utilization. We demonstrate health service availability by health facility and health worker density (per 10 000 population) per province. Health facility readiness implies a health facility's capacity to provide health services and is illustrated by an index comprising of the availability of necessary components to deliver health services. We derive a supply-side-readiness index, comprised of 28 equally weighted indicators, to explore health facility readiness. Lastly, we conducted a multi-variate regression analysis, to explore the association between the proportion of antenatal clinic attendees who a) tested for HIV and syphilis; and b) test positives treated for HIV and/or syphilis with health facility readiness, controlling for health facility size, urban and rural location of health facility and management/ownership type.

Results Health service availability is demonstrated by two indicators, health facilities and core health workers per 10 000 population. Only one of 22 provinces has reached the global target of 2 health facilities per 10 000 population, while three provinces have reached the WHO target of 23 core health workers per 10 000 population. Health facility readiness is illustrated by a supply-side-readiness index; most health facilities scored between 51 and 75% against 28 indicators. The average health facility readiness score was 0.66 with a standard deviation (SD) of 0.13. The regression analysis indicated that testing and treatment for HIV and syphilis is positively associated with supply-side readiness, when controlling for health facility size, urban and rural location, and management type.

Conclusion The availability of health facilities and clinical expertise is limited in rural settings, compared to health services provided in urban locations. However, readiness to deliver health services is somewhat similar in rural and urban locations. This is indicative of a need to address shortfalls in human resources and infrastructure to improve health service delivery. A larger cross-country health service availability and readiness assessment is warranted to detail health service availability and readiness to deliver equitable healthcare in PNG.

Econometrics of Acute Cardiovascular Services: Analyzing Pre- and Hospital Delays Among Acute Coronary Syndrome Patients in Jakarta, Indonesia

PRESENTER: **Ryan Rachmad Nugraha**, USAID Health Financing Activity/ThinkWell

AUTHORS: Euis Ratna Sari, Taufik Hidayat, Budi Hidayat

Introduction. Delay of treatments for patients having acute coronary syndrome (ACS) should be kept as short as possible to reduce complications and mortality. Yet, the extent of delays (both prehospital and hospital) within the proper timeframe and its determinant as well as innovative policies to shortening such delays in Indonesia is scanty. This study aims to investigate drivers of prehospital and hospital delays amongst ACS patients, by determining the symptom-to-door times (prehospital) and hospital delays of ACS patients admitted at health facilities in Jakarta, Indonesia, and to analyze variables associated with such delays by looking at patients' socio-demographical data, risk factors and comorbidities, and symptom characteristics. Identification of these factors is critical for raising awareness as well as designing innovative policies.

Methods. This is an observational study design. A retrospective ACS patients data recorded in the Jakarta Acute Coronary Syndrome (JAC) registry in the period of Jan 2016 till July 2019 is proposed to construct model specifications of prehospital and hospital delays amongst ACS patients with ST-elevated myocardial infarction (STEMI). We apply rigor econometrics methods by means of exploring several estimators and chose the best one to estimate the relationship between socio-demographical data, risk factors and comorbidities, and symptom characteristics with prehospital and hospitals time-lag measures. We define decision time as the time from the onset of pain until the first call for help. System time is defined as the time from the first call for help until hospital arrival as recorded by ambulance (for ambulance cases) or accident and emergency (A&E) triage (for all other cases). While the potential causes of pre-hospital delay are either patient- or transportation-related factors, and hospital delay causes are either staff- or system-related, our model specification will be based on existing information recorded in the JAC databases.

Results. The observed prehospital time for ACS patients is 1,635.4 minutes, consisting of symptoms-to-first medical contact (FMC) was 1,572.1 minutes, while FMC-to-door was 63.3 minutes. Meanwhile, the door-to-balloon time was 138.2 minutes. There are many factors significantly associated with delays of treatment for ACS patients, namely health referral system, transportation system, as well as different administration between different hospital class, contributing to either pre- or intrahospital delays. In contrary to the general notion, there is little role of education to time delays.

Discussion and Policy Implications. Treatment delay in acute care imposes significant impact on mortality and morbidity. Systemic policy change Is needed to alleviate barriers to treatment, both from internal and external factors. Cross collaboration effort especially integration of public safety center as well as traffic alleviation and assistance system to aid faster referral, leading to better health outcomes for ACS patients.

Horizontal Inequities in the Delivery of Psychiatric Care: Australian Evidence

PRESENTER: **Rubayyat Hashmi**, University of Southern Queensland

AUTHORS: Khorshed Alam, Jeffrey Gow

Horizontal inequities in the delivery of psychiatric care: Australian evidence

Abstract

Background

The mental healthcare delivery in Australia has adopted the features of a market model over the last two decades. Since the late 1980s, the country is accelerating de-institutionalisation of psychiatric patients. Recent evidence also suggests that mental health inequality in Australia is rising. The assessment of horizontal equity in the delivery of psychiatric care of Australia's mixed public/private health care system is ambiguous.

Objective

Assessing horizontal equity in the delivery of psychiatric care for different demographics.

Methods

This study analysed 2009 (wave 9, n=11563) and 2017 (wave 17, n=16194) of the Household, Income and Labour Dynamics in Australia (HILDA) survey data. The main outcome of interest of the study is whether an individual visited a mental health professional (i.e. psychiatrist or psychologist). An individual is considered mentally ill if their K10 score exceeds 20 in the period. Horizontal Inequities (HI) are measured through need and non-need adjusted concertation indices.

Results

The concentration indices (socioeconomic inequality) of psychiatric care utilisation for 2009 and 2017 in Australia were found to be pro-poor (-0.0871 and -0.0344 respectively). However, when the need and non-need factors were adjusted, the estimated horizontal inequity indices were found to be pro-rich in 2017 (0.0006) and relatively less pro-poor in 2009 (-0.0018). In 2009, the standardised horizontal inequity indices for female and male were calculated to be -0.0006 and – 0.0031 respectively. In 2017, the HI indices were more pro-rich distributed for females (0.0027) and less pro-poor for males (-0.0014). The HI indices were also more pro-rich distributed from -0.0043 in 2009 to 0.0097 in 2017 for the indigenous population. In summary, the inequity in psychiatric care utilisation has been increased in favour of the rich in recent decades in Australia.

Conclusion

Service equity across socio-demographics, areas and communities is one of the chief goals of Australia's national mental health strategic plan. Notwithstanding, our findings regarding the equity performance of psychiatric care are alarming. Although Australia's health care system performs well compared to the rest of the world, there is a greater need to develop policies to improve horizontal equity in psychiatric care service utilisation.

Who Gets the Last Bed? A Discrete Choice Experiment Examining General Population Preferences for Intensive Care Bed Prioritisation in a Pandemic

PRESENTER: **Amelia Elizabeth Street**, Prince of Wales Hospital

AUTHORS: Deborah Street, Gordon Flynn

Introduction: The COVID-19 pandemic has overwhelmed intensive care units and hospitals in many countries. Both locally and internationally, guidelines have been prepared to help guide decision-making when ICU demand exceeds capacity. These guidelines reflect the fact that when healthcare systems are overwhelmed, an individual's healthcare needs cannot be considered in isolation but rather resource allocation must balance each individual's needs with delivering the best outcome for the broader community.

Background: The Australian and New Zealand Intensive Care Society's (ANZICS) guiding principles for complex decision making during the COVID-19 pandemic advise patient assessment by at least two senior intensivists considering the patient's likelihood of surviving based on their acute illness severity, their comorbidities' independent prognoses, and their likelihood of long term survival. If these are equal then it may be ethically justifiable to consider factors such as caring responsibilities and age.

Methods: To explore whether the key patient attributes important to members of the Australian general population when prioritising patients for the final ICU bed in a pandemic over-capacity scenario aligned with the approach advocated in the ANZICS guidelines, a discrete choice experiment was administered online. It asked respondents (n=306) to imagine the COVID-19 caseload had surged and that they were lay members of a panel tasked to allocate the final ICU bed. They had to decide which patient was more deserving for each of 14 patient pairs. Patients were characterised by five attributes: age, occupation, carer status, health prior to being infected and prognosis. Respondents were randomly allocated to one of 7 sets of 14 pairs. Multinomial, mixed logit and latent class models were used to model the observed choice behaviour.

Results: A latent class model with three classes was found to be most informative. Two classes valued active decision-making and were slightly more likely to choose patients with carer responsibility over those without. One of these classes valued prognosis most strongly, with decreasing probability of bed allocation for those 65 and over. The other valued both prognosis and age highly, with decreasing probability of bed allocation for those 45 and over, and a slight preference in favour of frontline healthcare workers. The third class preferred more random decision-making strategies.

Conclusions: The ANZICS guidelines order probability of survival to hospital discharge and underlying comorbidities as variables that should be used in the first instance to discriminate between patients when ICU resources are overwhelmed, with the other variables that we studied to be considered only if the former did not allow discrimination between the patients. This is a similar decision-making strategy to respondents who fell into class 1 and broadly similar to those in class 2, although this class tends to more strongly favour younger patients. The guidelines probably underplay the value placed on carer responsibility by respondents, and decision-makers would be in line with community values if carer status is used to discriminate between patients should rationing be necessary.

5:30 AM –6:30 AM WEDNESDAY [Specific Populations]

IMMUNIZATION ECONOMICS SIG SESSION: Benefit Estimates, Budget Impacts and Cost Effectiveness of Immunization

MODERATOR: **Natalie Carvalho**, University of Melbourne

Public Health Impact and Cost-Effectiveness of Rotavirus Vaccination in China: Comparison between Private-Sector Provision Only and a Potential National Immunization Program

PRESENTER: **Mr. Jiahao Wang**, Peking University

Background: WHO has strongly recommended introduction of rotavirus (RV) vaccination in all national immunization programs, and significant reduction of the disease burden of RV gastroenteritis in children under 5 has been observed among countries that have introduced RV vaccines. However, the pace of introduction was relatively slow among countries in the Western Pacific Regions, and the lack of high-quality, local epidemiology and economic evidence remains a big obstacle. With a large population base, China contributes substantially to the regional disease and economic burden of RV gastroenteritis, but a mass vaccination program has not been launched. Only two RV vaccines are available in China, Rotateq and Lanzhou lamb rotavirus vaccine (LLR) by a domestic manufacturer, and parents are required to pay full payment in the private market for RV vaccines, resulting in a low immunization coverage. With a fully-constructed evaluation model and renewed clinical, epidemiological and

economic data, this study evaluates the public health and economic impact of a potential national immunization program with possible RV vaccines that were either widely used globally (Rotateq, Rotarix) or available domestically (LLR), compared with the current private-market scenario in China.

Methods: From a societal perspective, an economic evaluation was conducted using a decision tree-Markov model. Following the Chinese birth cohort in 2017 for 5 years, the model allowed repeated RV infections in individuals, and varied probabilities of use of health services (home care, inpatient or outpatient settings) by age, symptom severity, times of infections and protection by vaccination or natural infections. Parameters including demographic, diseases epidemiological and costs (direct and indirect) data, vaccines efficacy, cost and coverage were obtained from published literature specific for China, or estimated to reflect the local situation. Outcome measures included the prevented rotavirus gastroenteritis episodes, deaths, and quality-adjusted life years (QALYs) gained, and the incremental cost-effectiveness ratio (ICER) is presented. One-way and probabilistic sensitivity analysis were conducted to account for the uncertainty of parameters. Outcome and costs were discounted at a 3% annual rate.

Results: Compared to the current scenario of private-sector provision, a national immunization program using Rotateq would prevent 410 deaths, 0.47 million hospitalizations, and 3.54 million outpatient visits, and 1.63 million home care cases, with additional cost about $1.7 billion. Rotarix vaccination prevented 312 deaths and 4.72 million episodes with additional $1.5 billion cost. LLR vaccination prevented 148 deaths and 1.97 million episodes with additional $1.0 billion cost. The ICERs of the three vaccines were all less than one times GDP of China, and the ICER of Rotateq was the lowest, $3387.0/QALY, compared with that of Rotarix, $3803.2/QALY and LLR, $7277.5/QALY.

Conclusions: A national immunization program with the rotavirus vaccine would be highly cost-effective compared with status quo and substantially reduce rotavirus morbidity and mortality in China. Policy makers should seriously consider prioritizing the introduction of rotavirus vaccine.

Cost Effectiveness of Typhoid Vaccination in India

PRESENTER: **Akashdeep Singh Chauhan**, Post Graduate Institute of Medical Education and Research, Chandigarh.
AUTHORS: Isha Kapoor, Saroj Kumar Rana, Jacob John, Gagandeep Kang, Dr. Shankar Prinja

Introduction

World Health Organization prequalified the typhoid conjugate vaccine (TCV) after the Strategic Advisory Group of Experts on immunization recommended routine use of TCV in children over six months of age in typhoid endemic countries. We assessed the cost-effectiveness of introducing TCV in India.

Methods

A decision analytic model was developed, using a societal perspective, to compare the long-term costs and outcomes (at 3% discount rate) in a new-born cohort of 100,000 children immunized with or without TCV in India. Three vaccination scenarios were modelled, assuming the protective efficacy of TCV to last for 5 years, 10 years and 15 years following immunization. Incidence of typhoid infection estimated under the 'National Surveillance System for Enteric Fever' (NSSEFI)' was used. The prices of vaccine and cost of service delivery were included for vaccination arm. Both health system cost and out-of-pocket expenditures for treatment of typhoid illness and its complications was included. A probabilistic sensitivity analysis was used to test the parameter uncertainty. Several scenario and price threshold analyses were also undertaken.

Results

TCV introduction in urban areas would result in prevention of 17% to 36% typhoid cases and deaths. With exclusion of indirect costs, the incremental cost per QALY gained was ₹ 207,428 (98,745 – 389,151), ₹ 91,171 (18,712 – 206,185) and ₹ 70,754 (1780 – 177,269) for scenario 1, 2 and 3 respectively. While, when including of indirect costs, all the 3 scenarios were cost saving. Further, in rural areas, TCV is estimated to reduce the typhoid cases and deaths by 21% to 38%, with ICER (incremental cost per QALY gained) ranging from ₹ 2,367 (1459 – 4172) thousand to ₹ 3,622 (2244 – 6253) thousand (inclusive of indirect costs) among the 3 vaccination scenarios.

Conclusion

From a societal perspective, introduction of TCV is a cost saving strategy in urban India. Further, if the price of vaccine is reduced to ₹ 60, then even after excluding the gains in indirect costs, TCV also becomes cost effective even for the scenario with conservative assessment of vaccine efficacy of up to 5 years. Lastly, TCV is not cost-effective in rural India.

Health and Economic Benefits of Public Financing of COVID-19 Vaccination in Zimbabwe: An Extended Cost-Effectiveness Analysis

PRESENTER: **Charles Birungi**, UNAIDS
AUTHOR: Sharon Stella Musonza

The Covid-19 pandemic has had profound negative implications for the economy of Zimbabwe. With the first shots of the COVID-19 vaccine already being administered, it is increasingly becoming clear that poor countries are being pushed to the back of the queue for COVID-19 vaccines. Thus, for poor countries, whether to publicly finance Covid-19 vaccination or leave its financing to individual's ability to pay is a matter of life and death. This paper analyses the distributional, equity and poverty reduction benefits of a universal public financing (UPF) policy for Covid-19 vaccination in Zimbabwe. Using a novel economic evaluation method, the extended cost-effectiveness analysis (ECEA), and plausible values for key parameters, we preliminarily[1] find that the health gains and insurance value of UPF would accrue primarily to the poor. Reductions in out-of-pocket (OOP) expenditures are more uniformly distributed across income quintiles. This would, in turn, lead to a substantial decrease in Covid-19 deaths, mainly among the poorer. Also, it would effectively provide financial risk protection, mostly concentrated among the poorest. Finally, potential indirect benefits of vaccination (herd immunity) would increase program benefits among all income groups, whereas potentially decreased vaccine efficacy among poorer households would reduce the equity benefits of the program.

[1] This abstract presents preliminary results. Final results are expected by end of January 2021 and will be presented at the Congress.

Potential Budget Impact of COVID-19 Vaccine and Societal Saving in India.

PRESENTER: **Habib Farooqui**, Public Health Foundation of India
AUTHORS: Anup Karan, Suhaib Hussain

Introduction: India is one of the worst affected country by COVID 19 pandemic (10 million cases). Availability and emergency use authorisation of couple of vaccines has potential to turn the tide of the pandemic. India is one of the major global suppliers of the vaccines and hopes to deploy new COVID19 vaccines soon within the country. We analysed the potential budget impact of COVID 19 vaccine on Ministry of Health's budget and potential societal saving on account of disease episodes and expenditure prevented.

Methods: We estimated number of COVID 19 cases prevented in the next 3 years by the vaccines considering more than 90% efficacy with increasing coverage scenarios (20% coverage in first year, 30% coverage in second year and 50% coverage in third year). This is likely situation because of several constraints related to vaccine manufacturing capacity, storage, supply chain, syringe and human resource availability for vaccine administration. The population and demographic estimates were taken from the UN population projections for India[1]. The vaccine price considered in the analysis is based on maximum GAVI price of USD3 per dose[2], freight and insurance at the rate of 6%, vaccine wastage at 5% per dose (assumption), 0.5 ml AD syringe price of USD 0.03060 based on UNICEF supplies price[3]. This analysis assumes that there is enough reserve capacity in the existing cold chain to accommodate COVID 19 vaccine supply and the frontline workers already engaged in the immunisation program will be delivering these vaccines through existing established mechanisms. Furthermore, the cost associated with home isolation (mild and moderate disease), hospitalisation because of severe disease and ICU hospitalisation because of very severe disease were estimated from secondary data sources such as National Sample Survey Organisation (NSSO) and other sources and proportional distribution of

home isolation, hospitalisation and ICU usage was 84%, 14% and 2% respectively of the total COVID19 positive cases, based on latest estimates published by CDC.[4]

Results: Our analysis suggest that it would cost around USD 10.6 billion to vaccinate the entire 1.3 billion population of India over three year period. This would lead to saving of around USD 1.04 billion in healthcare expenditures alone and another USD 2.9 billion as saving in productive losses. These saving have major equity implications as majority of the COVID19 cases reported in India are from poor and vulnerable populations living in poor neighbourhood and had severe productivity losses because of draconian intervention such as lockdowns.

Conclusion: Assuming vaccine provides long term protection, the cost savings in terms of expenditures prevented on hospitalisation and productive gains, makes COVID19 vaccines good value for money which is in addition to millions of cases and deaths prevented.

[1] United Nations, Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019, Online Edition. Rev. 1.

[2] https://www.seruminstitute.com/download/Press-release-Gavi-SII-BMGF-Partnership-annoucement.pdf

[3]https://public.tableau.com/profile/supply.division#!/vizhome/UNICEFPricedataoverviewforvaccines/Fulldashboard

[4] Stokes EK, Zambrano LD, Anderson KN, et al. Coronavirus Disease 2019 Case Surveillance — United States, January 22–May 30, 2020. MMWR Morb Mortal Wkly Rep 2020;69:759–765. DOI: http://dx.doi.org/10.15585/mmwr.mm6924e2

5:30 AM–6:30 AM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

External Impacts and Shocks on Health

MODERATOR: **Stefan Boes**, University of Lucerne

Household Hunger and the Self-Reported Health of South Africans in the Time of COVID-19

PRESENTER: **Frederik Booysen**, University of Witwatersrand

Background: Epidemics such as COVID-19 stands to reduce the population's health, not only due to the direct impacts of COVID-19-related morbidity, but also due to the epidemic's economic consequences.

Purpose: The purpose of this research is three-fold. Firstly, the paper sets out to document the levels and changes in self-reported health of South Africans under the COVID-19 lockdown. Secondly, the paper presents evidence on how the economic impact of the COVID-19 lockdown caused household hunger to increase. Finally, the paper investigates the impact of household hunger on current levels of self-reported health and on changes in self-reported health.

Materials and methods: In April 2020, wave 1 of the Coronavirus Rapid Mobile Survey (CRAM) collected data from a nationally representative sample of 7,073 respondents interviewed in 2017/18 in wave 5 of the country's National Income Dynamics Study (NIDS). Self-reported health is reported as poor, fair, good, very good or excellent and compared between 2017 (pre-lockdown) and 2020 (lockdown). Average treatment effects on the treated (ATET) are estimated using propensity score matching methods available in Stata's *teffects* and *psmatch2*. The treatments are the loss of a main source of household income and the presence of household hunger, while the respective outcomes are household hunger and self-reported health. Heterogeneity in aggregate treatment effects are explored across sex and socio-economic status.

Results: Pre-lockdown, 91.90% of respondents reported being in good, very good or excellent health (95% CI 91.24% - 92.55%). This figure dropped to 73.30% during the lockdown (95% CI 72.27% - 74.34%). In total, more than half of respondents reported a decline in their self-reported health status (55.29%, 95% CI 54.09% - 54.49%). The propensity score matching analysis passed all the overall tests for covariate balance, including the likelihood-ratio test of the joint insignificance of all regressors, the level of mean bias, and Rubin's B and Rubin's R. Losing a main income source during the lockdown caused household hunger to increase significantly (ATET 0.105, 95% CI 0.065 - 0.145, $p < 0.001$), an effect that was distributed across the income distribution in the shape of an inverted 'U', being significant only in the middle household income quintiles. Household hunger saw respondents being significantly less likely to be in good, very good or excellent health (ATET -0.083, 95% CI -0.131 - -0.035, $p = 0.001$) and significantly more likely to have reported a decline in their health from good, very good or excellent to poor or fair, compared to remaining in good, very good or excellent health (ATET 0.069, 95% CI 0.021 - 0.118, $p = 0.005$). The former effect was significant for both females and males, but the latter effect was only significant for females. Both effects were only significant in the middle income quintiles, thus exhibiting an inverted 'U' shape.

Conclusion: The COVID-19 pandemic and resultant lockdown's economic impacts resulted in household hunger, which impacted significantly on the health of South Africans. Social protection and nutritional support is necessary to alleviate these adverse consequences of an influenza pandemic such as COVID-19.

Short- and Long-Term Effects of Outdoor Activity Restriction on Health: Evidence from the Nuclear Accident at Fukushima

PRESENTER: **Michio Yuda**, Tohoku University

This study examines the short- and long-term effects of outdoor activity restrictions on health using nationally representative individual data from the "Physical Fitness and Athletic Performance Survey (2006-2018)" conducted by the Japanese Ministry of Education, Culture, Sports, Science and Technology and the Japan Sports Agency.

After the accident at the Fukushima Daiichi Nuclear Power Plant caused by the Great East Japan Earthquake and tsunami on March 11, 2011, outdoor activities were strongly restricted in various areas of Fukushima Prefecture in order to minimize the effects of airborne invisible radiation on human health. For example, immediately after the accident (June 2011), 15% of the public elementary, junior high, and high schools in Fukushima prefecture imposed full restrictions on outdoor activities, and 50% imposed partial restrictions. These restrictions were lifted in 2015 in light of declining radiation levels, but since then, there have been reports of worsening health indicators such as obesity among children, people complaining of physical and mental illness, and the rate of elderly people requiring nursing care.

These restrictions and disruptions in lifestyle caused by the drastically environmental changes are likely to lead to future morbidity from lifestyle-related diseases and related medical costs. However, to the best of my knowledge, there are no studies that have analyzed in detail the impact of such restrictions on various health indicators using large scale individual data. This study would also be useful in predicting how restrictions on outdoor activities due to the emergency declaration or lockdown in response to the global COVID-19 pandemic may affect future health status in the short to long term.

In this study, I use the difference-in-differences (DD) model to identify the health effects of environmental changes caused by the huge earthquake and tsunami in the afflicted prefectures of Iwate, Miyagi, and Fukushima and of outdoor activity restrictions in Fukushima prefecture. The preliminary results controlling individual attributes and fixed effects of regions and time, based on almost 800,000 individuals in total, are as follows. First, the outdoor activity restriction significantly worsened body math index (BMI), physical fitness, and mental health for adults and decreased their monthly exercise time. Second, it also increases children's BMI and decreases the monthly exercise time of students. Third, environmental damage caused by the huge earthquake and tsunami significantly worsened the physical fitness of children and the mental health of minors.

These results suggest that it is necessary to secure opportunities for indoor exercise and to develop effective exercise programs based on medicine, health science, and sports science because the health deterioration due to decreased exercise time is inferred in a wide range of age groups.

[June 22] After several revision, the new title is: *Short- and Long-Term Effects of Activity Restriction on Health for Minors: Evidence from the Great East Japan Earthquake.*

Maternal Health and Health-Related Behaviour during Pregnancy and Their Association with Infant and Adolescent Health: Evidence from an Australian Birth Cohort

PRESENTER: **Mr. Kabir Ahmad**, University of Southern Queensland

ABSTRACT

Objective: This study seeks to investigate the associations between maternal health and health-related behaviours (nutrition, physical activity, alcohol consumption and smoking) during pregnancy or up to 15 months from childbirth and their children's health outcomes during infancy and adolescence (general health, presence of a chronic illness, and physical health outcome index).

Methods: This study used Wave 1 (2004) and Wave 7 (2016) data from the Longitudinal Survey of Australian Children (LSAC). We measured the mothers' general health through the presence of a medical condition or disability during pregnancy and mental health during pregnancy or in the year after childbirth. We subsequently measured the children's general health, presence of a medical condition or disability, and physical health outcome index at ages 0***1 (infancy) and 12***13 (adolescence). Binary logistic and linear regression analyses were performed to examine the association between the mothers' health-related variables and their children's health.

Results: Our results showed that poor general health during pregnancy was associated with higher odds of poor health in infants and adolescents in all three dimensions: poor general health (OR: 3.13, 95% CI: 2.16***4.52 for infants; OR: 1.39, 95% CI: 0.95***2.04 for adolescents), presence of a chronic condition (OR:Â 1.47, 95% CI: 1.19***1.81 for adolescents) and lower physical health score (Coeff.: ***0.94, p-value <0.05 for adolescents). Our study also revealed that the presence of a chronic condition in mothers during pregnancy significantly increased the likelihood of the presence of a chronic condition in their offspring at infancy (OR: 1.31, 95% CI: 1.12***1.54) and during adolescence (OR: 1.45, 95% CI: 1.20***1.75). The study found that stressful life events faced by mothers increase the odds of child health at adolescence, while the stress, anxiety or depression during pregnancy and psychological distress in the year of childbirth increase the odds of child health at infancy.

Conclusions: The present study found evidence that poor maternal physical and mental health during pregnancy or up to 15 months from childbirth has adverse health consequences for their offspring as measured by general health, presence of chronic health conditions, and physical health index scores. This suggests that initiatives to improve maternal physical and mental health would improve child health and reduce the national health burden.

5:30 AM –6:30 AM WEDNESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Understanding Risk Profiling, Pricing, and Predictive Modelling in Insurance Markets

SESSION CHAIR: **Francesco Paolucci**, University of Newcastle

ORGANIZER: **Josefa Henriquez**, University of Newcastle

Scope and Incentives for Risk Selection in Social Health Insurance Markets: An International Comparison

PRESENTER: **Richard van Kleef**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam

AUTHORS: Mieke Reuser, Thomas McGuire, John Armstrong, Konstantin Beck, Shuli Brammli-Greenberg, Randall Ellis, Francesco Paolucci, Erik Schokkaert, Jürgen Wasem

In many parts of the world, individual health insurance is subject to both regulation and competition to simultaneously pursue objectives related to fairness and efficiency in healthcare financing. We refer to such systems as 'social health insurance markets.' Examples include national health insurance schemes in Belgium, Germany, Israel, The Netherlands and Switzerland; voluntary health insurance markets in Australia and Ireland; and specific sectors, such as the state-based Marketplaces and Medicare Advantage in the United States. Though each of these systems follows its own path of reform, there are many commonalities, both in terms of how markets are regulated and the nature of competition.

Each of these nine systems relies on premium-rate restrictions. Though these restrictions come with important gains, such as improvements in fairness and reductions in reclassification risk, they also create incentives for risk selection by consumers and insurers, with generally negative effects. The potential for risk selection primarily has two drivers: 1) the *scope* for selection actions by insurers and consumers and 2) the *incentives* to engage in these actions. The goal of this paper is to compare the scope and incentives for typical forms of risk selection among the nine aforementioned social health insurance markets.

Our approach mainly consists of three steps. First, we distinguish four typical forms of risk selection: 1) selection by consumers in/out the market, 2) selection by consumers among high- and low-value plans, 3) selection by insurers via plan design and 4) selection by insurers via other channels such as marketing and customer service. We describe how each of these forms comes with specific welfare effects. In a second step, we discuss how relevant features of social health insurance markets affect the scope and incentives for risk selection. Features that influence scope are, for instance, the presence of an insurance mandate, the set of consumer choice options and the insurers' flexibility regarding plan design. Examples of features that influence incentives are risk adjustment and risk sharing. In a third step, we characterize and compare the nine health insurance systems on the basis of such features.

Our analysis reveals crucial differences in relevant features among the nine systems and shows how these differences impact scope and incentives for risk selection. For example, some systems have a (strong) insurance mandate while others have not (implying differences in *scope* for selection by consumers in/out the market). Another exemplary observation is the variation in consumer choice and insurers' flexibility (suggesting differences in *scope* for selection by consumers among plans and selection by insurers via plan design). Our analysis also reveals great differences in the design of risk adjustment and the extent of risk sharing (pointing toward different *incentives* for insurers to engage in selection actions).

Our framework and observations help understand the nature of selection problems and why specific forms of risk selection are more existent in some systems than in others.

Risk Equalization in Health Insurance Markets with Risk-Rated Premiums: A Tradeoff between Selection By Insurers and Selection By Consumers

PRESENTER: **Peter Paul Klein**

AUTHORS: Richard van Kleef, Josefa Henriquez, Francesco Paolucci

Risk equalization is typically studied as a tool to reduce selection incentives for insurers in the presence of community-rated premiums. Several regulated health insurance markets, however, include some form of risk-rating in order to mitigate selection incentives by consumers. This paper studies how – in these markets – risk equalization affects premiums. In a conceptual framework we develop measures of selection incentives for insurers and consumers and then implement these measures in a simulation analysis using administrative data from Chile. Our simulation shows that in the presence of risk-rated premiums risk equalization reduces selection incentives for insurers, but, exacerbates selection incentives for consumers. The explanation is that risk equalization mitigates both predictable spending variation not reflected in premiums (which reduces selection incentives for insurers) and predictable spending variation reflected in premiums (which reduces premium variation and increases selection incentives for consumers). The latter is due to the correlation between risk adjusters (e.g. diagnoses-based cost groups) and premium-rating factors (e.g. age): even when age is omitted from the risk equalization model, diagnoses-based cost groups will to some extent compensate for spending variation among age groups thereby reducing premium differences among age groups. To escape from this tradeoff, regulators could consider including premium-rating factors in the regression model used to estimate the risk equalization formula while implementing specific constraints on

the estimated coefficients of these factors to preserve a predefined level of premium variation, analogous to the approach proposed by McGuire et al. (2013).

Designing Feasible and Effective Health Plan Payments in Countries with Data Availability Constraints

PRESENTER: **Josefa Henriquez**, University of Newcastle

AUTHORS: Marica Iommi, Thomas McGuire, Emmanouil Mentzakis, Francesco Paolucci

Risk equalization is a fundamental tool in health plan payment in many countries, but often data availability constrains the feasible models. This paper proposes and implements a new risk equalization scheme adding new risk adjusters and incorporating risk sharing. Risk sharing relies on total spending data likely available for purposes of payment, potentially increasing the feasibility of an effective payment design. Alternative models are evaluated in terms of fit at the individual, insurer, and group level, in an examination of incentives for risk selection. Using Chile as a case study, we show that a modest amount of risk sharing greatly improves fit. Expanding the model's formula to include morbidity-based adjustors and risk sharing redirects compensations at the insurer level and reduces the opportunity to engage in profitable risk selection at the group level. Our emphasis on feasibility may make the alternatives proposed attractive to countries facing data availability constraints.

Can Risk Rating Increase the Ability of Voluntary Deductibles to Reduce Moral Hazard?

PRESENTER: **Marcello Antonini**

AUTHORS: Richard van Kleef, Josefa Henriquez, Francesco Paolucci

Several regulated health insurance markets include the option for consumers to choose a voluntary deductible. An important motive for this option is to reduce moral hazard. In return for a voluntary deductible, consumers receive a premium rebate, which is typically community rated. Under community-rating, voluntary deductibles are particularly attractive for low-risk consumers. Since these people use relatively little medical care, the total moral hazard reduction might be relatively small compared to the total health care spending. This paper examines the moral hazard reduction under risk-rated premiums. We use Chile as a case study due the unique feature of its healthcare system which makes it a valid benchmark for other countries that are currently debating the structure of their health systems. Our estimations show that in the presence of self-selection, the absolute moral hazard reduction from a voluntary deductible is expected to be larger within a system of risk-rated premiums than in a system of community-rated premiums.

5:30 AM –6:30 AM WEDNESDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: Evaluating the Consequences of Health Systems Responses to the Pandemic: Health Economic Reflections from across the Commonwealth

SESSION CHAIR: **Paula Lorgelly**, University College London

DISCUSSANT: **Jeff Round**, Institute of Health Economics

Telemedicine during and Post the Pandemic: Uptake and Preferences in Western Australia

PRESENTER: **Suzanne Robinson**, Curtin University

AUTHORS: Richard Norman, Rachael Moorin

The emergence of the coronavirus COVID-19 pandemic had a huge effect on how we deliver health services across the public and private sector. With the majority of non-urgent care across the sector being transitioned to telemedicine. This included virtual hospitals, video and phone consultations across GP and primary care. In March 2020 the Australian Federal Government released a list of temporary Medicare Benefits Scheme (MBS) Telehealth Services to cover general practice payments for patient consults. The aim was to make sure that patients could/would continue to access primary care services and reduce the risk of COVID 19 transmission.

In addition to the transformation of services to digital platforms, we also saw a shift in community behaviour and the need to enact social distancing and isolation measures. The restrictions and changes imposed by the Australian Federal and State Governments has been successful in turning the curve in relation to the first wave of COVID-19. The move to telehealth meant that providers have had to quickly adapt to new ways of offering services that have minimal impact on safety, quality and effectiveness. Whilst the rapid change of service delivery caused major disruptions it also provided an opportunity to explore ways of working that would not have been considered possible at such a large scale at the beginning of the year.

This study explores two areas: the impact of COVID on telehealth uptake (including types of consult video v telephone and geographical variation) and the consumer experience and preferences for different types of telehealth delivery modes (i.e. video verses telephone) and their views on telehealth verse face-to-face (F2F) consults.

Whole of Western Australia's general practice Medicare billing activity data (i.e. frequency of visits, appointment type, appointment duration) for the period Jan 2019 to Jan 2021 will be analysed. Descriptive stats where used to explore the number and type of encounters. The analysis was also interested in the patterns of uptake across WA (e.g. differences in rural and remote, urban etc). A Discrete choice experiment (DCE) was used to explore consumer preferences for different consult modes.

Early analysis shows an increase in telehealth consults during the COVID lockdown period, the main mode of telehealth consultation tended to be use of telephone rather than video consultation. The next stage of analysis is to focus on uptake post lockdown. The DCE analysis will be undertaken early 2021.

COVID-19 As an Opportunity to Reduce the Use of Low Value Elective Surgery: A Local Case Study from Australia

PRESENTER: **Jonathan Karnon**, Flinders University

AUTHORS: Jodi Gray, Andrew Partington, Aubyn Pincombe

The COVID-19 pandemic has had a significant effect on elective surgery, with global modelling predicting over 28 million cancelled or postponed operations during the first three months of the pandemic. In Australia, on June 30, 2020 10,563 patients on waiting lists for elective surgeries in New South Wales had waited longer than their clinically recommended timeframe, nearly 20-times the number of overdue patients on the same day in 2019. One approach to clearing elective surgery backlogs is to identify patients for whom surgery is a potentially low value procedure. Public hospitals in South Australia have been audited with respect to the frequency, distribution and cost of low value elective surgery. The Southern Adelaide Local Health Network (SALHN) provides hospital, outpatient and community services to a population of more than 355,000 people. An aim of this study was to work with the SALHN to review and act upon potentially low value elective surgery.

A project meeting was held in early January 2021 with SALHN surgeons to discuss the audit results, the outcome of which was to not prioritise further investigation and action on low value elective procedures. Instead, the research focussed on data analysis of trends in all, and low value elective procedures pre- and post- the large COVID-19 related fall in elective procedures in mid-2020.

An additional investigation of COVID-19 effects involved a survey of the use and experience of health services by Australian adults experiencing a health issue, for which they would have presented at an Emergency Department (ED) prior to the pandemic. 1,289 eligible respondents completed the survey. Almost 25% of respondents avoided an ED presentation, of which 60% used an alternative form of health care and 40% self-managed. Respondents making face-to-face or telehealth appointments with their general practitioner (GP) reported high levels of ED avoidance and mostly positive experiences of care provided by GPs. A high proportion of those who self-managed reported high levels of concern at the time of completing the survey. Telehealth consultations with GPs may be a more promotable alternative to the ED beyond the COVID-19 pandemic, providing easier access to a doctor with access to patients' medical histories than a booking for a face-to-face consultation. GP telehealth consultations may also address barriers to accessing health care for those with potentially the greatest need. The reported use and positive experiences with GP telehealth appointments should inform further research on their appropriateness as an alternative to the ED.

The Impact of COVID-19 on Cancer Screening and Diagnostic Dervices in British Columbia, Canada

PRESENTER: **Adam Raymakers**, BC Cancer/Simon Fraser University

AUTHORS: Dean Regier, Ryan Woods

In British Columbia, Canada, cancer screening services are largely focused on colorectal and breast cancers. At the beginning of the pandemic, these services were immediately halted while clinicians and decision-makers attempted to determine how to deliver 45,000 (22,000 mammograms; 23000 FIT tests) monthly screens without creating undue risk to patients and other areas of the healthcare system. The breast and colon screening programs operated by BC Cancer were suspended in mid-March meaning a delay in the detection of screen-detectable cancers and subsequent treatments.

We estimated the potential impact on patient outcomes of suspended screening in BC using the OncoSim simulation models created by the Canadian Partnership Against Cancer (CPAC). These simulation models can be used to inform cancer control policies using data on risk factors, disease incidence and progression, clinical treatment, and health outcomes and expenditures. Models were structurally adjusted to estimate the impact of a 6-month suspension in screening services due to COVID-19. We estimated the incidence, number of screen-detected cancers, the stage of diagnosed cancers, disease-specific mortality, and costs, over five and ten-year time periods.

Initial estimations based on hypothetical rates of decreased services (20%, 40%, 60%) of the impact of the suspension of these services indicate a deferral of between 702 (20% reduction) and 1192 (60% reduction) diagnoses of these cancer types in the first twelve weeks of the pandemic, assuming a twelve week suspension in screening. The breast cancer prediction model projects that a suspension in screening for six months will result in a decrease of 122 and 479 fewer stage 0 and stage I breast cancers in 2020, respectively. Similarly, over the five-year period after the suspension of screening services, the model predicts a net increase in the number of advanced breast cancers (stages III and IV) (n=83). For colorectal cancer, the model projects that 68 fewer stage I and stage II cancers in 2020 and net increase of approximately 43 advanced stage cancers over a five year period. Over a ten-year he model predicts an additional fourteen breast cancer deaths and an additional eight colorectal cancer deaths. These deaths are likely a result of diagnosing these cancers at a later stage where prognosis is poorer.

There is clear impact to cancer screening services following measures implemented to contain COVID-19 in BC. These services are fundamental to identifying cancer early in affected individuals. Importantly, the reduction in services will result in an interruption in the number of patients identified for treatment and will lead to future capacity shortages as a bolus of deferred diagnoses begin to require follow-up diagnostic procedures and treatment.

Costs and Effects of COVID-19 Mitigation Policies on Diagnostic Conversion to Cancer: A Case Study in Colorectal Cancer Symptom Presentation in the United Kingdom

PRESENTER: **Ethna McFerran**

Individuals with symptoms suspicious of cancer are referred by their GP or other clinicians to cancer-related specialist clinicians, gastroenterologists, and surgeons for assessment. During the initial consultation and triaging processes these teams use established referral criteria to prioritise access to more invasive tests than those more commonly available to primary care physicians. For each subsequent more-invasive test undertaken the suspicion of cancer can be confirmed or eliminated, and in many such cases, other conditions or pre-cancerous conditions are identified.

This diagnosis process necessarily means that people will have tests for which cancer is not the outcome (up to 93% in some cases). Thus, understanding all diagnostic test results, and the frequency with which cancer, other conditions or a negative result are found, provides an understanding of the (cost) effectiveness of triage processes and their underpinning criteria. The ‘conversion rate’ is therefore useful in examining the wider processes of care planning. However, these data are infrequently reported in academic literature and is not a standard metric in all jurisdictions, nor is it common to for the diagnostic conversion rate be subject to cost-effectiveness scrutiny.

During COVID-19 rapid changes were made in the UK NHS to limit the risk of harms to both patients and staff of aerosol-generating procedures like colonoscopy, whilst attempting to maintain access to diagnostic services. This resulted in highly restricted access which required additional triage testing to be carried out to inform prioritisation. These triage tests were introduced rapidly during the pandemic with little evidence of the effectiveness. They have the potential to be used more routinely if they can accurately predict and stratify those with cancer and other conditions and are a cost-effective means of selecting the right people in the right order of priority for urgent access to care.

We examine if data generated through triage testing in colorectal cancer introduced in response to the pandemic increases the ability to plan diagnostic testing more effectively; underpins the evidence base for adjustments to referral criteria; and develops our understanding of how best to advance the outcomes for all patients awaiting diagnostic testing.

Using data analytics methods, clinical database mining was conducted to extract near-real-time clinical annotations data related to diagnostic testing. A minimum of 1-year pre-COVID-19 data, and all available records for the period post-COVID-19, were retrieved to compile and evaluate diagnostic data on colonoscopy outcomes, to the date of extract (Oct 2020) and were mined for outcomes of diagnostic testing.

These data provide a conversion rate for cancer referrals which was clinically accepted pre-COVID and another as implemented during COVID-19 mitigation responses. We examined how COVID-19 influenced the ability to identify cancers, and those conditions which increase the risk of cancer (adenomas), using counterfactual data we explore the implications for those who did not meet diagnostic thresholds, and model how ‘mitigation’ referral priorities affected diagnostic testing referral criteria costs and benefits. Results are then compared with early COVID-19 models of anticipated cancer outcomes. Potential implications on the future clinical costs and effects beyond COVID-19 are discussed.

5:30 AM –6:30 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Economics of Mental, Neurological and Substance Use

MODERATOR: **Cathy Mihalopoulos**, Deakin University

The Use of Decision Analytical Modelling in Mental Health Cost Effectiveness Assessments

PRESENTER: **Aileen Murphy**, University College Cork

AUTHOR: Nicole Ring

Objective: Despite its rapid adoption in economic evaluations in general, diffusion of decision analytical modelling into mental health has been slower; a review in 2000, found 2% of studies included decision analytical modelling. This studies investigates if the adoption of decision analytical modelling has increased since and if it is being used to overcome the challenges associated with examining cost effectiveness of mental health interventions.

Methods: The literature search was conducted using EBSCO, seeking relevant full text peer-reviewed studies published from 2007 to 2020. Each identified article was assessed for relevance against the exclusion criteria. Evidence gleaned from the data extraction is presented in tabular format and summarised using a narrative synthesis.

Results: A preliminary review of the literature reveals 57 published economic evaluations in the mental health area. Studies span across 16 countries and over 70% were published since 2010. Most examined interventions (86%) and the most frequent conditions considered were depression (47%), anxiety (16%), and general mental health (12%). Of the full sample, approximately 90% of studies reported an incremental cost effectiveness ratio; 10% reported net benefit and few include value of information analysis. Of the studies reporting an incremental cost effectiveness ratio, approximately a third employed some type of decision analytical model. Of which in only a few does the decision model adopted a life-time time horizon; the average time horizon in the remaining studies was less than 5 years. Furthermore, 80% of these studies reported an incremental cost effectiveness ratio; 10% reported net benefit; 40% presented incremental cost effectiveness planes and 55% provided cost effectiveness

acceptability curves. The most common reason for employing a decision analytical model was to combine multiple sources of evidence to answer policy questions (90%).

Conclusions: Good quality modelling plays a key role, and is a complement to trials in economic evaluations of healthcare interventions, if the evaluation is of value to policy-makers and decision-takers. While use of decision analytical modelling is increasingly used in assessing cost effectiveness in mental health, one must ask, is its full potential yet to be realised? Or are the challenges associated with examining the cost effectiveness of mental health interventions limiting the capabilities of decision analytical modelling too? Nevertheless the quality of economic evaluations in mental health, with and without decision analytical modelling, needs to be maintained to ensure they are of high quality and fit for purpose.

Integrated Care in Multi-Episode Patients with Severe Psychosis: A Cost-Effectiveness Analysis

PRESENTER: **Dr. Christian Brettschneider**, University Medical Center Hamburg-Eppendorf

AUTHORS: Anne Karow, Dr. Hans-Helmut Koenig, Christoph U. Correll, Daniel Schöttle, Daniel Lüdecke, Anja C Rohenkohl, Friederike Ruppelt, Vivien Kraft, Jürgen Gallinat, Martin Lambert

Objective: Severe mental illness (SMI) is defined by considerable and persistent impaired functioning due to mental disorders. People with psychotic disorders fulfilling SMI criteria present clinical and social challenges (e.g. comorbid mental and chronic somatic disorders, social disability, service disengagement, medication non-adherence). Assertive Community Treatment (ACT) is one approach to address these issues. In this study, we compare cost-effectiveness of integrated care with therapeutic assertive community treatment (IC-TACT) versus standard care (SC) in multiple episode psychosis.

Method: The data for the present analyses were derived from the ACCESS I and II studies. 12-month IC-TACT in patients with schizophrenia-spectrum and bipolar I disorders were compared with a historical control group. Differences were adjusted by entropy balancing. The primary outcome was cost-effectiveness based on mental health care costs from a payers' perspective and quality-adjusted life years (QALYs) as a measure of health effects during 12-month follow-up. The incremental cost-effectiveness ratio and cost-effectiveness acceptability curves based on the net-benefit approach were calculated.

Results: At baseline, patients in IC-TACT (n=212) had significantly higher illness severity and lower functioning than SC (n=56). Differences were successfully adjusted. Over 12 months, IC-TACT had significantly lower days in inpatient (10.2±20.5 vs. 28.2±44.8; $p<0.05$) and day-clinic care (2.6±16.7 vs. 16.4±33.7; p=.004) and correspondingly lower costs (€-55,084). Within outpatient care, IC-TACT displayed a higher number of treatment contacts (116.3±45.3 vs. 15.6±6.3) and higher related costs (€+1,417). Both resulted in lower total costs in IC-TACT (€10,741±8,269 vs. €18,215±17,456; adjusted mean difference=€-13,248±2,975, $p<0.001$). Adjusted incremental QALYs were significantly higher for IC-TACT versus SC (+0.10±0.37, p=0.05). Hence IC-TACT was dominant. The probability of cost-effectiveness of IC-TACT was constantly higher than 99%.

Conclusion: IC-TACT was cost-effective compared with SC. The use of prima facies 'costly' TACT teams is highly recommended to improve outcomes and save total cost for patients with severe psychotic disorders.

Modeling Health Cost Savings and QALY Gains from Liberalizing Access to Electronic Nicotine Delivery Systems

PRESENTER: **Jennifer Summers**, University of Otago

AUTHORS: Driss Ait Oukrim, Nick Wilson, Tony Blakely

Background:

Measuring population health and costs effects of liberalizing access to electronic nicotine delivery systems (ENDS) is an evolving field with high persisting uncertainty. A critical uncertainty for quantifying net harms for policy makers has been the level of health harm of ENDs relative to conventional cigarettes, which experts have estimated at various points in the range between 5%-20%. However, these estimates of relative harm need updating with emerging evidence which ideally incorporates disease specificity.

We aimed to update estimates of the relative harm of vaping vs smoking, based upon biomarker studies, in an existing proportional multi-state life-table model (Petrović-van der Deen et al, *Epidemiology* 2019), to model the impact of liberalizing access to ENDS in New Zealand (NZ) on 16 tobacco-related diseases and health system costs over the lifetime of the NZ population alive in 2011.

Methods:

The model is based upon six smoking and vaping states, with movement between states determined by transition probabilities that reflect the potential effects of liberalizing ENDS (i.e. intervention) relative to business-as-usual (BAU) scenarios where ENDS are not legally available. Our re-analysis used updated disease specific estimates of relative harm estimates of ENDS use vs smoking ranging from 27.6% to 41.8%; substantially higher than the previous estimate of overall relative harm of 5%.

Results:

This modeling suggested that ENDS liberalization results in an expected gain of 195,000 quality-adjusted life-years (QALYs) over the remainder of the NZ population's lifespan. There was wide uncertainty in QALYs gained (95% uncertainty interval [UI] = -8,000 to 406,000) with a 3.2% probability of net health loss (based upon the number of simulation runs returning positive QALY gains). The average per capita health gain was 0.044 QALYs (equivalent to an extra 16 days of healthy life). Health system cost-savings were expected to be NZ$2.8 billion (US$2.1 billion in 2020 US$; 95%UI: -0.2 to 4.7 billion) with an estimated 3% chance of a net increase in per capita cost.

Conclusions:

This updated modeling around liberalizing ENDs in NZ, still suggests likely net health and cost-saving benefits – but of lesser magnitude than previous work and with a small possibility of net harm to population health.

5:30 AM –6:30 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Economic Evaluation in LMIC

MODERATOR: **Tingting Xu**,

Cost-Effectiveness Analysis of Surgery and Drug Treatment for Secondary Hyperparathyroidism Among CKD Patients: A Real-World Study

PRESENTER: **Li Yang**, Peking University

AUTHOR: Liu Yang

OBJECTIVE : The objective of this study was to estimate the cost-utility of surgery (PTX) and cinacalcet dug in maintenance hemodialysis (MHD) patients with severe secondary hyperparathyroidism (SHPT) in China.

METHODS: Screen patients (intact PTH >600 pg/mL) from outpatient clinic, hemodialysis center, and surgical patient database to establish a retrospective study cohort, divided into PTX treatment group and cinacalcet treatment group. For the cinacalcet group, cinacalcet was added to the base of conventional treatment. From the whole society perspective :the cost-effectiveness analysis for the short-term economics ,the cost includes the direct and indirect costs in the first year of treatment ， the effect index is the overall effective rate of each group in the first year of treatment, calculate ICERs and a single-factor sensitivity analysis . A Markov model was constructed from the whole society perspective for long-term cost-utility analysis , Patients with severe SHPT (intact PTH >800 pg/mL) were followed up over their lifetime. Cycle period 6 months, discount rate of 3%, dialysis costs were included, the health utility value is measured using the; EQ-5D-5L scale. Outcomes: Costs, QALYs, and ICURs.

RESULTS: The total costs of the PTX group and the cinacalcet group were RMB 127,700 yuan and RMB 111,000 yuan; The Probit regression analysis after PSM, the increased effectiveness of PTX treatment is 27.3%. PTX treatment compared with cinacalcet the ICERs of is RMB 53500 yuan. The Markov model outcomes: the PTX total cost was RMB 943,300 yuan, 8.16 QALYs were obtained; the total cost under the cinacalcet drug treatment plan was RMB 959,700 yuan, 7.22 QALYs . Cinacalcet treatment has a higher cost and lower utility compared with PTX treatment, and the ICUR is negative ， therefore , PTX is an absolute advantage in long-term treatment. Sensitivity analysis results show that: Mortality rate after surgery, discount rate, cost of cinacalcet for patients with iPTH<800 have a significant impact on the model results. In the probabilistic sensitivity analysis, when the WTP is RMB 190,000 yuan/QALY（3GDP,2018year）,the PTX program has a cost-effective probability of 78.9% compared with cinacalcet drug treatment.

CONCLUSION: The results of the short-term cost-effectivess analysis show that, If the willingness to pay is higher than RMB 53500 yuan , PTX is the cost-effective. For the patients (intact PTH >800 pg/mL) with life expectancy greater than 1 year and eligible for surgery, the PTX treatment is cost saving. Cinacalcet is suitable for patients who cannot undergo the PTX due to medical or personal reasons, and the expected life is less than 1 year, which improves the quality of life. It is likely to be cost-effective if the price of the drug reduced.

Should Minimally Invasive Surgeries be Scaled-up in Rwanda? A Rapid Economic Evaluation to Inform Health Benefits Package Design

PRESENTER: **Mr. Siyabonga Ndwandwe**, Clinton Health Access Initiative (CHAI) Inc.
AUTHORS: Dr. Tolulope Olufiranye OLUF, Parfait Uwaliraye, Regis Hitimana, Denyse Ingeri, Mr. Sukrit Chadha, Diana Kizza, Matiko Riro, Francis Ruiz, Eoghan Brady, Martin Nyundo, King Kayondo

Introduction:

Minimally invasive surgeries (MIS) are the standard of care for many surgeries in developed countries; however, their adoption has been minimal in developing countries[1]. To maximize benefits for patients, health providers, payers, and society at large, the scaleup of MIS must be informed by comparative evidence on health outcomes and costs. Whilst systematic reviews are becoming increasingly important in economic evaluation due to resource and data requirements, their application in developing countries is limited due to scant literature specific this setting. This analysis presents a rapid economic assessment of three MIS interventions using routinely collected medical and claims records.

Methods:

This retrospective analysis was based on health records from theatre registers, insurance and out-of-pocket records for 72 patients that had abdominal surgeries between March 2019 to March 2020 at University Teaching Hospital of Kigali (CHUK) and Rwanda Military Hospital (RMH) in Kanombe. Hospital length of stay proxied health outcomes whilst itemised invoices for patient out of pocket and insurer cost constituted total expenditure. Average total expenditure was computed and compared by surgery type and a two-tailed t-test was conducted to ascertain statistical difference in means. Other information captured include age, sex, insurer type, comorbidities, preoperative and diagnostic services, operative services, postoperative care, complications. One-way sensitivity analysis was conducted on insurer type, facility, and exclusion of patients with comorbidities.

Results:

The sample consisted of 72 patients from CHUK (68%) and RMH (32%). Hernia repairs accounted for 49% of observations whilst appendectomies and cholecystectomies accounted for 17% and 35% respectively.

Patients that received MIS had the shortest and statistically significant hospital stay—MIS cholecystectomies 2.6 vs 7.8 (p =0.000), hernia repair 2.4 vs 3.1 (p = 0.057); however, this was not significant amongst MIS appendectomies patients 3 vs 5.2 (p= 0.106).

Cost comparison of MIS with OS depended on type of surgery: MIS were more expensive for hernia (RWF 248,196 vs RWF 143,770 (p= 0.000)); MIS cholecystectomies were cheaper (RWF 233,481 vs RWF 355,455 (p=0.029)); and no significant difference for appendectomies. (RWF 305,427 vs RWF 289,045 (p=4209)). Admissions, pharmaceuticals, and surgical theater costs are the major cost drivers for the difference. The rapid cost-benefit of MIS is RWF 23,455 per day of averted hospital stay whilst the estimate for MIS hernia repair -RWF 149,180.

Results were robust to facility, health insurance type and to the exclusion of patients with pre-existing conditions.

Conclusions:

In Rwanda, MIS cholecystectomies are cheaper and have better outcomes than open surgeries—as proxied by hospital length of stay, therefore ideal candidate for adoption and scaling up whilst MIS hernia repair were more costly but with better outcomes. Further information on willingness to pay-thresholds, cost function and other outcomes is required to inform adoption. The major cost drivers are admission, pharmaceuticals, and surgical theater costs.

1 Rosenbaum, A.J. and Maine, R.G., 2019. Improving Access to Laparoscopy in Low-Resource Settings. *Annals of global health*, *85*(1).

Extensions to the Net Benefits Framework of Cost-Effectiveness Analysis to Cope with Elimination Objectives at the Local, Country, and Global Level: The Case of Human African Trypanosomiasis End-Game Programs in Democratic Republic of Congo

PRESENTER: **Marina Antillon**, Swiss Tropical and Public Health Institute
AUTHORS: Ching-I Huang, Ronald E Crump, Paul E Brown, Rian Snijders, Andrew Hope, Paul R Bessell, Erick Mwamba Miaka, Matt J Keeling, Kat Rock, Karen Grépin

Background: Cost-effectiveness has guided health resource allocation for the last two decades, most prominently embodied by the WHO CHOICE program. At the same time, several NTDs have been earmarked for elimination of transmission (EOT). As a result, there has been substantial progress on the tools and strategies to address NTDs, making their control a better value-for-money. However, once diseases are on the verge of EOT, the progressively higher marginal costs-per-case beg important questions about the comparative efficiency of such goals vis-à-vis previous control strategies. Here, we propose an extension to the net benefits framework, which accounts for uncertainty, cost-effectiveness on a per-case basis, and the premium for elimination. We illustrate our methods by considering the economic case for EOT by 2030 in the Democratic Republic of Congo (DRC) for *gambiense* human African trypanosomiasis (gHAT).

Methods: We developed an extension of the net benefits framework to consider the additional costs of switching from an optimal intervention (in terms of cost per disability-adjusted life year (DALY) averted) to an intervention with a higher likelihood of meeting elimination targets for each health zone of DRC with a history of gHAT transmission. Four interventions were evaluated by coupling a transmission model fit to the historical case data in DRC with a probability tree of treatment outcomes of gHAT. With our method, we have decomposed the cost of strategies with a >90% probability of EOT into two parts: 1) the cost justifiable by morbidity (DALYs) averted and 2) the additional “Premium of Elimination” that goes beyond what a 'cost-effective' intervention would justify. We considered the Premium of Elimination when WTP was $250 and $500 per DALY averted, which may be considered cost-effective (~0.5 and 1 times the gross domestic product) in DRC. Time-horizons of 2030 and 2040 were used to assess the potential return on investments if EOT has been reached.

Results: At WTP of $250 and $500, the recommended strategy yields EOT with 90% probability in approximately half and two-thirds of health zones respectively, a double or triple increase over the health zones that reach EOT by 2030 with the status quo strategy. Our framework indicates that, to have a high chance of elimination across DRC, and after accounting for the monetary value of additional DALYs averted by EOT-likely strategies, there remains a premium for the whole country of up to $33M when WTP is $250 per DALY averted, and of up to $14M when WTP is $500 per DALY averted. We identify the health zones where elimination investments are most efficient after accounting for uncertainty.

Discussion: While strategies that reach EOT are also cost-effective in a substantial number of health zones, the two goals do not always align. With our novel method, we determine the premium of elimination, or the additional resources necessary to reach elimination across all health zones of DRC beyond those resources justifiable by DALYs averted. Our method can also be used to compare the efficiency of resource use across regions or across diseases marked for elimination.

Optimizing Community Health Worker Time in Rural Mali

PRESENTER: **David Boettiger**, The University of New South Wales

AUTHORS: Saibou Doumbia, Prof. Sergio Bautista-Arredondo, Caroline Whidden, Youssouf Keita, Kassoum Kayentao, Ari Johnson, Nancy Padian, Emily Treleaven, Jenny Liu, Tracy Kuo Lin

Background

Rural Mali carries a disproportionate burden of the country's high under-five mortality rate (111 and 61 deaths per 1,000 live births in 2018 in rural and urban areas, respectively). Community health workers (CHWs) are critical for reducing child and maternal healthcare inequalities in such locations. However, little is known about how CHWs divide their time or what interventions may optimize their time. We describe the time CHWs in Bankass, Mali spend on their daily activities and explore some of the trade-offs they make.

Methods

A three-year trial in Bankass, the ProCCM study, will estimate the impact of door-to-door proactive case detection by CHWs on under-five mortality and maternal health outcomes compared to passive, site-based care. In early 2020, we collected time and motion data from a random selection of 112 of the trial's 124 CHWs. Over six weeks, trained observers followed each CHW for one period of four hours and documented their work activities. We also compiled data on self-reported average number of hours worked per day and administrative records on CHW salaries. Linear regression adjusted for CHW age and sex was used to describe time trade-offs. When the trial is unblinded in Jan/2021 we will stratify analyses by study arm and link data with indicators of CHW service quality.

Results

On average, CHWs worked 23.4 hours per week and were paid 12,820 CFA ($US 23.26) per week. Hours were divided evenly Monday to Saturday (approximately 3.5 hours/day), and Sunday hours were shorter (approximately 2 hours/day). Overall, CHW time was split: 50% waiting for the next patient, 17% travelling, 11% caring for children under-five, 10% break/meal, 6% non-specified, 3% caring for women of reproductive age (15-49 years), 1% caring for children aged 5-14 years, 1% caring for males aged >14 years, and 1% caring for women aged >49 years. Symptoms managed in under-fives were indicative of: 33% malaria, 24% respiratory distress, 21% diarrhoea, 20% non-specified, and 2% malnutrition. Health issues being addressed in women of reproductive age were: 50% non-specified, 26% prenatal care, 14% family planning, 5% labour/delivery, and 5% postnatal care. CHWs who spent less time waiting spent more time dedicated to under-five care (2.0% more time on care for every 10% less time waiting, $p<0.01$) and caring for women of reproductive age (0.5% more time on care for every 10% less time spent waiting, $p<0.01$). Time spent travelling was not associated with time dedicated to under-five or women's reproductive age care. CHWs who spent more time caring for women of reproductive age also spent more time caring for children under-five (6.2% more time on under-five care for every 10% more time on caring for women of reproductive age, $p=0.02$).

Conclusions

We found 14% of CHW time was dedicated to caring for children under-five and women of reproductive age. Over 65% of CHW hours were spent waiting or travelling. Given less time waiting for the next patient was associated with more time delivering care, CHW service delivery in Bankass may benefit from interventions aimed at reducing wait time.

7:00 AM –8:00 AM WEDNESDAY [Demand And Utilization Of Health Services]

Health Care Utilization in the Elderly Population

MODERATOR: **Luigi Siciliani**, University of York

Income-Poor but Asset-Rich: Effects of Housing Wealth on Older Adults' Healthcare Utilization

PRESENTER: **Michelle Tran**

Do wealthier individuals use more healthcare services than those less affluent? We investigate this question by exploiting the booms and busts in the U.S. housing market – a natural experiment that generated considerable gains and losses for homeowners. We estimate the effect of wealth on older adults' healthcare utilization using the Instrumental Variables (IVs) approach using the county - year variations in house prices to construct an instrument. Using data from the 1996-2016 Health and Retirement Study (HRS), we find that an increase in wealth increases the use of medical treatment and services such as prescription drugs, outpatient surgery, and dental services. On the other hand, we do not find evidence of wealth effects on hospital admission. At the intensive margin, the number of doctor visits increases in response to a positive wealth shock, but there is no significant effect on the number of hospital nights. Overall, we find consistent evidence with the wealth effect literature that wealthier individuals consume more health services. However, this change in healthcare utilization is not due to the depreciation in health.

Effects of Frailty Bio-Psycho-Social Dimensions on Healthcare Utilization Among Elderly in Europe: A Cross-Country Longitudinal Analysis

PRESENTER: **Ms. Cecilia Luini**, Universit&#xf; della Svizzera italiana

AUTHOR: Stefano Calciolari

Background: Frailty represents an emerging challenge for Europe and has major implications for clinical practice, public health and the sustainability of healthcare systems. It is a geriatric condition, related to but distinct from disability and multimorbidity and characterized by a diminished physiological reserve of multiple organs. Notably, such condition translates into increased adverse outcomes in older people. Despite little consensus and evidence, it has been argued that cognitive and social aspects influence the condition. In this respect, Gobbens and colleagues (2010) define frailty as "a dynamic state affecting an individual who experiences losses in one or more domains of human functioning (physical, psychological, social) that are caused by the influence of a range of variables and which increases the risk of adverse outcomes". Therefore, both biologic and psycho-social aspects should be considered to embrace a more integrated approach to frailty.

Objectives: The analysis aims to provide evidence on the importance of taking a broader approach in defining the condition of frailty, by investigating the role of its physical, social and psychological subdomains in predicting healthcare consumption, in particular the likelihood of hospital admission and the number of doctor visits, in elderly Europeans.

Data and Methods: The study uses the Survey of Health, Ageing and Retirement in Europe (SHARE), a multidisciplinary and cross-national panel database of micro data on health, socio-economic status and social and family networks. The analysis is based on the information from 12 European countries included in wave 4 (n=47,323), wave 5 (n=56,736) and wave 6 (n=52,899), collected in years 2011, 2013 and 2015 respectively, with a total number of observations equal to 156,958. Physical, psychological and social frailty indexes are built to proxy the Tilburg Frailty Index. The analysis investigates the relationship between the three dimensions of frailty on: 1) the likelihood of being hospitalized; 2) on the number of doctor visits. The study uses two models (logit and poisson, according to the nature of the outcome variable) exploiting the longitudinal structure of the data to control for time-fixed unobserved characteristics and including regressors to correct for demand side (health status; socio-economic status; and behavioral risk) as well as for country-specific characteristics (country binary variables).

Expected results and conclusions: Prevalence of physical frailty increases with age (61% vs. 39%, respectively, in 70-80- and 50-60-years old people) and is highest among respondents with multi-morbidities (64% vs. 36%, in people with and without, respectively). Similarly, prevalence of social and psychological frailty is highest in presence of multi-morbidities (90% vs. 10% and 79% vs. 21%, respectively), despite substantially

uncorrelated with age. Physical, social and psychological frailty are associated with higher healthcare consumption, after controlling for the main correlates and for unobserved individual effects. Results suggest taking a multidimensional approach to frailty has the potential to better predict complex needs of the elderly.

Keywords: *Aging; Frailty; Healthcare utilization; Social isolation; Psychological dimension.*

How Accurate Are Expectations About the Need for Nursing Home Care?

PRESENTER: **Ms. Lisa Voois**, Erasmus University
AUTHORS: Dr. Teresa Bago d'Uva, Owen O'Donnell

Objectives: Underestimation of the likelihood of needing nursing home care when old can leave insurance and saving insufficient to cope with long-term care costs, and result in poor health and low wellbeing in old age. Alternatively, overestimation of nursing home needs could lead to excessive saving and unnecessarily low consumption earlier in life. The health and welfare losses could be especially large for people with low educational attainment if their expectations of future need for nursing home care are more inaccurate. While it is known that longevity expectations tend to be highly inaccurate, particularly among the less educated, this is the first paper to measure and explain the accuracy of expectations of the likelihood of entering a nursing home.

Methods: We use data from the US Health and Retirement Study (HRS) for a sample of older (70+) Americans. We compare the subjective expectation of admission to a nursing home within 5 years with the ex post realization of this event. We use the mean squared prediction error (MSE) to measure prediction accuracy, and decompose this into outcome uncertainty, bias, discrimination and noise. We use this decomposition to explain variation in prediction accuracy by educational attainment. Furthermore, we examine whether long-term care insurance is related to nursing home expectations.

Results: On average, older individuals slightly overestimate their chances of nursing home entry. However, there is much variation and prediction errors tend to be large. The MSE is 0.19; on average, individuals under- or overestimate their chance of nursing home entry by more than 40 percentage points. The least educated have the least accurate predictions. After adjusting for the difficulty of the prediction task – the variance of the outcome – there is a clear education gradient in prediction performance, with the higher educated always performing better. The predictions of the higher educated contain less noise and tend to be better able to discriminate between those who enter a nursing home and those who do not, which helps explain the observed prediction differences by education. Importantly, long-term care insurance take-up slightly increases with expectations of the need to enter a nursing home, and individuals with less accurate predictions are less likely to have long-term care insurance.

Discussion: Overall, these results indicate that individuals, and especially the least educated, hold highly inaccurate expectations about the chance of nursing home entry, and they might not be planning optimally for their long-term care needs. This could exacerbate inequalities in health among the elderly, and it could have important policy implications, as it appears that people should not only be protected from random shocks, but also from their own suboptimal decisions based on their inaccurate judgments. At least, steps should be taken to inform people better about their likely needs for long-term care in old age, such that they can take better decisions about saving and long-term care insurance. A more radical inference from our findings would be to propose that long-term care insurance be made mandatory, such that people are protected from their own misperceptions.

7:00 AM –8:00 AM WEDNESDAY [Supply Of Health Services]

Hospitals' Incentives

MODERATOR: **Anthony Scott**, University of Melbourne

How Do Hospitals Respond to Payment Incentives ? Evidence from the Diagnosis-Intervention Packet Payments System Reform in China.

PRESENTER: **Mr. Jiaqi Yan**, Public Health College, Fudan University
AUTHORS: Ms. Xinyu Zhang, Dr. Mengcen Qian, Xiaohua Ying

Background: To induce costs containment and efficiency of care from the provider side, China has developed a new patient classification approach, Diagnosis-Intervention Packet (DIP), and piloted a global budget payment scheme associated with it. The payment system will soon rollout in more than 70 prefectural cities in China. More than 12,000 core DIP groups with related weights calculated by the past average expenditure were identified. Over 300 contracted hospitals were payed under the global budget at the city-level, and the relative weights measures the severity of the treatment and the amount of reimbursement available. However, there is little information on the behaviors change of the contracted hospitals under the incentives from DIP reform.

Method: Our study city was among the first cities to pilot the DIP payment reform since Jan 2018. We used discharge data of all contracted hospitals from 2016 to 2019 of tin our study city. We constructed a counterfactual scenario to identify the group that a patient would have been assigned to prior to the reform based on the rules and relative weights of classification in 2018. We calculated monthly inpatient volumes, the average weight of all inpatients and the actual cost per weight to capture hospital behaviors. Interrupted time-series analyses were performed with seasonal effects adjusted.

Results: (1) DIP reform changed the tendency of hospitals to recruit more patients. The whole number of inpatients increasing rapidly by 4480 ($P < 0.001$, 95%CI, 3,230 to 6,543) per month before. The DIP reform caused a growth reduction of 95.2% and the growth was 216 (P=0.792, 95%CI, 0 to 1862) after reform. (2) Hospitals were inspired to use more expensive and advanced treatments. The average weight of all inpatients remained stable before DIP reform, and the growth was 0.86 (P=0.3440, 95%CI, -0.95 to 2.66) per month, while it was 6.99 ($P < 0.0001$, 95%CI, 5.49 to 8.49) per month after reform. Therefore, 87.7% of average weight growth could be attributed to the DIP reform. (3) The actual cost per weight remained almost invariant, and the growth was not significant before and after DIP reform. It showed that the growth of average weight was more likely to represent the actual behaviors change of hospitals but not caused by Fraudulent “upcoding” or more completed medical records. (4) Subgroup analysis showed the primary hospitals are most affected and upcoding might happen in the high levels hospitals.

Conclusion: We observed a systematic shift of inpatients volumes and structures in hospitals after DIP reform. The hospitals shifted their focus from the number of inpatients to the weights of inpatients to get more reimbursement in DIP payment system. The change of average weight was more likely to represent the actual behaviors change of hospitals. In the DIP weights competition, primary hospitals might get loss due to the weak ability of treatment and coding.

Impact of Quality-Based Procedures on Orthopedic Care Quantity and Quality in Ontario Hospitals

PRESENTER: **Alex Proshin**, Paris School of Economics - University Paris 1 Pantheon-Sorbonne
AUTHORS: Mr. Adrian Rohit Dass, Rochaix Lise, Audrey Laporte

The objective of our study is to comprehensively evaluate the impact of a funding reform introduced in Ontario aiming to replace global budgets funding with a new and desirably more efficient system. Two of its main components - the Health-Based Allocation Model (HBAM) and Quality-based procedures (QBPs) - were phased in from 2012 with the goal to incorporate PPS and P4P incentives into Ontario inpatient care. The reform also envisaged preserving around 30% of hospital funding through global budgets based on hospital budgets from previous years.

The first component of the reform, HBAM, at its core was a mechanism designed to distribute a fixed provincial envelope between hospitals based on expected spending of each hospital. This component determined a hospital's share of the envelope by forecasting future hospital budgets, relying on a volume by unit cost approach.

At the inception of the program, the second component of the reform - QBPs - were supposed to encourage adoption of better clinical practices by affecting financial stimuli at the hospital level. Due to a presumed lack of coordination and communication between the designers of the reform and its various participants and because of inconsistency of policy objectives over time, the substance of QBPs changed from financially rewarding

providers for quality to a risk-adjusted volume by price funding for every eligible procedure performed, supplemented with an array of clinical guidelines to which hospital practitioners were expected to adhere.

Using patients from Canadian provinces of Alberta and British Columbia as control populations, we evaluate through both a difference-in-difference approach and a range of matching covariate/propensity score matching techniques the impact of QBPs/HBAM on the volume and quality of targeted procedures and other types of joint replacements plausibly competing for hospital resources. We rely on patient-level data from Canadian Discharge Abstract Database (DAD). After controlling for patient, hospital and regional characteristics, we found a significant decrease in acute length of stay associated to QBPs, as well as a marked shift towards patients being discharged home with/without post-operative supporting services. However, evidence for quality improvement across all joint replacement types was weak, inconsistent and at best short-lived.

To test robustness, we first ran the more conservative and, from a few perspectives, less flexible NNM algorithm with replacement and analytical Abadie-Imbens bias-corrected standard errors. To provide additional robustness, this analysis was further complemented with propensity score matching models and difference-in-difference specifications with kernel-weighed control groups

A New Case-Based Payment Reform Pilot in China: The Impact on Costs and Quality of Care

PRESENTER: **Ms. Xinyu Zhang**, School of Public Health, Fudan University
AUTHORS: Dr. Mengcen Qian, Yajing Chen, Su Xu, Xiaohua Ying

Background: The rollout and implementation of the diagnosis-related group (DRG) payment system have facing some challenges in China. Meanwhile, a new cased-based payment system named Diagnosis-Intervention Packet (DIP) with global budget was developed. The system uses a pure data-driven approach to classify patients based on combination of principal diagnosis ICD-10 (International Classification of Diseases, 10th Revision) codes and procedure ICD-9-CM3 (International Classification of Diseases, 9th Revision, Clinical Modification) codes, resulting in more than 10,000 groups. The payment was linked with the prospective intensity of healthcare resource utilization of each group, and restricted by the total insurance budget of a region. So far, no studies have empirically investigated the impact of this payment reform on inpatient costs and quality.

Methods: We used patient-level discharges data from January 1st, 2016 to December 31st, 2019 in a provincial capital city in Southeastern China. The study city piloted the DIP reform in all contracted hospitals since January 1st, 2018. Before the reform, the study city applied a "fixed rate per admission with a cap on annual total compensation" policy. We conducted difference-in-differences analyses on inpatient costs per case, length of stay (LOS), operation associated infection and postoperative complication rates. Policy effects were identified by comparing changes in outcomes between insured and uninsured patients before and after the reform. All models controlled for a rich set of patients and hospital characteristics.

Results: The study sample consisted of 10.38 million discharge records from 309 hospitals. The DIP reform was associated with a 4.3% (P=0.000) increase in inpatient costs per case among insured patients. The policy impacts on LOS (0.080 days, P=0.106), operation associated infection rate (negligible in size, P=0.719) and postoperative complication rate (-0.2 percentage points, P=0.053) were not significant. Subsample analyses divided by severity of patients using Charlson Comorbidity Index showed that the policy impact of costs per case (an 8.5% increase, P=0.001) and postoperative complication rate (a 3.6% decrease, P=0.046) was mainly driven by more severe patients. Changes in length of stay were also more sizable among severe patients.

Conclusions: The DIP payment reform was associated with an average of 8.5% (P =0.000) increase in inpatient costs per case (as intended), trivial changes in length of stay, and a 3.6% (P=0.046) reduction in postoperative complication rate among patients with high severity. Our findings suggested that the DIP-based payment helped regulate provider behaviors when treating high-risk patients. These experiences would be helpful for other resource-limited low- and middle-income countries to improve health system performance by strategic purchasing.

The Welfare Impact of Outcome-Base Prices: The Role of Competition and Productivity Heterogeneity

PRESENTER: **Mr. Enrico Maria Camarda**, KU Leuven

Many healthcare systems use competition across providers and regulated prices to incentivize quality of care while containing costs. Some recent papers studied the effect of changing regulated prices on welfare and on decisions correlated with provider quality. Hackmann (2019), Eliason et al. (2018) and Einav et al. (2018) have focused on the effect of changing regulated prices on some measures of quality of the inputs, for example, number of nurses per patient or length of stay in the hospital. Potentially, a more efficient way to increase welfare is to reward clinical outcomes ("quality of outcomes" or level of clinical improvement) directly. These "quality-based prices" would incentivize better hospitals to increase quality, use more inputs and attract more patients. If the best hospitals are also the most efficient, these incentives help re-allocating patients and resources towards the most efficient hospitals. Even if market power may affect this correlation between efficiency and quality of outcomes, I show that quality-based prices can lead to a welfare-enhancing re-allocation also in presence of market power.

In this paper I study the impact on welfare of a system of payments that pays different regulated prices for hospitals delivering different levels of quality. Firstly, I show evidence from a reform in England that pioneered linking hospital prices to clinical outcomes. This exploratory reform is my motivation to understand the welfare effect of these prices and simulate different scenarios to find optimal quality-based prices. To this end, I develop and estimate a model of partial equilibrium with demand and supply decisions in the hip replacement market of the English NHS. For demand I use a model to estimate preferences where patients trade-off waiting time for quality. The decisions of the hospitals, instead, consist in the choice of a bundle of quantity and quality given the level of productivity of the hospital and the quality chosen by the other hospitals. Given this production choice model, using surgery-level cost data, I estimate the hospitals cost function controlling for differences in productivity, input prices and measurement error. Combining these models I also derive the non-profit motives of NHS hospitals, as the difference between the marginal revenue and the marginal cost of quality. With these estimates at hand, firstly, I determine what is the optimal quality provision and, secondly, I analyze a series of counterfactuals, where I explore what would be the effect of quality-based prices. These are: i) assessing the efficiency of uniform prices, ii) comparing the welfare impact of uniform prices and quality-based prices and iii) determining the relative importance of efficiency (and productivity) v. market power in driving my results.

I show that adopting a system with outcome-based prices that reward for higher quality can lead to a welfare improvement of up to an additional 4% of total welfare compared to uniform prices. The improvement is driven by an intensification of competition and a re-allocation of patients and resources to most efficient providers. The extent of this improvement depends on cost structures and market power of hospitals.

7:00 AM –8:00 AM WEDNESDAY [Health Care Financing And Expenditures]

Strategic Purchasing Reforms Around the World

MODERATOR: **Jane Chuma**, Health Economics Research Unit - KEMRI | Wellcome Trust Research Programme

Impacts of National Drug Price Negotiation on the Expenditure, Volume, and Availability of Targeted Anticancer Drugs in China: A Controlled Interrupted Time Series Analysis

PRESENTER: **Yan Sun**, Peking University Health Science Center
AUTHOR: Li Yang

Background: The availability and affordability for anticancer drugs and their soaring expenditure are challenging for countries all over the world. In China, the price of anticancer drugs was concerned to be high compared with patients' average income, and there are very limited types of anticancer drugs in the reimbursement list. Facing these challenges, the Chinese government has launched four rounds of national drug price negotiation since 2016 to lower the price and provide reimbursement for clinical use of innovative drugs, most of which are anticancer drugs but some reports worried that the limited total budget and drug expenditure proportion would hinder patients' access. This study aims to

examine the effects of the second round of negotiation in 2017, which included far more kinds of anticancer drugs than the 2016 negotiation, on the expenditure, volume and availability of anticancer drugs at the provincial level.

Methods: Government documents of drug price negotiation in 31 provinces were reviewed in terms of co-payment, the limit on drug expenditure proportion and total budget. Three anticancer drugs were selected as the intervention group and pegaspargase, an anticancer drug not included by the negotiation and National Reimbursement Drug List was selected as the reference group. Procurement data at the provincial level from January 2017 to September 2018 were extracted from China Drug Supply Information Platform which was established by National Health Commission. The volume, expenditure, and availability of these drugs were analyzed using a controlled interrupted time series (ITS) design in 11 provinces which implemented the policy in September 2017.

Results: Provincial policies are in accordance with central government policy in terms of limited reimbursement scope and procurement prices. However, great ambiguity existed in regulations on drug expenditure proportion, total medical expenditure, retails purchasing and review-record system. Before the intervention, both groups revealed an increasing trend in volume (measured by Defined Daily Doses) and expenditure, while the availability of negotiated drugs decreased by 0.2 percentage per month ($p<0.05$). The incremental growth rate of monthly average expenditure and volume of the three negotiated drugs were 4.3 percentage ($p<0.05$) and 1203.7 ($p<0.01$) higher than those of the reference group, while no difference was observed in the immediate change on the level of volume and expenditure. The implementation of negotiation policy increased the availability of negotiated drugs by 2.1 percentage ($p<0.01$) in hospitals immediately, and the growth rate of availability increased by 0.4 percentage ($p<0.01$) per month compared with the reference group.

Conclusions: The national drug price negotiation in China increased the volume, expenditure and availability of anticancer drugs and achieved the expectation of the policy of guaranteeing patients' access to these drugs. The expanded utilization of anticancer drugs could be explained by the release of patients' potential demand, changing physician behaviors and fewer competitors on the market. At the same time, efforts could be made at the operational level to achieve reasonable utilization of insurance fund, such as the introduction of pharmacoeconomic evaluation and strengthened supervision on drug misuse.

A Composite Model for Pricing New Orphan Drugs

PRESENTER: **Afschin Gandjour**, Frankfurt School of Finance & Management

Background/aim: For the purpose of pricing new, innovative medicines two pricing models form the extremes of the spectrum: cost-plus pricing (CPP) and value-based pricing (VBP). Whereas VBP nowadays presents the gold standard in many industrialized countries, CPP is still influential in reimbursing orphan drugs. An intense dispute has revolved around the question if and how to adapt incremental cost-effectiveness thresholds used for VBP to the orphan drug space. The purpose of this study was to develop a composite model that strikes a compromise between CPP and VBP based on the size of the target population and other factors.

Methods: This study uses a Bayesian shrinkage estimator to create a composite model combining company-specific R&D costs and health benefits for the purpose of determining reimbursement prices. The weight placed on R&D costs is the proportion of the total variance in price attributable to the variance in the value-based price. Therefore, less weight is placed on R&D costs when population health benefits are more reliably estimated. Possible inefficiency of the R&D process can be incorporated as an increase in variance around the R&D cost estimate and the associated risk aversion.

Results: Applying the Bayesian shrinkage estimator, the price of an orphan drug decreases inversely proportional to the population size. The measure is able to incorporate R&D inefficiencies resulting from CPP.

Conclusions: A composite model for pricing new orphan drugs is able to account for the small target population of orphan diseases and to adjust the price accordingly. Further research is needed on how to allocate global R&D costs to each country.

Costed Health Benefits Packages in Nigeria: Comparing State Insurance Plans and Their Alignment with the Policy Objective of Achieving Universal Health Coverage

PRESENTER: **Olufunke Falade**, Palladium- USAID IHP

AUTHOR: Dr. Carlos Avila

Background. The National Health Act established the Basic Health Care Provision Fund (BHCPF) as an earmarked fund to guarantee the delivery of a basic package of services (BPS) to all Nigerians. States implementing health insurance schemes must define explicit BPS and identify and enrol beneficiaries. Under varying social and economic circumstances, states must decide their financial share to the BHCPF. Our objective is to address the questions of how the national and state BPS' are aligned to the policy objective of improving maternal and child health (MCH) and how viable it is to achieve Universal Health Coverage (UHC) with a BPS that can be feasibly financed at the state level.

Methods. We compared insurance plans' services (the depth of service package), coverage of the funding pool (breadth of population covered) and the actuarial pricing (financial share) in Bauchi, Cross-River, Ebonyi, Federal Capital Territory (FCT), Lagos and the National World Bank-BPS costed for Niger, Abia, and Osun. An evaluation reporting standard checklist was used to analyse the different BPS'.

Results. The BPS costs are reported for coverage ranges from 10 to 80%. The actuarial pricing differences are attributed to price inputs, number of interventions, and service delivery costs. Annual per-capita costs range from US$ 11.04 to US$ 48.32. All insurance plans added administrative, marketing, and contingency costs from 15 to 30%. The table below outlines details and number of interventions (#Int) by service category: family planning (FP), immunizations (IM), antenatal care (ANC), assisted delivery (AD), postnatal care (PNC), child health (CH), HIV interventions (HIV), tuberculosis (TB), malaria (M), neglected tropical diseases (NTD), and non-communicable diseases (NCDs).

State	Year	Coverage	Unit Cost	#Int	FP	IM	ANC	AD	PNC	CH	HIV	TB	M	NTD	NCD
National	2016	60%	US$ 11.04	72	5	6	16	15	9	19	0	0	1	0	1
C. River	2018	30%	US$ 30.79	36	n/s	n/s	1	1	1	1	1	1	1	1	9
Lagos	2018	10%	US$ 31.19	14	n/s	n/s	n/s	n/s	1	1	0	0	0	0	2
Ebonyi	2019	10%	US$ 31.10	72	1	1	4	7	3	9	1	0	1	0	5

FCT	2019	10%	US$ 48.32	74	1	1	1	4	1	9	1	1	0	0	6	
Osun	2019	10%	US$ 31.37	57	1	0	3	4	4	1	1	0	1	0	6	
Bauchi	2020	80%	US$ 32.52	75	7	6	7	18	14	15	0	1	3	3	1	

Conclusion. The annual cost per-person of an explicit BPS represents a rational, evidence informed, and scalable solution to achieve UHC; however, refinement of input costs, utilization and administrative expenses are needed to ensure long-term sustainability. Overall, BPS' include MCH interventions covering 65% of the disease burden. Comparable MCH packages report returns between US$9 and US$20 for every dollar invested in addition to social returns. Contrasting BPS' promotes transparency and is helpful in identifying distinctive interventions, determining their feasibility and reducing service gaps that will guide the reduction of preventable maternal and child deaths in Nigeria.

Detection and Investigation of Fraud in National Health Security on the Primary e-Claim Basis

PRESENTER: **Miranti Ratnafuri**, BPJS Kesehatan

AUTHORS: Mcandra ikhda Nurrohman, Tedo Arya Trisnanto

Background: entering the 5th year of its role as the only health social security provider in Indonesia, as of the first semester of 2020 BPJS Kesehatan has cooperated with 22,982 primary care provider and 18,861 of them, or about 82%, claim their non-capitation services they have been providing every month. Along with the increasing access to health services that give a positive impact on the quality of life of JKN participants through health and sick contacts at the primary care, the possibility of potential fraud and abuse in health financing at the primary care also increases. At the end of 2019, BPJS Kesehatan developed an electronic-based claim system for primary health service integrated with a verification feature. The principle of this primary e-claim is obtaining adequate data entry to ensure that the service is properly provided to and received by JKN participants as well as analyzing the pattern of the data entered to prevent the possibility of fraud.

Data and methods: The empirical data showed that the service level agreement (SLA) for claim settlement in 2019 is as follows: N-1 (35.17%), N-2 (27.10%), N-3 (12.72%) and N> -3 (24.02%). The impact of the implementation of primary e-claims can be seen in the utilization of non-capitation claims in 2020. Even though at the beginning of 2020 all countries in the world were affected by the Covid-19 pandemic including Indonesia, the existing data can provide an explanation that the use of primary e-caim can adequately improve the SLA quality of claim settlement of N-1 by about 4.79% with the following details: N-1 (40.96%), N-2 (27,03%), N-3 (13,52%) and N> -3 (18.51%). The implementation of standardized input for all health service data, especially non-capitation services in primary care, provides room for developing a prospective and retrospective non-capitation claim verification logic. Prospectively, the primary e-claim will block the condition of the claim submitted that is not in accordance with the provisions, for example double claim and the period of service before its time. Meanwhile retrospective verification is carried out through the verification application named SIGAP, which is capable of detecting and investigating actual and potential fraud, namely by tracking individual services in all health service lines both in the primary care, secondary care and tertiary care .

Result: e-claim has a positive impact on fraud detection, which is increasing the ability to detect inappropriate claims from 0.25% in the pre e-claim era to 1.46% in the e-claim era. In other words, increasing the ability to detect fraud by 1.21% of all non-capitation claims. As of the first semester of 2020, the data shows that primary e-claim able to detect potential fraud claims worth 10.8 billion Rupiah, which is a significant value when compared to the total financing non-capitation basis.

Conclusion: The implementation of primary e-claim has a positive impact on the settlement time of non-capitation claim by 4.79% and increases the ability to detect fraud by 1.21% which has an impact on efficiency in first semester of 2020 of 10.8 billion Rupiah.

7:00 AM –8:00 AM WEDNESDAY [Specific Populations]

MENTAL HEALTH ECONOMICS SIG SESSION: Environmental Shocks and Mental Health and Wellbeing

MODERATOR: **Enrica Croda**, Ca' Foscari University of Venice

Health Effects of Floods on the Urban Poor

PRESENTER: **Michelle Escobar**, Centre for Health Economics, Monash University

There are now billions of urban poor across the developing world, many of whom reside in high-risk areas where they are continuously exposed to floods and other natural disasters. Previous research shows that disasters in these settings can cause long-term adverse effects on child nutrition, adult morbidities and human capital accumulation. With climate change increasing the frequency and intensity of flooding, the impact of these aggregate shocks on the urban poor is expected to worsen.

However, little is known about the more immediate impacts on mental health, particularly of adults and children living in informal settlements, where insecure tenure and lack of access to basic services increases vulnerability and pathogen exposure. Important challenges of measuring health effects of floods among vulnerable populations in developing countries include i) the possibility that selection into the most affected areas is correlated with individual and household characteristics that also influence health; ii) sampling challenges due to population movements after a disaster and iii) the lack of datasets that distinguish between the urban poor in formal housing and those living in slums.

In this paper we investigate the effects of floods on adult and child mental health and physical illness among urban poor in Indonesia. We also test whether these effects differ across urban poor living in formal housing and those living in informal (slum) settlements. We do so by employing multiple waves of the Indonesia Family Life Survey (IFLS) and a novel longitudinal dataset from the Revitalising Informal Settlements and their Environment (RISE) program. Exploiting the longitudinal nature of our datasets, the study uses individual and province fixed effects in the IFLS and a combination of Difference-in-Differences estimations with settlement fixed effects in RISE to address potential endogeneity and selection issues that may bias the results of previous retrospective studies.

With the IFLS we find that urban populations with consumption below $1.51/day experience large significant increases in depressive symptoms following floods, and that these effects are lasting and strongest among women and adults who were in poor health during childhood. With RISE we discover that people living in informal settlements experience substantially worse health impacts than the urban poor with secure tenure and access to basic services. A large flood event in 2019 caused adults living in informal settlements to experience increased depressive symptoms, worse general health, to lose more days of work due to poor health, and experience symptoms such as gastrointestinal and skin infections. However, the strongest effects in both samples where borne by children living in informal settlements. The flood event caused a significant deterioration in their emotional functioning, especially among girls and younger children, to the extent of potentially causing major chronic conditions in terms of their paediatric quality of life. A final important methodological conclusion from these analyses is that frequent sampling is required to identify many of negative health effects caused by natural disasters and can partly explain the ambiguity in the findings of previous studies estimating the health effects of high-frequency but low-intensity shocks such as floods.

Influences of COVID-19 on Subjective Wellbeing: Cross-Country Analyses from Five Developed Countries

PRESENTER: **Gang Chen**, Monash University Centre for Health Economics

AUTHOR: Jan Abel Olsen

Introduction

The pursuit of subjective wellbeing has become one of the ultimate aims of public policies globally. The COVID-19 outbreak has substantially impacted the daily lives of people. This study aimed to empirically reveal a composite picture of how COVID-19 impact on the multidimensional life and wellbeing amongst the general public in five developed countries.

Methods

An online survey was developed and administrated to an online panel of the general public aged 18 years and older in five countries (Australia, Canada, Norway, UK, USA) between April to June 2020. In each country, more than 2,000 respondents completed the survey. Respondents were asked to self-assess the COVID-19 impact on their wellbeing by use of the Personal Wellbeing Index which includes global life satisfaction and domain-specific items. They also self-evaluated any changes in their feeling of loneliness. Descriptive and regression analyses were conducted. The study has been approved by the Monash University Human Research Ethics Committee (Project ID: 24071).

Results

(1) To what extent have people been influenced by the COVID-19?

Both negative and positive shocks owing to COVID-19 were reported. Around 30% in all countries (except for Norway where it was slightly lower) reported that their lives as a whole had become (somewhat/much) worse. Concerning different life domains, the perceived negative impacts varied across seven life domains and countries. For example, in Australia, it ranged from 14% on achieving in life, 20% on personal health, to 37% on personal relationships. As for loneliness, no surprise that respondents felt more lonely during the pandemic.

(2) Who were more likely to report negative impacts from COVID-19?

Generally, younger adults, those with long-term health condition or disability were significantly more likely to report that their lives as a whole became worse due to COVID-19. Besides, socio-demographic characteristics (e.g. marital status, occupation, early life financial situation) and risk attitude towards health, tend to explain who report negative impacts (although the evidence is not robust in all countries).

(3) How did the COVID-19 influence subjective wellbeing?

Controlling for socio-demographic characteristics; long-term health condition, and, risk attitudes towards health, those reported negative impacts were associated with a statistically significant lower global life satisfaction, with estimated magnitudes across the five countries ranging from -0.7 to -1.5 (on a 0-10 scale). All else equal, those perceived to have negative impacts on each life domains were also significantly associated with lower life domain satisfactions. Cross-country differences were observed, e.g. those perceived negative impact on health were significantly associated with an average decrement of 0.6 (Norway) to 1.6 (UK/US) on life domain satisfaction.

Discussion

This study provided a unique cross-country comparison on the extent to which subjective wellbeing of the general public has been influenced during COVID-19 pandemic. Heterogeneities exist across five countries on who were more likely to perceive negative shocks and the magnitudes of the wellbeing impacts. Limitations also exist that albeit a rich set of personal characteristics were controlled for, the reported magnitudes of COVID-19 impact should be interpreted with caution given the nature of the cross-sectional survey.

Something in the Air? The Effect of Air Pollution Disclosure on Physical and Mental Health in China

PRESENTER: **Tingting Xie Xie**, ��
AUTHOR: Ye Yuan

A growing body of literature has documented the adverse effect of air pollution on one's cognitive functioning and mental well beings in cases where information on air pollution is publicly available. However, little is known on how much does the awareness of air pollution contribute to the overall impairment of air pollution. We provide the first piece of evidence to separately identify the effect of pollution awareness on individual's health, as well as the effect of exposure to air pollution when individuals were not aware of the air pollution.

Before 2012, China' average daily concentration of fine particulate matter (PM 2.5) was five times over the WHO standard. However, real-time monitoring or disclosure of air quality was nonexistent in China. Prompt by the rising outcry for air pollution management and transparency, China launched a three-wave introduction of comprehensive monitoring and disclosure of air quality. This paper exploits the staggered introduction of China's pollution disclosure program to estimate the effect of air pollution on one's physical and mental health both before and after the information on air quality was publicly disclosed. Based on two large nationally representative datasets in China, we pinpoint individual's exposure to air pollution according to the exact time and geographic locations. We measure the ground level of air pollution using the spatiotemporal inversion from satellite reading to overcome the issue of missing pollution data before 2013. We further adopt the measure of thermal inversion as an instrument variable for the ground pollution level to deal with potential confounding factors from regional economic activities.

Our findings are two-fold. First, we find a significantly negative effect of air pollution on both individual's physical and mental health before the air quality was publicly disclosed. Second and more importantly, we find that disclosure of the air pollution has an additional negative effect on one's health, especially for mental health and depression. Specially, the disclosure of air pollution increases the magnitude of estimated effects of air pollution on physical health and cognitive performance by about 10%, and increases that on mental health and depression by about 20%. These results are robust against alternative measures of air pollution, different estimation specifications, and various measures of health. We also provide evidence that negative effects of air pollution disclosure are more pronounced for the more vulnerable, i.e., who are older and less educated.

Our findings have crucial implications for uncovering channels through which air pollution may impair individual's health, especially on how pollution-induced mental deterioration may exacerbate the detriment of air pollution on physical health and cognitive performance. Our research also has important policy implications.

7:00 AM –8:00 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Modelling Methods

MODERATOR: **Gesine Meyer-Rath**, Boston University

The Impact of Patient Heterogeneity on Quality of Life: A Case Study in Atrial Fibrillation

PRESENTER: **Matthew Little**, University of Oxford
AUTHORS: Ramon Luengo-Fernandez, Philip Clarke, Aldo Maggioni, Aleksandra Torbica, Jose Leal

Background: Atrial fibrillation (AF) is associated with significant morbidity and mortality, particularly from an increased risk of stroke, heart failure and impaired quality of life (QoL). With an ageing population, prevalence of AF is anticipated to increase. Recent guidelines produced by the European Society of Cardiology (ESA) on the management of AF state the need to distinguish the effect on QoL of individual patient characteristics from those of symptoms and adverse events. However, doing so requires accounting for potential bias from unobserved patient heterogeneity.

Objective: To estimate the impact of AF on health-related QoL over a 2-year period while distinguishing the effects of individual patient characteristics from those of symptoms and complications.

Data and Methods: We used the ESC's Atrial Fibrillation General Registry, a prospective, multinational study for AF and its outcomes which enrolled 10,249 individuals across 27 countries with up to two years of annual follow-up. We included a total of 8,982 patients with an average follow-up of 1.3 years. QoL was measured using the EQ-5D-5L instrument at baseline, 12- and 24-months. EQ-5D-5L responses were converted to a QoL score using German tariffs. Complications and symptoms of AF (individual and as EHRA score) were identified, extracted from the dataset,

and used as predictors of EQ-5D-5L utility scores. Random effects (RE) and fixed effects (FE) models were compared to assess the bias arising from unobserved patient heterogeneity. Hausman tests were performed to assess the appropriateness of the FE estimator. In addition, we used the RE estimator to model potential serial correlation while allowing for time invariant region specific effects.

Results: Approximately 38% of patients reported symptoms associated with AF. The most common symptoms were palpitations (22%), shortness of breath (22%) and fatigue (14%). EHRA scores indicated 27% with mild symptoms, 10% with severe symptoms and 1% with disabling symptoms.

Results from the RE estimator found that shortness of breath, chest pain, dizziness, fatigue and anxiety were the symptoms associated with significant decrements in utility. New onset or worsening of heart failure had the largest decrement on utility (-0.06 95% CI -0.252 to 0.003) of the complications considered. ST segment elevation myocardial infarction and thromboembolic and haemorrhagic events were also significantly associated with worse EQ-5D-5L scores. The FE estimator gave similar results, except that palpitations also became significant (-0.01 CI -0.017 to -0.000) while the effect of haemorrhagic events became nonsignificant. The Hausman test indicated the presence of patient heterogeneity ($p<0.001$), suggesting the FE model may be more appropriate. Interactions between region and EHRA score showed larger decrements in utility associated with the Eastern region (-0.12, 95% CI -0.252 to 0.003).

Conclusions: This study found that both the RE estimator and the FE estimator give similar results when estimating the association of symptoms and complications on QoL. This suggests the decrements in EQ-5D-5L utility are attributable to AF and not merely the result of patient heterogeneity.

When Data Is Sparse: Modelled Economic Evaluation of Phacoemulsification and Extracapsular Cataract Extraction in Indonesia

PRESENTER: **Firdaus Hafidz**, Department of Health Policy and Management, Faculty of Medicine, Universitas Gadjah Mada
AUTHORS: Fikru Rizal, Giovanni van Empel, Rizki Tsalatsita Khair Mahardya, Ajeng Viska Icanervilia, Putri Listiani, Hermawati Setyaningsih, Roland Arung Pirade, Maria Lastri Sasanti, Imam Tiharyo, Muhammad Edrial, Santi Anugrahsari, Bambang Setiohadji, Indra Tri Mahayana, Dr. Jarir At Thobari

Background: Cataract surgery is a high-volume and high-cost medical service in National Health Insurance (NHI) in Indonesia. Between 2016 and 2018, cataract surgery performed using the phacoemulsification technique increased by 576% cases ($100 million), while extracapsular cataract surgery (ECCE) technique decreased by 22% cases ($3 million). This study aims to estimate the cost-effectiveness of phacoemulsification compared to the ECCE in Indonesia and understanding the budget impact of these interventions using sparse data due to COVID-19 situation.

Methods: Primary data collection cannot be done, a modelled economic evaluation was applied using a decision tree approach from a societal perspective. Time horizons including diagnostic, surgery, and follow-up (2 months post-intervention), was used to estimate the cost-effectiveness of phacoemulsification compared to ECCE for the treatment of an uncomplicated senile cataract. Systematic review and meta-analysis were used to obtain outcome parameters. Normative costing constructed from six hospitals' clinical pathway and e-catalogue price data were employed to retrieve cost parameters. Deterministic and probabilistic sensitivity analysis using 10.000-times Monte-Carlo simulation was performed to understand the uncertainty of parameters. Indonesia's National Health Insurance claims data were employed to estimate the budget impact for the next five years.

Outcome measures: Clinical outcomes were measured with the proportion of patients who attained improved functional vision measured on Best Corrected Visual Acuity (BCVA), Uncorrected Visual Acuity (UCVA), and post-surgical complications. Using the mean value retrieved from the systematic review. Uncertainty in costs, relative benefit, and the probability of complications parameters are modelled in gamma, log-normal, and beta, respectively.

Results: The model estimates the total cost for a full episode of cataract surgery was 7 million IDR for phacoemulsification and 7.3 million IDR for ECCE (Incremental cost of 387 Thousand IDR). A large difference was found in equipment cost with a 13% share from the total cost for phacoemulsification and only 4% in ECCE. The indirect cost of phacoemulsification was lower than ECCE, 6% vs 7% of the total cost. Meta-analysis showed that phacoemulsification outperforms ECCE in improving visual acuity with a risk ratio of 1.14 (95% CI 1.07-1.22) for BCVA and 2.24 (95% CI 1.65-3.04) for UCVA. The Incremental Cost-Effectiveness Ratio (ICER) was 3.7 million IDR and 1.8 million IDR for an additional one patient with better BCVA and UCVA at two months, respectively. The deterministic sensitivity analysis reveals that the variation in cost associated with staff remuneration and the relative benefit of phacoemulsification were the two most significant sources of uncertainty. Budget impact analysis showed NHI need to pay more than 1.7 trillion IDR in 2024.

Conclusions: Phacoemulsification is clinically superior and has a lower cost ratio per outcome compared to ECCE after two months of follow-up. A better policy of strategic purchasing for cataract surgery is needed to ensure quality and cost containment.

Factors Associated with Non-Completion of Quality of Life Questionnaires for Economic Evaluation in a Large Multi-Centre Randomised Controlled Trial (CARSK) Among Waitlisted Kidney Transplant Candidates

PRESENTER: **Karan Ketan Shah**, NHMRC Clinical Trials Centre, The University of Sydney
AUTHORS: Tracey Ying, Bree Shi, Helen Pilmore, Andrew Pilmore, John Gill, Patrick Kelly, Angela Webster, Steve Chadban, Rachael L Morton

Aim

To identify factors associated with quality-of-life (QoL) questionnaire non-completion, to support data completeness for a within-trial cost-utility analysis in an on-going multicentre randomised controlled trial.

Background

Missing QoL data in trials can bias trial outcomes and impair cost-utility analyses. QoL and cost-effectiveness are important secondary endpoints in the Canadian-Australasian Randomised trial of screening kidney transplant candidates for coronary artery disease (CARSK).

Methods

QoL in CARSK was assessed using two preference-based health-related QoL instruments in all eligible Australian and New Zealand (ANZ) participants: the EuroQoL 5 domains, 5 levels (EQ-5D-5L) was administered at baseline, 6 and 12 months. The Kidney Disease Quality-of-Life instrument 36 items (KDQOL-36) was administered at baseline and 18 months. For EQ-5D-5L data, QoL non-completion was dichotomized into Yes =all items missing; No =all items complete at each timepoint (as no partial completion was observed). For KDQOL-36 data, non-completion was dichotomized into Yes =all items missing; No =full or partial completion (partial completion can generate utilities). Factors associated with QoL non-completion, including age, sex, ethnicity, dialysis modality, diabetes status and country, were investigated using multivariable logistic regression models and presented as odds ratios (OR).

Results

Between June 2016 and December 2018, 461 participants were randomised from 14 centres in Australia (254, 55%) and New Zealand (207, 45%). At baseline, mean age was 52 years (SD 12), 66% males, 28% Indigenous, 37% diabetics, 176 (38%) were managed with facility-based haemodialysis, 121 (26%) with home-haemodialysis, and 164 (36%) with peritoneal dialysis. EQ-5D-5L completion rate was 93%, 73%, and 70% at baseline, 6 and 12-months respectively across all centres. KDQOL-36 completion rate was 89% at baseline and 63% at 18-months overall.

At baseline, younger patients were significantly less likely to complete the EQ-5D-5L than older patients >60 years old [<40 years (adjusted OR 4.9, 95%CI 1.3-24.5); 40-50 years (adjusted OR 4.2, 1.2-19.8); 51-60 years (adjusted OR 4.3, 1.3-19.6)]. Australian participants were less likely to complete the EQ-5D-5L than New Zealand participants (2.86, 95%CI 1.08 to 8.67). At 6-months follow-up, younger patients <40 years (5.06, 95%CI 1.88-14.33), male gender (2.16, 95%CI 1.03-4.79), and New Zealand participants (2.10, 95%CI 1.03-4.34) were less likely to complete the

EQ-5D-5L than their counterparts. At 12-months follow-up, younger patients aged <40 years (3.86, 95%CI 1.03-15.34), and diabetics (3.39, 95%CI 1.24-9.79) were less likely to complete the EQ-5D-5L than their counterparts. No difference was observed for KDQOL-36 non-completion.

Discussion

Younger patients, male gender, diabetes and centres in ANZ were significantly associated with QoL non-completion. Additional investigation of the trial and patient related factors and solving issues around collection of self-reported data, can help improve QoL data completeness for the remainder of the trial and subsequent cost-utility analyses. Future work on methods guiding imputation of QoL data within multi-country clinical trials for countries with low completion-rates will be explored.

7:00 AM –8:00 AM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Behavior, Risk and Choice

MODERATOR: **Arthur Attema**, Erasmus University Rotterdam

How Does Psychological Distress Affect Financial Behaviours and Outcomes?

PRESENTER: **Ian Weijie Li**, The University of Western Australia
AUTHORS: Dan Hoang, Ingebjorg Kristoffersen

Background

Mental health and well-being has gained prominence as a health and societal priority. A substantial body of evidence has found that well-being is associated with multiple outcomes, including longevity, employment and social relations, to name a few. A more limited literature examines the causal relationships between mental health and life circumstances, such as financial outcomes. Psychological distress can be both a cause and consequence of adverse financial circumstances, but developing an appropriate policy response requires better understanding of these relationships.

Objective

This study examines how mental health affects financial circumstances. Specifically, the study aims to evaluate changes in financial preferences, behaviours and outcomes when individuals report increased psychological distress.

Psychological distress is found to be both a cause and consequence of many adverse life circumstances, though the direction of causality is often difficult to establish with confidence. Financial preferences, behaviours and outcomes are important variables of interest. Clearly, financial hardship is an important risk factor for psychological distress. However, mental health may also affect wealth accumulation. This could occur via lower productivity and thereby income, but also through changes in financial behaviour in terms of consumption, saving and financial management; which is the focus here. Currently, very little evidence is available to support or challenge these hypotheses. This study aims to exploit rich panel data to evaluate the financial consequences of psychological distress in the short-to-medium term.

Method

The study uses data from the first 18 waves of the Household, Income and Labour Dynamics in Australia (HILDA) Survey, which is an ongoing annual population representative longitudinal survey. The Kessler-10 scale for measuring psychological distress is used to identify individuals who report clinically significant deterioration in mental health. The key outcome variables used here are financial preferences and behaviours (risk and time preferences and saving habits), and circumstances (financial shortfalls, access to emergency funds and household wealth). Key variables (specifically financial behaviours and K10) are captured in alternate survey waves, and this feature of the panel is exploited here to facilitate a clean identification using lagged and leading variables. Here, a fixed-effects panel data approach with lagged explanatory variables is applied in the core analysis, complemented by a Difference-in-Difference approach. The sample is restricted to individuals of working age (26-65).

Results:

The results indicate that increased psychological distress impedes individuals' ability to make sound financial decisions, and thereby their ability to accumulate wealth. Specifically, increased psychological distress is associated with increased preferences for risk-taking and diminished forward focus. That is, psychological distress leads to 'financial myopia', whereby the time horizon for financial decisions narrows. In addition, we observe an increased propensity to incur credit card debt in the short term, and divestment of household assets and wealth in the longer term.

Discussion:

Mental ill-being is clearly a risk factor for wealth accumulation directly through potential loss of income. The results presented here suggests risky financial behaviours may further compound the more far-reaching economic consequences of mental health issues.

Relating Visceral Factors to Domain-Specific Risk Attitudes

PRESENTER: **Adriana Natalja König**, Ludwig-Maximilians-Universität München
AUTHOR: Lars Schwettmann

Background: Impermanent physical or psychological states – so-called visceral factors – can contribute to discrepancies between desirable and actual behavior. The extent to which visceral factors, such as pain, affect behavior depends on their experienced intensity. The higher the intensity of a visceral factor, the more focus and attention is drawn to mitigating this specific factor. At high to extreme levels, this may even result in self-destructive decisions.

One such relevant behavior concerns risk taking in health contexts (e.g., drug abuse or overeating) but also in a variety of other domains such as financial choices (e.g., investments in risky assets or saving for retirement) or career-related decisions.

Pain is a highly prevalent condition, which can evolve to a chronic disorder. It potentially affects daily decision-making, and in particular decisions under risk. However, previous literature has disregarded the relationship between this visceral factor and self-reported risk attitudes. The present study closes this research gap by assessing the relationship between pain and self-reported general as well as a variety of domain-specific risk attitudes.

Methods: We used data from a large population-based cohort study, which was conducted in southern Germany. In total, 1,728 participants were included in the study. Participants answered five questions related to pain. To consider risk attitudes, the study employed a prominent self-reported instrument focusing on general risk attitudes, but also specific domains including health, car driving, financial, sports/leisure, and career.

We used negative binomial regressions to analyze the data and applied several models to assess the robustness of our results. Apart from our main variables, viz. pain and risk attitudes, we controlled for income, height, age, sex, education, body mass index as well as several medications related to pain.

Results: We reveal that pain is significantly associated with risk attitudes in a similar way within one domain. However, this effect varies across risk domains. More specifically, the visceral factor shows negative effects on general risk attitudes, but also in the financial and the leisure/sports domain. In contrast, in the health context pain has a positive impact on risk attitudes. Our results are robust with regard to several alternative model specifications. Furthermore, effects of confounding factors are in line with previous findings.

Discussion and Conclusion: Our results indicate that the visceral factor considered is significantly associated with self-rated risk attitudes in a variety of contextual domains. However, differing patterns between health- and non-health-contexts appeared. One possible explanation might be that respondents with high levels of pain indicate higher willingness to take risks in the health domain to alleviate intense pain levels, whereas they fear to increase these levels in other domains by risk-taking behavior.

Joints and More: Bundle Choices, Complementarities and Dynamics Among Sin Goods.

PRESENTER: **Dr. Liana Jacobi**, The University of Melbourne

Marijuana legalization is becoming more commonplace. Around two-thirds of Americans support marijuana legalization. As of November 2020, it is legal to sell and buy in 15 U.S. states, as well as in Canada and Uruguay. Marijuana sales rival that of other sin goods such as cigarettes and alcohol and in the U.S. are expected to exceed $30 billion by 2024. Global sales of cannabis in regulated markets were $12.2 billion in 2018. Total legal cannabis spending in the U.S. alone reached $ 9.8 billion in 2018. In the same year, wine sales in the U.S. totaled $48 billion, spirit sales $14 billion, and tobacco sales $107 billion. Not surprisingly, a large part of the impetus for marijuana legalization centers around the potential to raise taxes.

There is one potentially important caveat that has only been explored in a very limited way within the empirical health literature. Marijuana is typically not used in isolation. Hence, as an illicit substances like marijuana moves into the legal product space, substitution patterns with legal products become more salient. In particular, marijuana legalization may have implications for use of other "sin", such as alcohol and cigarettes, given their joint use pattern observed in the data. There may be different implications for health behavior due to complementarities or substitutability among these products as their use manifests itself differently on health, while tax revenues from alcohol and tobacco may also be impacted. In addition, changes in behavior may become more permanent due to the addictive nature of these products. While alcohol and cigarette use declined among U.S. adolescents by at least ten percentage points between 2007 and 2017, marijuana use increased by four percentage points.

In this paper we assess the (perhaps unanticipated) impact of marijuana legalization on other sin goods. Specifically, we focus on an individual's choice to consume marijuana, alcohol or cigarettes (and possible combinations of these products) within a dynamic framework of multi-substance use. This requires us to develop an economic model of multi-use of illegal and legal substances that allows for persistence in multi-product use and incorporates complementarities in use. We also introduce a flexible estimation framework to allow for the analysis of substance/product price elasticities within the proposed model where individuals can choose between bundles containing all possible combinations of the three substances, while also controlling for persistence in use and unobserved characteristics. The empirical analysis investigates marijuana, cigarette and alcohol use among the high risk group of adolescents using pre-legalization data from the US, including a carefully constructed data set of marijuana market prices by quality. It is the first study to allow the identification and quantification of complemenatry effects between cannabis and both alcohol and tobacco. Our preliminary results indicate clear complementary effects between cannabis and both substances as well as persistence of past use. Demographic characteristics matter in substance choices, but not necessarily in the same way. Our results inform the policy debate regarding the impact of marijuana legalization on the long-term use of sin goods.

7:00 AM–8:00 AM WEDNESDAY [Cross-Cutting Themes And Other Issues]

COVID Policy Evaluation

MODERATOR: **Jemimah Ride**, University of Melbourne

The Economics of Pandemics: New Methodologies and Governance to Mitigate Pandemics Globally

PRESENTER: **Kathryn Antioch**, Monash University

The Economics of Pandemics: New Methodologies and Governance to Mitigate Pandemics Globally

Objective

This paper presents a new national governance and decision-making model utilizing economic, social and epidemiology evidence under consideration by the Australian Parliamentary Senate. It aims to improve decision making at all levels of the health system on pandemic mitigation. The model was developed following analyses of economic studies on pandemics, international responses to the COVID-19 pandemic and international governance approaches to pandemics over the past two decades. COVID-19 has stimulated improved decision-making tools utilizing the economic and health evidence in Australia. The new model aims to consolidate this success through enhanced approaches to CBA, CEA, Multi-Criteria Decision Analysis (MCDA) for improved decision making, serving as a model internationally.

Methodology

A new multi-disciplinary risk analysis framework for assessing economic and social factors versus the health and epidemiological evidence to develop policies, health and social interventions to mitigate pandemics is developed. WHO has called for societal pandemic risk models for jurisdictions to mitigate the COVID 19 pandemic utilizing such data. The model facilitates enhanced MCDA, CBA, CEA and political decision making during pandemics. New national political governance structures to support the new model and data requirements are developed. Australia is a world leader in achieving outstanding economic and health performance during COVID-19. Australian epidemiological and economic performance data are presented.

Results

There is a paucity of economic studies addressing the mitigation of pandemics at the societal level. MCDAs concerning COVID-19 address prioritizing health service provision, diagnostic methods, artificial-intelligence for medical imaging and innovation horizon scanning. Systematic reviews of economic evaluations involve CEA of antiviral-treatments and economic-analysis of healthcare-associated infection prevention/control interventions. Prior economic studies investigated investments in antibiotics to mitigate pandemic influenza; impact of the 2009 influenza pandemic on work absenteeism; quasi-experimental evidence on flu shot confidence in the 2009 swine flu pandemic; optimal production capacity for influenza vaccine; economic impact of H1N1 on Mexico's tourist and pork sectors; investment in antiviral drugs as a real options approach; testing the fetal origins hypothesis in developing countries and the evidence from the 1918 influenza pandemic; dynamic versus static models in CEA of anti-viral drug therapy to mitigate influenza pandemics; partial equilibrium and the economic analysis of public health emergencies; WTP for a statistical life during pandemics; and the determinants of influenza vaccination timing. An Australian Pandemic and Health Protection Agency (APHPA), Virtual Australian Centre for Disease Control (ACDC), multi-disciplinary-teams and enhanced economic-models are recommended to facilitate decisions concerning uptake of diagnostic testing, vaccines, treatments, and policies concerning mask wearing, social distancing, quarantine, business closures, population movement and border-closures. The model can facilitate CBA, CEA and MCDA to guide decisions at national, state and local levels.

Conclusion

This paper presents a new and much broader economic, epidemiological, and societal framework to mitigate pandemics. It holds considerable promise to impact globally. It provides an effective platform for health economics as a discipline to make significant contributions to solving urgent public health emergencies through spearheading a new framework for more effective multi-disciplinary approaches.

Does the Lockdown Have Any Impact on COVID-19 Prevalence and Fatality? A Cross Country Panel Study

PRESENTER: **Niveditha Lakshmi Narayanan**

AUTHOR: Subhasish Dey

Motivation and Aims

The novel Coronavirus was first discovered in Wuhan in the Hubei province of China in late December. The increasing number of fatalities and cases created a sense of panic amongst people, thereby making the lockdown crucial for political decision makers. At a glance, it can be inferred that a

lockdown will reduce the number of cases and mortality from COVID-19. While multiple countries have demonstrated effectiveness of the lockdown by flattening the curve, the easing of the lockdown has caused a rise in the number of cases predicting a second wave of the virus. The rise in the number of confirmed cases of COVID-19 despite the implementation of the lockdown motivates this research question. Therefore, this paper aims to analyze the effectiveness of the lockdown, a non-clinical preventive measure, in curbing the case prevalence and fatality due to COVID-19.

Data and Methods

We use a cross-country panel data for 60 countries and is spread over a period of 13 weeks beginning on the 11th of March 2020, which marks the declaration of the pandemic by WHO. In this paper, the lockdown is measured quantitively using the Lockdown Stringency Index developed by the Blavatnik School of Government at the University of Oxford. The data obtained for the time-variant coronavirus related variables, such as the number of cases per million, number of deaths per million, stringency index and number of tests per thousand are obtained from Our World in Data which are updated on a day-to-day basis.

A cross- country panel regression with country fixed effects and Generalized Method of Moments are utilized to study the same. Additionally, a sample heterogeneity test is performed to understand any variation of trends present in the sub-sample groups (developed and developing countries).

Findings and Discussion

The results obtained, convey that the lockdown by itself does not cause a significant decline in the number of cases or the fatality rates. However, having a stringent lockdown with higher levels of testing proves to be effective. While countries such as Italy, China and the UK, have used the lockdown to flatten the curve, some of them are witnessing a resurgence in the number of cases. Therefore, this paper provides empirical proof that the lockdown must be taken with certain levels of caution and cannot be entirely depended on to curb the spread of the virus and reduce its fatality. Therefore, it is imperative for governments to keep their health care facilities in check to efficiently cater to its population. The results obtained for the developed and developing countries sub-sample using the sample heterogeneity test prove the main results to be consistent.

Economic Shocks, Health and Social Protection: The Causal Effect of COVID-19 Income Shocks on Health and Mitigation through Cash Transfers

PRESENTER: **Julius Ohrnberger**, Imperial College London

Background: The COVID-19 pandemic caused a global health and economic crisis unprecedented in modern history. Nation-wide lockdowns intended to suppress the spread of infections triggered major economic disruptions to the livelihoods of populations across the world. Little is known about the consequences of these extreme economic shocks for health outcomes of populations living in Low- and Middle-Income Countries (LMICs). Neither do we know how potential health effects vary from the poorest in society to the richest nor is the mitigation potential of social protection programmes such as cash transfer known for income-poor populations.

Objective: In this study, we aim to fill these three gaps in the literature. We build our analysis on the first wave of the National Income Dynamics Study – Coronavirus Rapid Mobile Survey (NIDS-CRAM) in May/June 2020. The NIDS-CRAM is a broadly nationally representative panel study of South African adults of age 18 and older. We supplement the analysis with data from five waves of the National Income Dynamics Study (NIDS) ranging from 2008 until 2017. Our sample is comprised of 6,437 individuals who are observed in both the NIDS-CRAM and the NIDS. Individual health is measured by self-rated health and lockdown induced income shock is measured by the loss of the main source of income at the household level. To identify the causal health effects of exposure to the income shock, we use difference-in-difference estimation. We then use a triple difference-in-difference estimation to understand firstly if health effects are heterogeneous by wealth quartiles, and secondly if exposure to the South African Child Support Grant (CSG), a large-scale cash transfer programme, mitigates the hypothesised negative health effects in the lowest wealth quartile, those deemed most vulnerable.

Results: We find that the COVID-19 lockdown related income shock significantly reduces individual health by on average 0.2 units or 0.2 standard deviations (SD) in health. However, health effects are not significantly different between wealth quartiles. Exposure to the cash transfer programme among individuals in the lowest wealth quartile mitigates the negative health effects. Individuals exposed to the CSG have on average smaller negative health effects of size 0.28 (0.17 SD in health) compared to 0.457 (0.4 SD in health) for non-recipients. We further find that the negative health effect is fully mitigated for individuals exposed to an on average higher top up of the cash transfer programme.

Conclusion: Our analysis shows that the COVID-19 lockdown induced income shock causes worse health outcomes. Importantly, no adverse health effects are observed across wealth distributions which can be explain by the (full) mitigation effects of (scaled up) cash transfer programmes provided to income-poor populations. Cash transfer programmes can thus be an effective policy to combat extreme economic shocks and their negative effects on health for vulnerable populations living in LMICs.

Consumers' Response to Governmental Counteracting Measures to COVID-19 Pandemic: Preliminary Evidence from Europe.

PRESENTER: **Prof. Lara Gitto**, Universit&#65533; degli Studi di Messina
AUTHOR: Maria Daniela Giammanco

Due to the Coronavirus disease 19 (COVID-19) pandemic, the World Bank forecasts for 2020, on average, 5.2 percent reduction in the world GDP, while recession will be experienced by at least 90% of the 183 countries considered. Governmental reactions to face the COVID-19 pandemic threat are varied and characterised by diverse intensity. Restrictive measures, accompanied by economic support measures have been taken to control the pandemic, although the same actions have determined economic fallouts that need to be faced by other governmental interventions, such as additional measures of social welfare support.

The question concerning the type and the intensity of the governmental actions is still an open issue in the public debate. Following these considerations, the present contribution is aimed at offering evidence on the impact of anti-COVID government actions on the volume of trade.

This study carries out a preliminary reflection on how different sectors of economic activity react to the crisis engendered by COVID-19.

Using monthly Eurostat data on 29 European countries, it investigates the relationship between the adoption of governmental measures and, respectively, the turnover of volume of sales (the percentage change on previous period) of the retail sale of food, beverages and tobacco and of the internet retail sector.

Explanatory variables employed encompass the government response to COVID-19 pandemic as measured by the Oxford University team led by the Blavatnik School of Government, namely, a government response index, a stringency index, a containment and health index and an economic support index employed in their lagged values. In order to limit the use of independent variables, the consumer confidence index has been chosen as control variable, because of its stable relation with relevant macroeconomic variables.

Two generalised least squares models have been estimated (one for each dependent variable), controlling for heteroskedasticity across panels and autocorrelation.

As far as the first model is concerned, the results outlined a positive relationship between consumer confidence and the dependent variable i.e. the percentage change on previous period of the index of deflated turnover of retail sale of food, beverages and tobacco; a negative relation between the dependent variable and restrictive governmental measures; with respect to the second model, evidence is offered of a negative relation between consumer confidence and the percentage change on previous period of the index of deflated turnover of retail sale via mail order houses or Internet. Instead, it emerged a positive relation between governmental measures aimed at stringency and the percentage change on previous period of the index of deflated turnover of retail sale via mail order houses or Internet.

The results of the analysis offer preliminary insights on consumers' response to governmental action to tame the COVID pandemic state of emergency. Although foods, beverages and tobacco satisfy primary needs and they should be not significantly affected by stringency measures, evidence is offered that consumers are suffering because of such stringency. On the other hand, internet retail trade shows an opposite pattern, probably because of the limitations to free circulation.

7:00 AM –8:00 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Issues and Directions in the Measurement and Valuation of Health of Children

SESSION CHAIR: **Richard Norman**, Curtin University

The Use of Child-Specific Utility Instruments in Decision-Making in Australia; A Study of Pharmaceutical Benefits Advisory Committee (PBAC) Public Summary Documents

PRESENTER: **Cate Bailey**, The University of Melbourne

AUTHORS: Nancy Devlin, Kim Dalziel, Rosalie Viney, Paula Cronin

Objective Although methods for measuring and valuing health-related quality-of-life (HRQoL) are widely used and accepted in adults, these methods can be problematic when applied to children. This study aimed to investigate the use of child utilities in Pharmaceutical Benefits Advisory Committee (PBAC) Public Summary Documents where medines are described as being used in children for the management of childhood diseases, and in which a cost utility analysis was conducted.

Method We conducted a systematic search of PBAC Public Summary Documents using four separate framing lists: 1) the World Health Organization (WHO) Model List of Essential Medicines for Children (2019), 2) Medications used by children in The Longitudinal Study of Australian Children (LSAC), 3) a search for key terms on the PBAC site and 4) the National Immunization Schedule. We identified and captured any PBAC documents that matched these medicines (there may be multiple documents for each medication). We then searched the selected documents for key terms that pertained to infants, children, and adolescents up to age 18 and whether child utilities were mentioned in the documents or a cost-utility analysis was conducted. For documents meeting these conditions, relevant data were extracted. We also extracted illustrative text relevant to understanding the use of child utilities in decision making.

Results . There were 1889 available Public Summary Documents. After removal of duplicates, 62 documents were found on the PBAC website that mentioned children or adolescents and contained utilities and/or used cost-utility analyses. Only four of these documents included child-specific HRQoL measures. A further 16 documents used HRQoL measures developed for use in adults, most of which were the EQ-5D. Direct elicitation was used in 11 documents, mostly time trade-off. In 31 documents, the source of utilities was not defined. We estimated whether decision making uncertainty may have been reduced if child-specific HRQOL measures had been used, based on three considerations: a) if a cost-utility analysis was included, b) whether utility values were understood to be important in the model, and c) whether children were a significant section of the population under consideration. Through this method, we found for medicines which did not use child-specific HRQoL measures, in 85% of cases the uncertainty around decision making may have been reduced.

Conclusion There is little evidence that child-specific utility instruments are being used for decision making for medications used by children and approval for PBAC funding. We conclude that increasing the use of such measures would improve the evidence-base for decisions regarding the subsidization of medicines for children in Australia

Systematic Review of Published Economic Evaluations in Very Young Children: Implications for Decision Making Focusing on Use of Outcome Measures and QALYs

PRESENTER: **Kim Dalziel**, The University of Melbourne

AUTHORS: Anthea Sijan, Natalie Carvalho

Background: Decision makers around the world face important resource allocation decisions that relate to interventions for very young children such as global public health efforts including vaccination. With health care use being greatest in very young children, it is important to ensure that appropriate methods for measuring and valuing outcomes in very young children are used.

Objective: To identify recent published economic evaluations that target children aged ≤24 months of age and to describe their use of outcome measures including QALYs.

Methods: We examined economic evaluations published in 2018 that included an intervention targeting the health of children ≤24 months of age. Included studies additionally were required to report an incremental cost effectiveness ratio (ICER) specially for children ≤24 months of age. Data extracted included: population or condition of interest, intervention and comparator details, type of economic evaluation conducted, and outcomes used in economic model. Quality assessment was performed using CHEERs and Drummond Checklists to determine quality of reporting and modelling with an emphasis on use of outcomes.

Results: 28 studies were included with the types of interventions including vaccines (8/28), testing and diagnosis (6/28), hospital intervention/surgery (328), screening and non-vaccine prevention (3/28), pharmaceuticals (2/28), supplementation (2/28). Ten of the included studies were cost-effectiveness analyses, 14 cost utility analyses reporting QALYs and 4 cost utility analyses reporting DALYs. Cost effectiveness studies most commonly were based on adverse events avoided (4/10) or diagnoses achieved (2/10). Of the cost utility analyses reporting QALYs, 10/14 clearly reported the methods by which health states were valued. Five of the cost utility analyses used multi-attribute utility instruments (MAUIs) as the source of utility data with the HUI (5/14) and EQ-5D (1/14) used. More commonly the cost utility analyses used direct elicitation methods to source utility data (8/14 studies: 2 U-Titer II, 4 time trade off, 2 standard gamble). Quality assessment showed good compliance with describing choice of health outcome and its source. Key concerns related to methods used to value health states including describing and justifying methods used to elicit preferences with 5 studies not reporting the utility source or assuming the value used.

Conclusion: Current practice reveals use of cost-effectiveness analysis for interventions targeted at children aged ≤24 months with the most common method being cost utility analysis for vaccines and diagnostic testing. Cost utility analysis is problematic in this age group due to the lack of validated MAUIs available. Current practice shows a reliance on direct elicitation which is expensive to conduct and the HUI measure which is not officially validated for children ≤24 months of age. There is a critical need for strengthening methods for measuring and valuing outcomes in very young children.

Developing and Testing of the Toddler and Infant (TANDI) Health Related Quality of Life Measure for Children 1-36 Months

PRESENTER: **Janine Verstraete**, University of Cape Town

AUTHORS: Jennifer Jelsma, Lebogang Ramma

Objective: To describe the step wise approach to development and testing of a new proxy Health Related Quality of Life (HRQoL) measure for children younger than three years of age.

Methods: A review of the literature was done to define the concepts, generate items and identify measures that might be an appropriate starting point of reference. The items generated from the cognitive interviews with parents and literature were subsequently pruned by experts in the field of HRQoL and paediatrics over two rounds of a Delphi study. Thereafter the identified dimensions were tested and further pruned on an Alpha and Beta Draft. The TANDI was tested for validity and reliability in a group of a group of children who were either acutely-ill, chronically-ill or from the general population in South Africa.

Results: A systematic review identified the EQ-5D-Y proxy as the best model upon which to base the structure of the measure and the International Classification of Functioning, Disability and Health as a guiding conceptual framework. The item development was done from the

ground up in a step wise approach. The methodology used to identify candidate items was rigorous and yielded items which were developed to be observable with dimension descriptors referring to 'age appropriate behaviour'. The Toddler and Infant (TANDI) measure included six dimensions: movement, play, pain, relationships, communication and eating. The dimensions have three levels of report: no problems, some problems or a lot of problems. An additional question on general health is scored on a Visual Analogues Scale from 0-100. The content validity had been established during the development of the instrument. Concurrent validity of the different dimensions was tested between the TANDI and relevant items from the Ages and Stages Questionnaire, FLACC and NIPS pain scale and Diet History. The Spearman's Rho coefficients were significant and moderate to strong for dimensions of activity and participation and significant and weak for items of body functions. Known groups were compared and children with acute illness had the lowest ranked VAS (median 60, range 0-100), indicating worst HRQoL. The six dimensions of the TANDI were tested for internal consistency and reliability and the Cronbach's □ as 0.83. Test-retest results showed no variance for item scores of movement and play, and high agreement for pain (83%), relationships (87%), communication (83%) and eating (74%). The scores were highly correlated for the VAS (ICC=0.76; p<0.001).

Conclusion: The development of the dimensions was based on a sound conceptual model, acceptability to stakeholders and consideration of the observability of the item selected. The TANDI was found to be valid and reliable for use with children aged 1-36 months in South Africa. It is recommended that the TANDI be included in future research to further investigate HRQoL and the impact of interventions in this vulnerable age group. It is further recommended that future testing be done to assess the feasibility, clinical utility, and cross-cultural validity of the measure and to include international input in further development.

The Role of Preference Heterogeneity in the Estimation of EQ-5D-Y Value Sets Using Stated Preference Approaches

PRESENTER: **Oliver Rivero-Arias**, University of Oxford
AUTHORS: David Mott, Koonal Shah, Juan Ramos Goñi, Nancy Devlin

Objectives: Discrete choice experiments (DCEs) are increasingly used to estimate value sets for multi-attribute utility instruments. In these exercises, the utility coefficients of the instrument attributes are typically estimated using choice models and are subject to two types of unobservable random heterogeneity: taste and scale. There are available sophisticated models to account for preference heterogeneity including scaled multinomial logit (SMNL), mixed logit (MIXL), generalised multinomial logit (GMNL) and latent class (LC) models. It is not clear whether the use of these models result in different value sets compared to widely used models such as multinomial logits (MNL). We apply these models in a DCE used to estimate latent scale value sets associated with health states described by the youth instrument, EQ-5D-Y.

Methods: An online DCE was administered to a sample of 1,000 adults (aged >18 years) and a sample of 1,005 adolescents (11-17 years) in the United Kingdom. Each DCE task required respondents to make a choice between two EQ-5D-Y health states. Adults completed the tasks from the perspective of a hypothetical 10-year-old child whereas adolescents responded for themselves. A Bayesian efficient design, with main effects and all two-way interactions, minimal number of unrealistic health states, overlapping of health states in two-dimension levels, and good level and utility balance was created. DCE responses for each group were analysed using main effects and a MNL, SMNL, MIXL, GMNL and LC models. MIXL and GMNL were estimated with uncorrelated and correlated parameters and different starting values. Classes in the LC models were selected using information criteria. Goodness of fit using Bayesian Information Criteria (BIC) was used to understand which model provided the best data fit. Latent scale mean parameters for each of the models were used to predict latent scale utilities for the 243 EQ-5D-Y states. Rescaled latent scale utility predictions of the 243 states were compared using kernel density functions.

Results: All models were logically consistent with the expected directions and statistically significant in the adults and adolescent samples. In the adult sample, all models including heterogeneity were preferred to the MNL (with a BIC of 16,703) with GMNL with uncorrelated parameters the preferred model (BIC 14,781), followed by LC (BIC 14,883) and then SMNL (BIC 14,927. Similar results were obtained in the adolescent sample. For both samples, the choice of model has subtle differences in the ranking and predicted values for the 243 health states, even in the case of MNL. The kernel density function for the predicted utilities suggested a similar distribution and spread of latent scale values for all models in both samples.

Conclusions: In this particular case study, accounting for preference heterogeneity did not lead to a different value set for the EQ-5D-Y compared to the MNL. All the models estimated similar preference weights for a potential candidate latent scale value set. Other aspects such as interpretability and ease of implementation of these discrete choice models in practice are recommended when selecting a latent scale value set.

8:30 AM –9:30 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Newborn and Child Health

MODERATOR: **Joanna Thorn**, University of Bristol

The Role of Women's Bargaining Power on Nutrition Among Low-Income Households: Evidence from a Novel Experimental Measure of Women's Bargaining Power

PRESENTER: **Aurelia Lepine**, University College London
AUTHORS: Juan Segura-Buisan, Mariah Ngutu, Ann Wambui, Suneetha Kadiyala, Salome Bukachi, Paula Dominguez-Salas

Background: Women's empowerment has become a primary policy goal globally. In Sub-Saharan Africa, malnutrition affects one third of preschool children and remains an important obstacle to individual and national development since physical and cognitive skills may be affected and can in turn affect productivity. According to Kenyan Demographic & Health Survey, 26% of children under-5 were stunted, 9% of women were underweight and 33% of women were overweight or obese in 2014. In addition, there are important pockets of undernutrition, for instance in informal settlements of Nairobi where 35% of children and 26.3% of babies are stunted.

Method: While the link between women's bargaining power and child nutrition has been extensively researched, measurement error in women's bargaining power has remained an important problem. To overcome this challenge, we developed a novel experimental measure of women's bargaining power informed by formative research conducted with women in coupled households living in informal settlements in Nairobi, Kenya. Our experimental task involved two options of offering the woman (wife) to choose between an amount of money to be received by her husband or a different amount of money to be received by herself without her husband's knowledge. We start by offering the wife less money than her husband and then increase this amount until the point at which more money is offered to the wife. We used the switch point i.e. the point at which the wife accepts the money for herself as a proxy for her relative power in the couple. In resource-poor setting and where literacy levels are low, this methods allows identification of participants who do not understand the task and who switch multiple times. We implemented an incentivised task with real payoffs and a hypothetical version of this task among 300 coupled women who lived with their spouse in informal settlements of Nairobi.

Results: Overall, we found that 70% of participants understood the task. When correlating this measure with self-reported measures of women's empowerment, we showed that the experimental measure was strongly positively associated with joint decision-making, trust toward the husband but negatively associated with other dimensions of women's empowerment such as woman deciding alone, woman's physical freedom and freedom to spend money. Finally, we showed that the experimental measure of women's empowerment is a better predictor of children and women's nutrition markers than all other self-reported measures. Precisely, we found that women who have greater bargaining power have higher hemoglobin level and have children with better growth indicators.

Conclusion: Our results showed that this new experimental measure of women's bargaining power was well understood and was associated with several dimensions of women's empowerment. However, our results also highlighted the complexity of relying on self-reports when measuring women's bargaining power. When using the experimental measure to predict nutritional status of women and children, we found that it was performing better than self-reported measures of women's empowerment capturing similar and different dimensions of women's empowerment. Our study highlights the importance of women's bargaining power to improve child nutrition in low-income countries.

Treatment Cost of Day-Care-Approach (DCA) in Rural and Urban Settings for Management of Childhood Severe Pneumonia in Bangladesh

PRESENTER: **Marufa Sultana**, Deakin University
AUTHORS: Jennifer Watts, Nur Haque Alam, A.S.G. Faruque, George J Fuchs, Niklaus Gyr, Nausad Ali, Md. Jobayer Chisti, Tahmeed Ahmed, Lisa Gold

Background

Childhood severe pneumonia is the leading cause of under-five deaths in Bangladesh. Management of severe pneumonia commonly relies on 24-hour hospital care and is therefore associated with substantial resource usage. A new day-care management approach (DCA) was implemented in primary-level healthcare facilities in urban and rural areas of Bangladesh. Reliable cost estimates are important to determine the economic viability of the new management approach. The objectives of this study were: to estimate the societal cost of DCA per patient; to assess rural-urban cost variation; and to determine cost sensitive parameters.

Method

This study was conducted alongside a cluster randomized effectiveness trial, conducted by icddr,b in Bangladesh in 32 clusters covering both urban and rural areas. Children diagnosed with severe pneumonia were enrolled between November 2015 and March 2019. This analysis considered the sixteen intervention clusters to compute societal cost of DCA. A societal perspective was adopted to capture both household and provider cost per patient for one episode of childhood severe pneumonia. A bottom-up micro-costing approach was applied to collect detailed cost data at patient level from each of the facilities (n=16). Data were collected from each facility using structured questionnaire, interviewing relevant facility staff, interviews with parents/caregivers, and patient's record review. All costs were converted to US dollars (USD) using 2019 price year (1 USD = 84.5 BDT). Analysis measured mean cost and cost variation across socio-economic groups, facility location, clinical variables, and determined cost-sensitive parameters.

Results

A total of 1,745 children were enrolled in DCA management over the trial period. Among them, 63% were male and 57% were less than a year old. The mean societal cost per patient was US$ 94.2 (95% CI: US$ 92.2, US$ 96.3) with a mean length-of-stay (LOS) of 4.1 days (SD±3.0). Costs of medical personnel (US$ 32.6), caregiver's productivity loss (US$ 25.8) and medicines (US$ 21.7) were the major cost contributors. Average per patient cost was significantly higher for urban-located facilities compared to rural (mean difference US$17, 95% CI: US$ 12.6, US$ 20.8). Average per patient cost was significantly higher for the richest group and for higher parental education (P<0.001). No variation was found by age, sex, and other clinical variables such as presence of malnutrition and hypoxemia. Sensitivity analysis revealed LOS, caregiver's income loss and personnel costs were the major cost drivers.

Conclusion

The new management approach is comparatively less costly than inpatient care, based on available literature on resource poor settings. Findings suggest that making DCA management available particularly in rural areas would be beneficial for households in terms of increasing accessibility by reducing productivity loss and transportation cost. Implementing this new approach would be able to improve care-seeking, therefore could reduce pneumonia-specific childhood mortality.

Do Diet and Physical Activity Interventions in Adolescents Provide a Cost-Effective Use of Healthcare Resources? an Illustration Based on the Engaging Adolescents in Changing Behaviour (EACH-B) Research Programme

PRESENTER: **Neelam Kalita**, University of Southampton
AUTHORS: Keith Cooper, Janis Baird, Katherine Woods-Townsend, Keith Godfrey, Cyrus Cooper, Hazel Inskip, Mary Barker, Joanne Lord

Background: Unhealthy diet and lack of physical activity are responsible for many early deaths and cost billions of pounds every year. Engaging Adolescents in CHanging Behaviour (EACH-B) is a research programme designed to develop and test an intervention to encourage school students to eat more healthily better and exercise more. The intervention, LifeLab-Plus, comprises: i) an education module which teaches school students the science behind health messages through a 2-week module with a "hands-on" practical day visit to a teaching laboratory at University Hospital Southampton; ii) training for teachers in skills to support behaviour change; and iii) access to a specially-designed, interactive smartphone app with game features. Appropriate models to assess the cost-effectiveness of interventions such as LifeLab-Plus are needed.

Aim: The aim of this paper is to present an illustrative model that assesses costs, health outcomes and cost-effectiveness of such an exemplar school-based multicomponent intervention for adolescents compared with usual schooling.

Methods: A Markov model was developed that focused on four potential benefits of healthy behaviour for adolescents and young adults: better mental health, higher earnings, reduced incidence of type 2 diabetes and adverse pregnancy outcomes. Costs and quality adjusted life years (QALYs) were estimated from a UK societal perspective with a 20-year time horizon and discounted at 3.5% and 1.5% per annum. The intervention costs were estimated from the EACH-B pilot trial, and costs and utilities for adverse health outcomes and earning potential were sourced from the literature. Preliminary estimates of effectiveness were based on systematic reviews of published evaluations of similar interventions. Uncertainty was explored through one-way and probabilistic sensitivity analyses.

Results: We estimated an incremental cost of £14,367 per QALY gained for the exemplar school-based intervention based on LifeLab-Plus compared with usual schooling at 3.5% discount rates for costs and QALYs. The incremental cost was £12,044 per QALY at 1.5% discount rate for both costs and QALYs; and £12,640 per QALY, discounted at 3.5% for costs and 1.5% for QALYs respectively. At a willingness-to-pay threshold of £20,000 per QALY, the probabilities of such an intervention being cost-effective are 67% (discount rate: 3.5%), 83% (discount rate: 1.5%) and 80% (discount rate: 3.5% for costs; 1.5% for QALYs) respectively. The key drivers that influence the cost-effectiveness results are the relative effects of physical activity, quality of life gain from high activity, duration of the intervention effect and the time over which the effect wanes.

Conclusion: Complex multi-component behavioural interventions that aim to improve diet and levels of physical activity amongst school-aged children have the potential to provide cost-effective use of healthcare resources. In our illustrative analysis, we focused on short to medium-term benefits of healthy eating and physical activity based on the strong evidence base in this age group. While such interventions have the potential to reduce the burden of non-communicable diseases such as cardiovascular diseases, diabetes and some cancers, benefits in later life are more sensitive to assumptions about the persistence of behavioural change and discounting. There is a need to establish long-term effectiveness of such interventions.

Cost-Effectiveness Analysis of Newborn Screening for Spinal Muscular Atrophy with Disease Modifying Treatments

PRESENTER: **Sophy Ting-Fang Shih**, The Kirby Institute, UNSW
AUTHORS: Michelle Farrar, Veronica Wiley, Georgina M Chambers

Spinal muscular atrophy (SMA) is an autosomal recessive neurodegenerative disease resulting in degeneration of motor neurons in the spinal cord and brainstem, progressive muscle weakness and atrophy and significant disability. With an incidence of approximately 1 in 11,000 live births, SMA was the leading genetic cause of infant mortality prior to the introduction of novel therapies. The paradigm shift in therapeutic development, such as nusinersen and gene therapy, have rapidly and irrevocably transformed clinical practice and patient outcomes. Gene therapy is a one-off treatment with a price of $1 to $2 million, while nusinersen is a lifetime treatment with cost over $20,000 per year. The most beneficial response to treatment to date has been seen in infants treated prior to symptom onset, highlighting the value of early diagnosis. This study aims to conduct a model-based economic evaluation of a newborn screening (NBS) program for SMA informed by a pilot NBS study in Australia.

A decision analytic model was constructed for NBS versus no NBS nested with Markov models representing SMA with early treatment initiation (screen detected) versus late treatment initiation (clinically diagnosed). Our Markov models focused on motor milestone achievements. Parameters for the decision analytic model were derived from the pilot NBS study. Quality of life (QoL) utility values were sourced from the literature and an

Australian study on the pre-nusinersen economic and QoL burden of SMA which included a detailed cost analysis of 40 infants with SMA. Results were reported in incremental cost-effectiveness ratio (ICER) per quality-adjusted life-years (QALYs) from the societal perspective (2018 USD). All costs and QALYs were discounted at 3% per annum. One-way sensitivity and scenario analysis were performed to identify key parameters and their impact on ICERs. Probabilistic sensitivity analysis (PSA) was conducted using Monte Carlo simulation with 1,000 iterations.

Screening every newborn in the population and treating diagnosed SMA with nusinersen over 60years would cost $867 per newborn and result in 0.00146 QALYs ($86.7 million and 146 QALYs in 100,000 newborns). Without NBS and treating clinically identified SMA with nusinersen in line with current practice over 60 years would cost $432 per newborn and result in 0.00061 QALYs (61 QALYs in a cohort of 100,000). Compared to current practice, NBS would gain 0.00085 QALY at an additional cost of $435 per newborn resulting in an ICER $513,000 per QALY. In contrast, NBS for SMA treated with gene therapy would be dominant compared to current practice without NBS. Assuming the same treatment efficacy for nusinersen and gene therapy, screening and treating diagnosed SMA with gene therapy would incur $407 with the same QALY gains ($40.7 million and 146 QALYs in 100,000 newborns). PSA results show that 77% ICERs for NBS with gene therapy would be either dominant or below $50,000/QALY. Scenario analysis indicates an ICER $21,000/QALY for the base case with gene therapy at $2.1 million.

While the upfront costs of gene therapy are high, the likely return on investment and one-off nature of the treatment makes it the preferred choice of intervention.

8:30 AM –9:30 AM WEDNESDAY [Demand And Utilization Of Health Services]

Demand and Utilization of Tertiary Care

MODERATOR: **Judite Gonçalves**, Nova School of Business and Economics, Lisbon

The Intended and Unintended Consequences of the Health Poverty Alleviation Program in China

PRESENTER: **Dr. Mengcen Qian**, Fudan University

A health poverty alleviation program has rolled out rapidly across prefectural cities of China with the goal of providing more financial risk protection for the poor with illness. The government reviews the profiles of the residents periodically to identify individuals in poverty based on certain standards. For those identified poor, they were eligible to enjoy a 5 percentage points higher reimbursement rate for inpatient services. Another privilege is that they can pay their out-of-pocket costs at discharges without the need to make a deposit into their inpatient account at admissions. All their claimable expenditures were paid in advance by the hospitals until the insurer reimbursed the hospitals later.

This program has been an unprecedented effort of poverty alleviation via healthcare, which potentially may increase healthcare utilization behaviors and reduce out-of-pocket expenditures for the eligible poor population due to strong financial incentives. However, we note that generally there is a one-or-two-month lag between patient discharges and receipts of final reimbursement, which may lead to strong budget constraints on hospitals. This study aims to comprehensively evaluate the impact of the program, using inpatient claims in a prefectural-level city in middle China.

Our data source is the individual inpatient claims of New Rural Cooperative Medical Scheme (NCMS) in our study city during 2016-2019. Almost all rural residents are covered by the scheme. Each claim includes the program eligibility, admission and discharge dates, total expenditures, and an anonymous patient identifier. We defined the treated group as those who were ever identified as eligible for the program. The program was implemented in Jan. 2017 and experienced a five-month of transition period. Accordingly, we define post dummies equal to zero for admissions before 2017 and one for admissions after May, 2017. The outcome of interest includes length of stay, 30-day readmission rate, total expenditures, out-of-pocket costs. We also calculated total inpatient expenditures in last three months before admission for each patient to capture the underlying health conditions of the patients.

We first used interrupted time series regressions to identify immediate changes in levels and trends in response to the program among the poor population. For both control and treated group, we then employed an extensive difference-in-differences design to capture changes in outcomes before and after the program in hospitals that received higher budget constraints, relative to their counterparts. We used the ratio of total medical expenditure incurred to the poor population to all admissions in a given hospital in last month to capture budget constraints facing with the hospitals.

We find that out-of-pocket costs largely dropped among the poor population in response to the program, suggesting effective financial risk protection. The program is also associated with reduced total expenditures and 30-day readmission rates among the treated group, which could be explained by increased visits and lower severity of illness. However, our results showed that hospitals facing with higher budget constraints showed a higher tendency to select healthier patients from the ineligible population to treat and to enhance out-of-pocket costs of this group after the program.

The Unavoidable Costs of Being Small: Understanding Economies of Scale Using Patient-Level Costs

PRESENTER: **Júlia González Esquerré**, NHS England and NHS Improvement

AUTHORS: Rebecca Hand, Steven Paling, Ranya Alakraa

Aim

This paper investigates the drivers of patient-level costs of delivering health care in England. We focus on understanding which cost drivers could be considered unavoidable for small remote hospitals. Specifically, we aim to answer the question of whether there are additional costs associated with operating at a small scale and what the evidence is for economies of scale at the department, site and provider levels. The level at which economies of scale take place has implications for policy making, as the findings can inform decisions on service reconfiguration.

Approach

Our analysis is innovative in the data it employs. Previous research in England makes use of Reference Costs or other aggregated cost measures that provide information on the average cost of activity for all hospitals. Our analysis is the first to use the new National Costing Collection Patient Level Information and Costing System (PLICS) data for 2018/19 that covers nearly all non-specialist acute providers in England. By drawing on patient episode level costs that capture the variation in the costs of providing healthcare at the episode level, we are able to analyse the drivers of unit costs.

We developed an econometric model to examine the relationship between costs per episode for admitted patients and the scale of healthcare services and other unavoidable cost drivers. We included a set of provider and patient-level control variables to ensure that the effect of scale variables was net of any cofounding factors that might be driving costs.

We apply this as a hierarchical model, measuring activity at three levels: a department within a hospital site, a site within a provider and at the overall provider.

Results

We find that larger department size is associated with lower costs per episode. This indicates that economies to scale exist at the department level. At the site and provider levels, we find slight diseconomies to scale or scope, with a relatively small effect size. These findings appear robust to alternative econometric specifications, including non-linear models.

Conclusions

Our findings afford novel insight that economies to scale may operate at certain levels (department level), but not at higher levels (i.e. hospital site).

Our findings suggest that reconfigurations where different activity within a provider is merged to form larger departments, without changing the overall number of patients treated within that department, could result in cost savings.

Furthermore, our findings can be used to help to inform the design and implementation of sustainability funding targeted towards providers with legitimate unavoidable costs as a result of their scale, and any longer-term payment structures to support this.

Given that economies to scale from absolute increases in size at the department level might be compensated by diseconomies to scale from the subsequent increase at the site and provider levels, further work needs to be done to identify providers with unavoidable costs due to their small scale.

Effect of Lifetime Health Cover Policy in Australia on Private Hospital Use

PRESENTER: **Dr. Maxim Ananyev**, Melbourne Institute, University of Melbourne

AUTHORS: Jongsay Yong, Yuting Zhang

In year 2000, Australian government implemented a reform to allow private insurers to charge higher premiums for every year a person spent without private health insurance after the age of 30. In this paper, we evaluate the causal effect of this reform on private hospital use. For our identification strategy, we use two age-related cut-offs implied by the policy: first, it applied only to people over the age of 30, second, persons who were born before July 1, 1934 were exempted. These two cut-offs allow us to evaluate the impact of the policy on private hospital use by relatively young people as well as by older persons. Using administrative admission-level data from hospitals in the state of Victoria and difference-in-differences design around those cut-offs, we find that the policy led to 1.3 percentage point increase in probability of using a private hospital, conditional on hospitalization, among the 31 year-old persons (compared to the 30 year-old persons), and 1.4 percentage point increase – for older cohort (those who were born in 1935 compared to those who were born in 1933 and were exempted from the policy). Our results demonstrate that financial penalties can motivate switching from public to private hospitals on the margin.

8:30 AM –9:30 AM WEDNESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Sustainable Health Financing: Lessons from the USAID Health Financing Activity in Indonesia

SESSION CHAIR: **Hasbullah Thabrany**, Centre for Health Economics and Policy Studies, University of Indonesia

Regulatory Battles on Seven Years of the National Health Insurance of Indonesia

PRESENTER: **Kalsum Komaryani**, Center for Health Financing and Health Insurance, MOH Govt. of Indonesia

Introduction. Since 2014, Indonesia has been implementing health reform through the implementation of the National Health Insurance Scheme (NHIS) or *Jaminan Kesehatan Nasional* (JKN), the National (single-payer) Health Insurance system. Seven years regulatory battles to adjust the implementation mitigating moral hazard from people, health care providers, and also the NHIS administration. The growth of coverage from 132 million people in 2014 to 224 people in 2020 requires very dynamic regulation. This paper presents the art, problems, challenges, and success of regulatory aspects of the NHIS.

Methodology. A synthesis of seven years of experiences in regulatory roles of the Center for Health Financing the Ministry of Health is summarized from various minutes of meetings with various stakeholders, hearing with the House of Representative, negotiating prices with health care providers, and dealing with employers and employees' associations. Various reports from media on moral hazards by people and health care providers as well as the NHIS administrators are compiled to draw lessons for regulatory adjustments.

Result. The JKN membership grew rapidly at almost 20 million new members annually. Currently, the JKN covers 224 million people, or 82% of the total population. To ensure efficiency, since the beginning, the JKN adopted managed care techniques as strategic purchasing. The members must go to gate keeper to receive specialist care at hospitals. Increasing membership should be accompanied by increasing the number of health care providers contracted by the NHIS. Currently, about 700,000 claims are submitted daily, creating huge administrative challenges and potential moral hazards. Regulations on benefit, contribution, payment and claim procedures as well as grievance procedures must be adjusted frequently. Balancing revenues with increasing claims due to higher utilization as the JKN becoming more mature and more trusted requires intricate balance among various stakeholders' interest. The final stage is in 2020, the JKN is undertaking massive reform to standardize benefit and reimbursement prices.

Conclusion. The Indonesian experience with the very big reform on health financing and strategic purchasing in a very diverse and large population could be a valuable lesson for LMICs.

Strengthening Private Healthcare Providers in the National Health Insurance Scheme

PRESENTER: **Ahmad Fuady**, Faculty of Medicine Universitas Indonesia

Introduction. At the beginning of the implementation of the JKN, all public healthcare providers were mandated to sign contract with the NHIS administrator while private health care providers may sign any time, they perceive beneficial. The NHIS use a close panel system in which the benefit can only be accrued at the contracted healthcare providers. The high growth of membership, at about 20 million new members annually, private healthcare providers have been facing difficult situation. They have fewer patients if they do not sign contract with the NHIS. Without contract with the NHIS, private health care providers are losing patients and revenues. Private healthcare providers increase access to medical care by the NHIS members. However, competition with public healthcare providers has become stronger. Many private healthcare providers complained receiving discrimination in making contract and receiving patients of the NHIS. To map out regulatory and financial barriers in empaneling private health care providers, this assessment is undertaken.

Methods. The assessment uses mixed methods (qualitative and quantitative) to identify perceived barriers, benefits, and discriminatory treatments by the NHIS and or the governments who own public healthcare providers. In addition, evidence of members satisfactions and out of pocket is also assessed using special survey to 135 private health care providers and 625 exit poll patients in 27 regencies, 9 provinces, are being conducted.

Results. Interim, qualitative assessment found significant barriers for private healthcare providers to empanel with NHIS, as follow:

- Branch offices of NHIS at various regencies applied discretionary decisions that limit the number of private providers, violating the law of fair competition between public and private health care providers.
- the amount of capitation and bundle prices (DRG like payment) called Case mix Base Group (CBG) provide disincentive to private providers, yet private providers have lack of choice not to sign contract with NHIS due to shrinking market on non NHIS members.
- Some local government health offices who have the authority to license private hospitals and clinics colluded with branch of NHIS to maintain high volume of NHIS members for financial interest.
- Quantitative results will be presented in the session

Discussion and Policy Implications. Currently, there are about 2,700 hospitals in Indonesia, about 60% are private hospitals. The NHIS is established to ensure everyone get healthcare they need, regardless of the ownership of health care providers. The members of NHIS have a freedom to choose healthcare providers they prefer. This, "money follows patient" principle aims at improving access and satisfaction of people or member of NHIS. The NHIS pay capitation to primary health care providers and CBG hospitals with very narrow gaps. Although the payment for private healthcare providers is slightly higher, it is considered unfair because the government still allocate budget for salary and investment for public health care providers. In the seventh year of implementation of the NHIS, there has been barriers for private healthcare providers to play a significant contribution to healthy Indonesians.

The Role of Stakeholders in Decision Making of the National Health Insurance: Discourse Network Analysis Using Foresight Methods

PRESENTER: **Diah S Saminarsih**, Center for Indonesia's Strategic Development Initiatives

Introduction. The JKN has been suffering deficits for the six-consecutive years since its first operation in 2014. Although several evidence indicated the main cause of the deficits was the setting of contributions that was mostly political, not actuarially sound decision. It is heavily debated especially due to its sustainability concern. During Coronavirus Disease-19 (COVID-19) pandemic, moreover, such condition is exacerbated, particularly due to economic turmoil and the blow to the health system. JKN data show, moreover, that almost 4 million people dropped out 6 months after pandemic due to economics reason. To sustain JKN in the future, it is imperative that strategic roadmap is foreseen for JKN, especially that of considering uncertainties, potential shocks, as well as complexity of policy reform. To understand how a certain policy of the JKN being decided and the roles of stakeholders, a Discourse Network Analysis is being conducted.

Methods. This study is to analyze perspectives and social interactions among policymakers and the public. Data mining was utilized to perform the analysis twitter posts, hashtag, sentiments, as well as influential post, to establish social relation elements in a collective manner. Such social relation includes betweenness, centrality, closeness, density, as well as cohesion. Twitter was used to ease the text analysis in which complex social interaction can be observed. Data was observed during different sequence from March 2-16 to March 2020, particularly where public sentiments were at its strongest.

Results. From discourse network analysis, during timeline, almost every regulation regarding JKN are seen in public. Despite the variation of issues, controversy was seen most during time JKN issued contribution increase. After having reached its peak in March 2016, protest was launched especially November 2019 to March 2020, where there was polemic of contribution increased followed by lawsuit by patients' group.

In twitter there is seen polarization between govt. policy and public demands, particularly in JKN. From March 6th, 2016 to April 5th, 2016, there were observed 5187 identical tweets and 1386 retweet for posts with similar theme. From August 25th to September 2019, there were seen 54,063 tweets and 141,320 retweets, the latter being protest following first contribution increase. The public response peaked during May 12th to 23rd 2020, with 53,875 tweets and 226,679 retweets particularly when the government decided to increase contribution again, with lower amount. The last peak (of response on JKN contribution increase) was arguably exacerbated by pandemic situation.

Discussion and Policy Implications. Policy around national health insurance does not slip from public gaze, meaning that every reform and change needs to be communicated to the public. This study identified that policy reaction and/or change was attributed to public response, particularly in sides where economic value was at a stake. This highlights role of government communication role, as well as the usage of social media as 'testing the water' as well as testing the water public policy options.

Increasing Public Finance through JKN: Evidence from National Health Account

PRESENTER: **Herlinawati Herlinawati**, Center for Health Financing and Health Insurance, MOH Govt. of Indonesia

Introduction. Indonesia has been, for over the last decade, increasing its effort in increasing the investment in health for fostering health programs for better health outcomes. To achieve the optimum health outcomes, Government of Indonesia (GoI) has made strategic medium term development plan of 2020-2024, focusing on achieving the universal health coverage (UHC). Until now, the Government has been investing 5 % of national budget for health. A long with private and out of pocket, Indonesia spent around 3% of Gross Domestic Product (GDP) in the last ten years. To yield better evidence in health spending, GoI had spent considerable efforts to create framework, collecting data from various sources, as well as mobilizing resources and political commitment to build the national health account.

Methodology. This study portrays the National Health Account (NHA) Indonesia of 2018. Synthesis of data from primary NHA data collection, covering household level data, claims or disease accounts data, and budget for health program data, combined with multiple sources such as Indonesian laws and regulations. The synthesis follows the methodology of SIHA 2011, covering provider, financing scheme, and healthcare function.

Results. Results shows, in general, there was significant increase in public financing for health, which was attributed to the national health insurance expansion. In 2018 spending, financing for hospital services accounted for over 59% of total spending and 34% for other health programs. By function, of the total hospital spending (US$ 32.46 billion), as much as 70% were spent for both inpatient and outpatient. From program perspective, there was an increase investment of more than 10% for public health programs.

Discussion and policy implications. The NHA reflects progress and challenges for better spending for health. Achievements for better spending were noted, although challenges laid for accommodating priority such as strengthening primary health care as well as to support public health programs. Significant change is needed to shift the mindset to spend more in primary care and public health programs.

8:30 AM –9:30 AM WEDNESDAY [Supply Of Health Services]

Primary Care

MODERATOR: **Katharina Hauck**, Imperial College London

Equal Access to Primary Care: A Benchmark for Spatial Allocation

PRESENTER: **Anna Werbeck**, RWI - Leibniz Institute for Economic Research

AUTHORS: Alexander Haering, Matthias Kaeding

Using a greedy algorithm together with very fine spatial data, we calculate an allocation of general practitioners in Germany that reduces spatial inequalities in health care access. This allows us to answer the following question: (i) What is the amount and regional allocation of primary care physicians in Germany that would generate equal access to primary care? We apply a modified greedy algorithm to solve this set cover problem, taking the capacity of PCPs into account. To do so, we use a unique combination of five data sources: GEO-GRID population demographics on 1km × 1km grid level, OpenStreetMap to derive realistic drive times, information on PCP locations in 2019 as well as survey data on PCP visits. Comparing the counterfactual to the actual situation enables us to turn to a second question: (ii) What are common characteristics of regions experiencing a shortage of primary care physicians? Our findings suggest that 6% more PCPs would have been needed to generate equal access to primary care. Also, we observe that besides rurality, business tax and migration index correlate with a regional shortage of PCPs.

The Impact of the Economic Crisis on Quality of Primary Care: The Case of Portugal

PRESENTER: **Joana Pestana**, Nova School of Business and Economics

AUTHOR: Pedro Pita Barros

Objectives: The European debt crisis that unraveled in 2009 produced adverse social and health effects in several countries, including Portugal. The recession did not only affected factors that determine the population health, but it also affected the financial capacity to respond due to the austerity measures. Prior literature supports the direct impact of the crisis on the population health and the public spending directed to the health care system, but few studies assess the impact on the quality of the provided services and on the capacity of the services to restructure and adapt.

Our aim was to study the impact of the crisis on the utilization of the health care services and the quality of the process throughout the delivery of healthcare at the practice level and across geographic areas. We describe which practice- and patient-related characteristics have an impact on good quality and further study whether different types of practice respond significantly different to the adverse socioeconomic conditions and whether there are differences in the equity of primary care delivery within each of the three types of practice organization and financing.

Methodology: We exploit a 10-year panel (2009-2018) of practice and patient characteristic, taken from Donabedian structural dimensions, linked with regional socio-economic data. A total of 1208 practices were identified from which 870 met inclusion criteria and were used in the analyses. To identify the causal effect of changes in the unemployment rate on the practice' indicators of quality and utilization of different health care services

we employ linear and dynamic models to account for time-invariant heterogeneity as well as difference-in-differences approaches. The primary health care services analyzed included: family planning, maternal health, infant health, screening of adult patients and management of patients with chronic conditions. To study whether there are heterogeneous effects across types of practice and potential socioeconomic gradients within types we include the type of practice and five discrete income levels of the population in the region.

Results: The results show a significant impact of higher unemployment rates on the utilization of certain health care services (family planning visits, diabetic patients and nurse home visits for newborn children) after adjusting for the patients' characteristics and controlling for the relevant economic factors. The effects found are concentrated among the most economically vulnerable population. There was no significant impact of unemployment rates on the quality of care indicators.

Conclusion: These results indicate that despite the hardship the practices were flexible enough to accommodate the increase in demand resulting from the economic crisis. Economic crises can be addressed as opportunities for policies to practice health reform. The primary care reform from 2005 and the policies implemented during the adjustment program seem to have produced the desirable impact.

Identifying the Sources of Inequality in Quality of Maternal Care in India

PRESENTER: **Dr. Igna Bonfrer**, Erasmus School of Health Policy & Management

AUTHORS: Leander Buisman, Dr. Eddy Van Doorslaer

Background

One fifth of infant deaths worldwide occur in India. These deaths are largely avoidable through the provision of good quality maternal care.

Methods and data

Using the India Demographic and Health Surveys 2005 (N=35,166) and 2015 (N=183,285), we identify changes in quality of antenatal care, proxied by blood pressure, urine sample and blood sample taken. We estimate socioeconomic inequalities in antenatal care and in quality antenatal care using the Erreygers concentration index. Using a regression based approach with village fixed effects, we differentiate between socioeconomic inequalities in quality antenatal care driven by spatial sorting and by within-village differences. The first relating to the kind of area that a mother lives in and the health care services available there and the latter to differences across women, probably from the same village, receiving care in the same facility.

Results

Socioeconomic inequalities in quality are persistent. Using a regression based approach we find that 37 percent of the overall gradient is due to spatial sorting while 63 percent is driven by within-village differences.

Conclusion

This study suggests that women in equal need, often receive different care in the same facility, more so than that quality differs across facilities nationwide.

Are Seniors Ageing without Becoming Older? A Cohort Effect Analysis of Health Care Needs in the Australian Population

PRESENTER: **Dr. Tina Rampino**, UQ

AUTHORS: Stephen Birch, Laurence Bristow

With rising health care costs in developed economies, it is in the public interest to train only as many professionals as is necessary to meet the needs of the population. Traditionally, the approach to human resources for health care planning only considered the effect of changing demographics on the demand for health care. However, this approach does not account for general improvements in health conditions of subsequent cohorts over time. Using longitudinal survey data, and applying cross-classified multilevel modelling to estimate Age-Period-Cohort effects, we present findings that health care needs are changing over time in the Australian population. Our analysis advocates for the adoption of a needs based approach in health care planning which is relevant to policy makers concerned with the efficient allocation of limited health care resources.

8:30 AM –9:30 AM WEDNESDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: Behavioral Experiments in Health: Ambiguity, Risk, and Time Preferences

SESSION CHAIR: **Daniel Wiesen**, University of Cologne

ORGANIZER: **Arthur Attema**, Erasmus University Rotterdam

DISCUSSANT: **Stefan Lipman**, Erasmus School of Health Policy & Management, Erasmus University Rotterdam

Reference-Dependent Discounting for Health and Money

PRESENTER: **Zhihua Li**, University of Birmingham

AUTHOR: Dr. Arthur Attema

Reference-dependency has become a widespread phenomenon in decision making for risky outcomes, not only for money but also in other domains, such as health. However, when the prospects involve risky timing instead of risky outcomes, much less is known about reference-dependency. This study is the first to test for reference-dependency in timing prospects. We employed the semi-parametric method where certainty equivalents of two-outcome prospects were elicited by means of choice lists. This was done for gains, losses, and mixed prospects. Prospects were constructed for two contexts (health and money) and two kinds of prospects (amount of the outcome and timing of the outcome). For all tasks, a majority is risk averse for gains and risk seeking for losses, with risk attitudes being more mixed for losses. We also observe substantial probabilistic pessimism and loss aversion in both health and money, and both outcome and timing prospects. We have extended discounted utility theory to a reference-dependent version, and found substantial empirical support for it, both in the monetary and in the health domain. Our results indicate that people's decisions are not only affected by psychological biases, such as probability weighting and loss aversion, in situations where the outcome is risky, but also in intertemporal situations where the timing of an outcome is risky.

Ambiguity Attitudes Towards Ongoing Natural Events: A Comparison between Doctors and Non-Doctors during the COVID-19 Pandemic

PRESENTER: **Yu Gao**

AUTHORS: Zhenxing Huang, Ning Liu, Jia Yang

Owing to the nature of their work, doctors are often required to deal with uncertainties and must rely on their expertise to make decisions delegated to them. However, it is unclear whether doctors are better at dealing with uncertainties than the general population. We compare ambiguity attitudes of doctors and non-doctors towards the future severity of the COVID-19 pandemic and the stock market performance in China, Italy and the US. Doctors and non-doctors exhibit similar levels of ambiguity aversion; however, doctors are less insensitive towards likelihood changes (i.e., understand them better) than non-doctors. These results can explain laypeople's non-compliance with health regulations and expert advices from a cognitive perspective and show that reducing likelihood insensitivity is essential in effective health policies.

Higher Order Risk Preferences: New Experimental Measures, Determinants and Field Behavior

PRESENTER: **Sebastian O. Schneider**, Max Planck Institute for Research on Collective Goods

AUTHOR: Matthias Sutter

We use a novel method to elicit and measure the intensities of higher order risk preferences (prudence and temperance) in an experiment with 658 adolescents. In line with theoretical predictions, we find that the degrees of higher order risk preferences - particularly of prudence - are strongly related to adolescents' field behavior, including first and foremost health-related and addictive behavior, but also eco-friendly behavior, or financial

decision making. Most importantly, we show that dropping prudence and temperance from the analysis of adolescents' field behavior would yield largely misleading conclusions about the relation of risk aversion to these domains of field behavior. Thus our paper puts previous work that ignored higher order risk preferences into an encompassing perspective and clarifies which orders of risk preferences can help understand field behavior of adolescents at this formative time in their lives.

To Test or Not to Test? Risk Attitudes and Prescribing By French Gps

PRESENTER: **Antoine Nebout**, ALISS INRAE

AUTHORS: Emmanuel Kemel, Mr. Bruno Ventelou

Risk is a key dimension of economic decisions, but whether risk attitudes can predict real economic behaviour is still subject to investigation. We measure general practitioners' (GPs) risk attitudes and check for a relationship with variations in prescribing practices. Individual-level risk attitudes are elicited from simple survey choices on a representative national panel of 939 French GPs, and are linked to their volume of lab-test prescriptions through administrative records. Specifically, we estimate individual components of a flexible risk model (rank-dependent utility) using random-coefficient estimations, and then treat these components as predictors of observed lab-test prescribing. We find that (1) GPs exhibit the usual patterns of risk attitudes: risk aversion and inverse S-shaped probability weighting prevails (2) risk aversion captured by the utility function is positively correlated with lab-test prescribing.

8:30 AM –9:30 AM WEDNESDAY [Specific Populations]

Determinants of Health and Work Outcomes

MODERATOR: **Claire de Oliveira**, University of York; Centre for Addiction and Mental Health

Prolonging Working Life and Its Impact on Work Disability across Socioeconomic Groups

PRESENTER: **Dr. Raun Van Ooijen**, University of Groningen

Motivation: Over the last few decades, many western countries have introduced pension reforms to encourage later retirement to keep the pension system sustainable. For instance, by abolishing pathways to early retirement and by increasing the retirement age at which workers can claim full retirement benefits. Prolonging working life may be difficult for workers with health problems. It may, therefore, increase early labor market exit via disability benefits, especially for low-income workers in demanding occupations in sectors with limited financial possibilities to facilitate early retirement.

Objectives: This paper aims to examine the impact of abolishing early retirement and increasing the normal retirement age on disability applications across socioeconomic groups and sectors of employment.

Methods: Register data on disability assessments from the Dutch Employee Insurance Agency are used for 2008 to 2018. These data are linked to employers' payroll administration to measure workers' yearly disability application rate. We exploit cohort differences in pension reforms in the Netherlands. First, in 2006 fiscal facilitation of pathways to early retirement was abolished for workers born after December 1949. Second, in 2013 a stepwise increase in the retirement age from 65 to 67 was introduced, implying a subsequent increase of three to four months for workers born after September 1950. We use a regression discontinuity approach where we estimate weighted local linear regression models for employers that were born nine months before-and-after the policy reforms.

Results: The abolishment of early retirement doubled the disability application rate in the age range 59-62. The increase in the normal retirement age with three to four months more than doubled the application rate in the age range 64-65. Lower-income workers experienced the largest increase in the disability application rate. For abolishing early retirement, effects are seen across all employment sectors. For increasing the normal retirement age, only the public sector and the wholesale and retail trade sector experienced an increase in disability applications. Among higher-incomes, for abolishing early retirement, effects are only seen for workers in sectors with demanding occupations (construction, manufacturing, and transportation), while the increased normal retirement age only affected workers in the public sector.

Conclusions: The rise in the retirement age particularly led to an increase in the disability application rate among lower-income workers aged 60 and above, implying that this group of workers requires special attention when designing policies to prolong working life. In particularly since lower-income workers with health problems have limited financial means to afford early labor market exit. Heterogeneity in effects across sectors for both types of pension reforms suggests that a large share of lower-income workers in demanding occupations already moved out of the labor force a few years before reaching the normal retirement age.

With Booze, You Lose: The Mortality Effects of Early Retirement

PRESENTER: **Patrick Chuard-Keller**, University of St. Gallen

This study analyzes the effect of early retirement on male mortality. I exploit two reforms in Switzerland, which allowed men as of a certain cohort to retire one and two years before the statutory retirement age. This generates two sharp eligibility cutoff dates, which I use in a regression discontinuity design. I draw from two full sample administrative data sets: the mortality and the old age insurance register. Retiring two years before the statutory retirement age increases the absolute risk of death before the age 83 by 41 percentage points. Heterogeneity analysis reveals that the effect is driven by lifestyle diseases such as alcohol dependence and respiratory diseases related to smoking. The effect is largest for unmarried men and for men living in the German-speaking part of Switzerland. Also, there is no effect heterogeneity regarding income, which suggests that the negative health effect is not caused by a loss in income due to retirement. The results support the lifestyle hypothesis suggesting that retirement increases mortality due to a loss of structure and a concomitant unhealthy lifestyle.

Optimising the Public Health Benefits of Sex Work Regulation in Senegal: A Formative Study

PRESENTER: **Sandie Szawlowski**, Centre for Global Health Economics, UCL

AUTHORS: Fanny Procureur, Carole Treibich, Mylene Lagarde, El Hadj Alioune Mbaye, Khady Gueye, Cheikh Tidiane Ndour, Aurelia Lepine

Background

Senegal is the only African country that regulates sex work. Female sex workers (FSW) must register with the police and a health centre where their files are held for life. Valid registration identification gives FSWs the ability to solicit legally. To validate their identification they must attend monthly sexual health appointments and test negative for sexually transmitted infections (STIs). Registration of FSWs allows the government to monitor STIs in FSWs and limit the spread of HIV/AIDS in the general population. However, only 20% of FSWs in Senegal are currently registered. This is likely due to fundamental issues in the design of the registration policy, rendering the costs of registering greater than the benefits. The aim of this study is twofold. First, to identify elements of the registration policy that are attractive or unattractive to FSWs. Second, to identify potential policy changes and assess their feasibility in the current socio-political context.

Method

To elicit FSW registration policy preferences, a discrete choice experiment (DCE) was administered to 241 registered and 273 non-registered FSWs. Five key policy attributes (registration file, registration identification, health centre confidentiality, health visit costs, psychological support) presented in the DCE were identified by our previous research on the registration policy in Senegal and four focus groups with registered and non-registered FSWs. Conditional logit models were conducted to analyse the data. The findings and feasibility of potential policy changes were discussed with the main actors involved in the registration policy in 18 interviews with staff of the Ministry of Health and the Home Office, medical doctors and social assistants, police officers, NGOs staff working with FSWs and FSWs' group leaders.

Results

The DCE results demonstrate that registration policy preferences of registered and non-registered FSWs are aligned. According to FSWs, ensuring confidentiality at health centre, replacing the physical registration proof by a QR code, providing psychological support, removing the registration file held by the police and only holding the registration file at the health centre whilst active in sex work significantly improve the registration

policy. We discussed our findings with relevant policy-makers and found that they were willing to support improvements in confidentiality and provide a psychosocial support service. However, replacing the current registration proof with a QR code, complete removal of police files and suppression of files held at the health centre when they are not active would require a reform of the current law and therefore raised substantial concerns. Given unfavourable social norms toward sex work, reform is unlikely to occur any time soon.

Conclusion and policy recommendations

Several interventions with the potential to increase the registration rate of FSWs and improve their wellbeing can be implemented without overturning the law. For example, bettering relationships between FSWs and police officers, improving information regarding the benefits and costs of registration and including psychosocial support in the registration support package. In addition, integrating registered FSWs mandatory sexual health appointments with maternal health appointments, available to all women, will increase the confidentiality of FSWs.

8:30 AM –9:30 AM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Equity-Informative Economic Evaluation in Sub-Saharan Africa

SESSION CHAIR: **Stephane Verguet**, Harvard T. H. Chan School of Public Health

ORGANIZER: **Naomi Kate Gibbs**, The University of Sheffield

DISCUSSANT: **Heather Lynne Fraser**, SA MRC/Centre for Health Economics and Decision Science – PRICELESS SA; **Mizan kiros Mirutse**, University of Bergen

Equity in the Midst of Scarcity

PRESENTER: **Susan Goldstein**, SAMRC Centre for Health Economics and Decision Science - PRICELESS SA

Background

South Africa (SA) is in the process of developing a national financing system for health care. The National Health Insurance (NHI) Bill was put to parliament in 2019. The objective is to provide universal access to quality health care for all South Africans as enshrined in the Constitution. It includes commitments to redressing structural imbalances in the health system that undermine access to quality health services while reducing the burden of disease at the same time.

However, as countries worldwide explore health system reforms to progress toward UHC, policymakers face challenging decisions about what and whom to cover with their limited health budgets. SA is one of the most unequal countries in the world with 40% of the health spend is currently allocated to serve 15.5% of the population through the private sector, while the remaining spend goes to serving the remaining 84%.This study is part of a larger study called South African Values and Ethics for Universal Health Coverage (SAVE-UHC) – which looks at how a locally developed values and ethical framework could assist in future Health Technology Assessments.

Methodology

Given that there is no existing HTA agency or committee in place in South Africa, the research team convened three multi-disciplinary stakeholder groups to simulate the function of HTA appraisal committees in order to pilot test the SAVE-UHC ethics framework, the development of which is described elsewhere, one of the key domains was “equity”.

Each simulated appraisal committee (SAC) comprised of approximately 8-10 stakeholder representatives from diverse backgrounds, including policymakers, civil society representatives, patient groups, public health practitioners, service providers, health economists and academics. These were purposively sampled to ensure representation of perspectives as well as gender, race, and age groups. The SAC’s were transcribed and analysed both inductively and deductively by the team of researchers. This paper is focussed on the equity aspects of the discussions in the SAC’s.

Findings

Equity was an important issue for all groups. The understanding of what equity means in the context of the case studies varied, but a constant concern was raised about the possibility that creating equity might make an intervention more expensive. This was related to poorer and rural areas having poor infrastructure and health services, and therefore quality implementation of the intervention to these areas would cost more per DALY.

Discussion centred on reaching equity amidst scarce resources such as medical specialists and how equity could be maintained without compromising quality of service delivery. Finally, the measurement of equity in a manner that allows for shared understanding whilst considering interventions was highlighted.

Interpretation

South African stakeholders in this study raised concerns about equity in terms of providing quality health care, and how to measure this. In the process of the priority setting exercise the stakeholders felt that equity was a national priority, and must be included in all priority settings for universal health care.

Effects of Minimum Unit Pricing for Alcohol in South Africa across Different Drinker Types and Wealth Quintiles: A Modelling Study

PRESENTER: **Naomi Kate Gibbs**, The University of Sheffield

Background

Drinking in South Africa is characterised by high levels of both abstinence and binge drinking amongst drinkers, leading to significant levels of alcohol related harm. Previous research in high income countries has found Minimum Unit Pricing (MUP) for alcohol to be an effective, well-targeted policy for reducing alcohol related harm. This paper aims to investigate whether this is true in the South African context and provide estimation of distributional impact across wealth quintiles.

Methods

A causal, deterministic, epidemiological South African alcohol model was built using secondary data to estimate the effects of MUP across sex, drinker types and wealth quintiles. A programme of stakeholder engagement informed model development, and included policy professionals, civil society members and local academics. The model accounts for alcohol consumption across population subgroups. We estimate price distributions for drinker types and wealth quintiles. South African price elasticities, disaggregated by drinker type, were taken from the literature. Baseline rates of mortality and morbidity, taken from the Institute for Health Metrics and Evaluation, were adjusted using evidence from the General Household Survey to account for existing socioeconomic inequalities in health. Outcomes prioritised by stakeholders included individual consumption, individual spend, tax revenue, retail revenue, health harms (HIV, intentional injury, road injury, liver cirrhosis and breast cancer), and hospital and crime costs. Sensitivity analysis varied key assumptions and parameters within the model.

Findings

Overall, we estimate that a MUP of R5 per standard drink of 15ml of pure alcohol would lead to an immediate reduction in consumption of 3.4% (−30.3 units per drinker per year). Moderate drinkers saw the greatest percentage decrease in their drinking, followed by occasional binge drinkers then heavy drinkers (-4.5%, -3.7%, -2.5%). This translates to an absolute reduction in units per drinker per year of -11.6, -21.7 and -48.6 respectively.

Distributional results across wealth quintiles are still being finalised.

Interpretation

Interpretation is likely to include whether or not the policy is effective in reducing alcohol harm and whether the distributional results suggest the policy is progressive or regressive in terms of income and health outcomes with implications for its acceptability.

Estimating the Distribution and Household Financial Impact of Vaccine-Preventable Diseases in Ethiopia

PRESENTER: **Dr. Solomon Tessema Memirie**, Addis Ababa University

Background

The Expanded Program on Immunization (EPI) in Ethiopia currently includes 11 antigens in the routine childhood immunization schedule. Ethiopia has made gradual improvements in immunization coverage since the program began in 1980, which has contributed to substantial reductions in infant and under-five mortality. However, the country still struggles with a high burden of vaccine-preventable diseases (VPDs). The impact of VPDs on human development goes beyond morbidity and mortality, as VPDs also often cause severe financial hardship to households in low- and middle-income countries, especially in settings like Ethiopia where health systems are weak and out-of-pocket (OOP) health financing is substantial.

Methods

We develop a modeling approach that uses risk factors drawing from the Ethiopian Demographic and Health Survey to estimate the distribution, across socioeconomic groups and geographic regions, of the morbidity and mortality associated with six VPDs (hepatitis B, human papillomavirus, measles, meningococcal meningitis A, pneumococcal pneumonia, and rotavirus). Using secondary data from published literature and surveys, we then estimate the risk of catastrophic health expenditure (CHE) – OOP medical expenditure surpassing a certain threshold of household consumption – due to VPDs, taking into account a household's likelihood of health services utilization, OOP costs for VPD treatment, and household consumption expenditure.

Results

We find that children in lower wealth quintiles would have a high burden of VPDs, particularly of rotavirus diarrhea, measles, and pneumococcal pneumonia, which also means that poorer households in Ethiopia are at risk for VPD-related medical impoverishment and CHE. However, the risk of CHE would vary with household wealth, because wealthier households are more likely to seek health care upon illness. The risk of CHE also varied by VPD, ranging from low risk (e.g. for measles) to high risk (e.g. for meningitis), indicating that the risk of CHE would also be closely tied to the average cost of VPD treatment.

Interpretation

Understanding the distribution of VPDs, as well as their impact on household finances, is important for setting vaccine policy priorities, guiding vaccine program implementation strategies, and allocating resources in a manner that is both efficient and equitable under severely financially constrained environments.

8:30 AM–9:30 AM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Challenges to Health Policy Programmes

MODERATOR: **Apostolos Davillas**, University of East Anglia

Sick Pay Generosity, Sick Leave Behavior, and Contagious Diseases: Spillovers and Infections in Public Schools

PRESENTER: **Nicolas Ziebarth**, Cornell University

AUTHORS: Dr. Christopher Cronin, Matthew C Harris

The United States is one of few OECD countries without universal access to paid sick leave. Over the past decade, however, twelve states and dozens of cities have passed employer sick pay mandates. Moreover, most public state employees, such as public-school teachers, have access to paid sick leave.

A key policy question is how to optimally design sick pay schemes to minimize shirking and presenteeism behavior. Overly generous paid leave systems encourage employees to shirk. On the other hand, a significant share of American employees work sick and, when contagious, spread diseases. U.S. sick pay schemes are typically individualized sick leave credit accounts where employees earn and accumulate sick leave hours when working and unused days carry over to the next year. Most public teacher sick pay schemes have very similar designs. Thus, studying sick leave behavior of public-school teachers may provide important insights into how sick pay schemes can be optimized.

This paper uses unique administrative data on daily attendance and sick leave behavior of 982 school teachers of one district in a Southern U.S. state from 2010 to 2018. All teachers work under a standard U.S. teacher sick pay scheme that provides 10 new sick days per school year and allows unused sick days to accumulate over school years. We enrich the administrative data with information on public holidays, snow days and official data on flu activity on the weekly level over nine years. The flu data provides us with objective doctor-certified ILI rates and allows to exploit plausibly exogenous variation in the duration and strength of flu activity across months of the year and over time. Because we rely on teacher panel data, we can additionally exploit within-teacher variation in the number of available sick days, as we observe the sick day balance of each teacher on each day over our period of observation.

Our findings show, first, that teachers are significantly more likely to call in sick during times of high flu activity. This yields evidence that teachers take sick days as intended when they carry contagious diseases. Moreover, we do not find much evidence that teachers are more likely to extend their vacations by calling in sick in the days just before and after. Also, during a popular sporting event, teachers are more likely to use personal days to take a day off but not sick days.

Second, we find that lower sick day balances make it less likely that teachers call in sick. In other words, we find a positively sloped balanced-leave elasticity which is an important parameter for the design of optimal sick pay schemes.

Finally, we study presenteeism behavior among public school teachers. We provide evidence that higher sick day balances reduce presenteeism behavior during times of high flu activity.

One policy implication of this finding is that, especially when flu activity is high, schools should consider providing teachers with low sick day credit balances with extra sick days to minimize presenteeism behavior among teachers and infections in schools.

Resource Allocation in Public Sector Programmes: Does the Value of a Life Differ between Governmental Departments?

PRESENTER: **Nadine Henderson**, Office of Health Economics

AUTHORS: Patricia Cubi-Molla, David Mott, Bernarda Zamora, Martina Garau

Introduction

In many countries, public sector guidance documents set out the manner in which an economic evaluation should be conducted. A monetary value is usually applied to life and health. However, different values are used in analyses depending on which department is conducting them, giving rise to

inconsistencies in decision-making. We explore whether life and health are valued differently across three governmental departments (health, transport, and environment) in Australia, Canada, Japan, New Zealand, The Netherlands, and the UK, and identify potential patterns between these countries.

Methods

For each country, a literature review was conducted to identify evidence from technical reports, guidelines, and tools published by government departments indicating methods for conducting impact assessments or appraisals. Estimates of value of life and health identified in the literature review were collated in extraction tables. Metrics considered included the value of a statistical life (VSL), the value of a life year (VOLY), and the value of a quality adjusted life year (VOQ). In many cases, adjustments to VSL/VOLY estimates were required to update them to current prices. Sensitivity analyses were conducted that used alternate assumptions in the metric conversions.

Results

Generally, values used in transport and environment exceeded those used in health, often by a significant proportion (on average, 40% higher). In 71% of the cases, the upper health values used in HTA (e.g. based on rarity of the condition) are still lower than those from other sectors. The sensitivity analysis found that the overall trend held even with the most extreme assumptions (assuming that a life year would be equivalent in value to a quality-adjusted life year).

Discussion

The value of life and health in the health sector is significantly lower than the values used in other non-health departments. Some form of reconciliation is needed to correct the potential imbalance in the value of the same attribute (health and life) across public sectors.

Improving Economic Conditions Matter for Mortality Among Medicare Fee-for-Service Beneficiaries in the US

PRESENTER: **Harper Wallace**, Ecole Normale Superieure
AUTHORS: Kenan Fikri, James N Weinstein, William Weeks

Introduction

Among Medicare fee-for-service beneficiaries, higher local economic distress is associated with less recommended care receipt, higher per-capita spending, lower care quality, and higher mortality rates. We sought to determine whether spending and mortality rate disparities changed over time and within communities where local economic distress changed dramatically.

Methods

From the Dartmouth Atlas Project, we obtained 2003–2015 hospital service area (HSA) level data on price- and age-, sex-, and race- (ASR) adjusted total annual per-capita Medicare Part A+B expenditures and mortality rates for fee-for-service enrollees.

From the Economic Innovation Group (EIG), we obtained 2000 and 2015 Distressed Communities Index (DCI) scores at the ZIP Code level. Constructed from seven measures of local economic distress, scores range from 0 (least economically distressed) to 100. For 3412 HSAs, we assigned ZIP-Code-enrollee-weighted HSA-level scores to 2000 and 2015 DCI quintiles.

We tracked annual expenditure and mortality rates over time and used enrollee-weighted ANOVA (R, Vienna Austria) to compare quintile-specific values. We identified HSAs that started in the least or most distressed quintiles in 2000 and compared those that changed at least 2 quintiles by 2015 (n=14 and 39, respectively) to those that did not (n=628 and 603, respectively).

We obtained all data from publicly available sources; IRB approval was not required.

Results

Between 2003–2015, annual per-capita Part A+B expenditures for the most economically distressed HSAs were 12–13% higher than those for the least ($p<0.0001$ for each year).

Mortality rates declined across all 2000-DCI-defined quintiles; they were substantially higher in the most economically distressed HSAs than in the least ($p<0.0001$ for each year). Between 2003–2015, the absolute mortality gap between most and least distressed quintiles increased from 0.76% to 1.13%.

Enrollees living in areas where local economic conditions substantially worsened between 2000–2015 experienced higher ASR-adjusted mortality rates than those where economic conditions remained favorable by a widening margin, from –0.05% in 2003 (n.s.) to 0.53% in 2015 ($p<0.05$). Enrollees living in areas where local economic conditions substantially improved experienced significantly lower ASR-adjusted mortality rates than those where economic conditions remained unfavorable, with the absolute mortality gap widening over time (from 0.77% in 2003 to 1.28% in 2015, $p<0.0001$ for each year). Per-capita spending was higher in HSAs where economic distress decreased than where it remained high ($p<0.01$ in all years save 2006–2010).

Discussion

Medicare fee-for-service enrollees living in the most-economically distressed areas in 2000 consistently experienced higher per-capita expenditures and mortality rates between 2003–2015 than those living in the least. Among those living in the most- and least-distressed HSAs, substantial improvement or worsening of local economic conditions was associated with relative decreases or increases in mortality rates, respectively.

While limited by their associative though natural-experiment-based nature and use of Medicare fee-for-service enrollees, our findings suggest that those living in persistently economically distressed communities face disproportionately high mortality rates. Our research suggests that substantial improvement in local economic conditions might mitigate that inequity and could confer long-term health benefits in a relatively short time period.

Subsidized Screening and Lifestyle Management of Gestational Diabetes Mellitus in Rural China: A Multicenter, Randomized Controlled Trial

PRESENTER: **Dr. Tingting Xu**
AUTHORS: Qing Xia, Dr. Xiaozhen Lai, Julie A Campbell, Barbara de Graaff, Kun He, Liangkun Ma, Hai Fang, Andrew J Palmer

Background: Gestational diabetes mellitus (GDM) has become an increasing health problem among pregnant women, however, it showed a low GDM screening and management rate in western rural China. Insufficient compliance and motivation due to economic factors were important causes of the current circumstance of GDM. With the increasing urban-rural disparities of diagnostic screening and treatments in pregnant women with GDM in China, we proposed that a subsidy program offering GDM screening and lifestyle management might be an effective way to improve GDM screening and management rate and promote the health of pregnant women with GDM and their offspring in western rural China.

Methods and analysis: We did a multicenter, two-group, unblinded, randomised controlled trial in six hospitals located in the provinces of Yunnan, Sichuan and Shaanxi in China. Pregnant women without overt diabetes (i.e. type 1 diabetes and type 2 diabetes) in a singleton pregnancy, telephone-access, and signing the informed consent at 24-28 weeks of pregnancy were recruited. Randomization was done with an internet-based, computer-generated in blocks of size six, and was stratified by sites. The intervention group received subsidy and standard care, and the control group received usual antenatal care only. The primary outcomes were the maternal and neonatal complications. Secondary outcomes included mother's cognition scores, screening rate, the number of glucose retests actually done, weight gain at pregnancy, changes in diet and exercise, and quality of life. Analysis was done by intention to treat. This trial is registered in the China Clinical Trials Registry (ChiCTR1800017488).

Results: A total of 3294 pregnant women (intervention group: 1649; control group: 1645) were recruited in this study. The GDM screening rates in the intervention and control groups were 97.2% and 94.5%, respectively, and their GDM incidence rates were 15.5% and 16.5%. The demographic characteristics and baseline health conditions of pregnant women in the two groups were similar and none of them being statistically significant. The number of glucose retests actually done for women with GDM in the intervention group was 1.5, which was significantly higher than that in the control group (0.4 reexaminations) with P value < 0.01. For pregnant women with GDM, 85.3% of them in the intervention group and 77.1% in the control group successfully managed their glucose levels to normal before delivery (P value = 0.05). The proportion of participants with maternal and neonatal complications in the intervention group was sufficiently lower than that in the control group (overall: 37.2% vs 41.2%; women with GDM: 38.3% vs 48.2%; P value = 0.02).

Conclusions: Self-payment for GDM screening was not a barrier at all as long as doctors recommended it to pregnant women in western rural China. But the subsidized GDM management and consultation visits increased the number of GDM consultations and retest visits, and contributed to reduce maternal and neonatal complications. Therefore, it is recommended that the Chinese government urge hospitals in rural China to provide GDM screening, management and consultations, which can be added into the subsided antenatal care package.

9:45 AM–11:00 AM WEDNESDAY [Special Sessions]

CENTERPIECE SESSION: Are Economic Evaluation Methods fit for Purpose to Inform Pandemic Policy?

MODERATOR: **Jane Hall**, Centre for Health Economics Research and Evaluation

SPEAKER: **Susan Cleary**, University of Cape Town; **Richard Holden**, University of New South Wales; **Christian Gollier**, Toulouse School of Economics; **Richard Smith**, University of Exeter; **Rosalie Viney**, Centre for Health Economics Research and Evaluation (CHERE), University of Technology, Sydney (UTS)

11:30 AM–12:30 PM WEDNESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Is the Gap between Public Financial Management, Best Practices, and on-the-Ground Exigencies Closing? Evidence from Three African Countries

SESSION CHAIR: **Jorge Ugaz**, Palladium-Health Policy Plus

Is the Gap between Public Financial Management, Best Practices, and on-the-Ground Exigencies Closing? Evidence from Three African Countries

PRESENTER: **Suneeta Sharma**, Palladium

Overcoming Public Financial Management Obstacles to Mobilize Resources for HIV in Nigeria

PRESENTER: **Frances Ilika**, Palladium -Health Policy Plus

Background: One factor behind Nigeria's insufficient progress towards Universal Health Coverage (UHC) is the lack of adequate funding for health interventions. In Nigeria, there is a strong reliance on donor funding for key HIV interventions. Thus, improving domestic funding is key to closing UHC and HIV control financial gaps. A few key obstacles must be addressed; first, funds for health programs are rarely adequately appropriated; second, funds that have been allocated are sometimes partially released, not released on time, or not released at all; and third, even when released, funds for health are not properly expended or executed. Understanding Public Financial Management (PFM) process and obstacles in Nigeria remains essential to overcome these three obstacles and improve the potential of domestic resource mobilization (DRM) for the health sector.

Methods: With that objective, the USAID-funded Health Policy Plus project (HP+) supported Lagos and Kano states to map out government PFM processes and helped identify key actors and institutions involved in the PFM cycle, including budget planning, execution, and monitoring. HP+ supported the creation of a DRM Technical Working Group (TWG) integrated by Civil Society Organizations, private sector, Office of the Governor, Ministry of Health, of Economic Planning and Budget, of Finance, State Treasury, legislators, and NGOs. These stakeholders successfully engaged in applying political economy knowledge to create incentives and identify mutual benefits, identified PFM obstacles to mobilizing domestic funds for the health sector and HIV through strategic workshops, and carried out evidence-based advocacy and lobbying for the progressive implementation of policies and plans towards increased government spending on health and HIV/AIDS.

Results: The coalition identified major PFM obstacles, including low budget credibility, unrealistic budgets, and lack of accurate costing during the planning process. Also, they found that budgets often have political biases rather than being evidence-based and that key health actors have an inadequate understanding of the PFM processes and are not proactive in requesting that previously approved funds be effectively released. HP+ found that centralized disbursements slow down budget execution and often require strong political advocacy and lobbying. The TWG was able to remove some obstacles by providing vital information to health and HIV actors, enhancing political leverage for fund allocations and releases, and enabling an improved understanding of health sector issues by non-health actors. Key outcomes from these TWG efforts include an increase in the allocation and releases of funds for health and HIV, greater allocations for universal coverage and HIV in Kano and Lagos states, and significant increments in budget execution rates (from 26% in 2018 to 46% in 2019).

Conclusion: Evidence-based engagement, transparency, and accountability of health actors are essential to overcome PFM obstacles. Understanding the influence and interest of key actors and institutions, and the application of such knowledge to engage both state and non-state actors with government influence could be the game-changer going forward. Intersectoral action is the panacea, and capacity building of health sector actors on PFM, fostering inter-sectoral collaboration and partnerships are essential for achieving the maximum potential of DRM efforts.

By Shifting the Public Financial Management Paradigm, Counties in Kenya Achieve Budgetary Gains for Health

PRESENTER: **David Khaoya**, Palladium -Health Policy Plus

Background: Kenya's 2012 Public Financial Management Act requires counties to use program-based budgeting (PBB)—a method that links budget allocations to health outcomes. However, by 2015, most counties (the main subnational level of government) did not know precisely how to put PBB into practice, leaving them unable to defend their budgets or advocate for additional financial resources. Urgent support was needed to train county management teams on PBB and ensure they would allocate and use financial resources effectively and efficiently.

Methods: In 2015, USAID's Health Policy Project (HPP) collaborated with government entities and stakeholders to develop a PBB manual and templates for county health sectors that allowed them to establish specific categories for priority health areas. County health teams were trained to adapt the template to respond to their priorities and were given tools and guidance on how to influence the budget approval process and advocate for their needs. HPP's follow-on project, Health Policy Plus (HP+), and the Kenya School of Government used the PBB curriculum to train county health management teams and provide hands-on mentoring and coaching to emphasize stakeholders' engagement.

Overall, HP+ assisted nine counties to track how health funds were being spent and to determine their impact on health outcomes. HP+ also helped these counties to identify ways they could spend those resources more efficiently and helped them develop roadmaps to address bottlenecks and gaps in areas such as supply chain, procurement processes, and human resources. HP+ analyzed trends in health financing indicators in counties where they provided support and compared them with comparable counties that had not received HP+ support.

Preliminary results: Preliminary results suggests that HP+ technical support in the target counties has led to different types of improvements. Nyeri County, for example, used to spend a significant portion of its health budget on staff salaries; however, following HP+'s assistance, the county health management team planned for the retirement and replacement of 280 staff and hired new staff on fixed-term contracts, saving the county $60,000 per year, funds that were reallocated to support other needy areas. Besides, after implementing PBB, the county has been able to

increase its health budget by more than 20 percent. Similarly, in Mombasa County, after HP+ support, the health management team increased the health budget, from 12% of the total county budget in FY 2015 to 27% in FY 2018. At the same time, out-of-pocket spending in the county was drastically reduced from 41% (of total health expenditure) in FY 2015 to 34% in FY 2017.

In just two years, nine counties where HP+ provided intensive support collectively increased their health budgets by 30%, compared to the other comparison counties where budgets rose only marginally. The additional money allocated in the targeted counties has been utilized to purchase essential medicines and other medical supplies, ensuring that people get the care they need without any financial risk, increasing access and reducing catastrophic expenditures. The analysis will be completed by January 2021, for presentation in the session.

Public Financial Management in the Delivery of Health Care Services: The Case of the Malawi Health Care System

PRESENTER: **Atamandike Chingwanda**, Palladium -Health Policy Plus

Background: The theoretical links between public financial management (PFM) systems and healthcare service delivery have recently been demonstrated (see Cashin et al., 2017). However, there is limited actual evidence on the role of PFM systems in the achievement of healthcare service delivery goals. The lack of evidence is particularly stark for low-income countries (LICs), with a few exceptions (see Piatti-Fünfkirchen and Schneider qualitative study from 2018 on the role of PFM systems in countries like Zambia and Tanzania).

This study examines the extent to which PFM systems affect the achievement of service delivery goals in Malawi. Although donors contribute 58.6% of total health expenditure in Malawi compared to public sources (only 23.9%), approximately half of the total health expenditure (48%) is managed through the government mechanisms (Malawi National Health Accounts, 2020). It is therefore important to understand how the current PFM mechanisms affect service delivery to identify key policy recommendations and address challenges within the PFM-healthcare service delivery nexus.

Methods: A qualitative study was conducted at the national and sub-national levels to understand the alignment of the PFM system to healthcare service provision and how this affects the achievement of key healthcare service delivery goals in Malawi. A semi-structured questionnaire was designed based on the World Health Organization's guidance on alignment of PFM systems and health financing (see Cashin et al., 2017). Thequestions were modified and tailored based on feedback received from an expert group responsible for developing the recent Malawi Health Financing Strategy. The questionnaire was administered to purposively selected stakeholders including representatives from the Ministries of Finance and Health.

Multiple iterative phases of data analysis are being conducted. The first phase involved a detailed write-up of responses from stakeholders. The second phase involved mapping stakeholders' responses to PFM assessment tables (Cashin et al, 2017). The final phase involves analyzing the effect of PFM systems on service delivery using the 'PFM to service delivery' conceptual framework (see Piatti-Fünfkirchen and Schneider, 2018).

Preliminary results: The study has confirmed the existence of significant misalignment between PFM system design, processes, and health service delivery goals. More specifically, despite the adoption of Program-based budgeting (PBB), health budget allocation still seems to be based on past budget allocations by the Ministry of Finance. Also, there seems to be a consensus regarding budget releases and execution not being aligned with health sector needs. The study also identified multiple inefficiencies that are not remedied when budget monitoring is conducted due to irregular and delayed expenditure reports. Besides, issuing budget expenditure reports is no longer a prerequisite for subsequent budget releases, hampering accountability, and transparency of the budget process. Secondly, concerning budget execution, we found that released funds are not aligned to key health programs, and that expenditure reports are not produced promptly.

We recommend that intersectoral collaboration amongst the ministries of finance, local government, and health focus on aligning the PFM system design and implementation towards the achievement of health service delivery goals. We also recommend better adherence to PFM provisions to improve healthcare service delivery.

11:30 AM –12:30 PM WEDNESDAY [Demand And Utilization Of Health Services]

ORGANIZED SESSION: Big Data and Health Economic Analyses: Evaluating the Effects of Insurance Policy and Design on Marginalized Populations Evidence from the United States and Taiwan

SESSION CHAIR: **Jake Morgan**,

ORGANIZER: **Meng-Yun Lin**, Wake Forest School of Medicine

DISCUSSANT: **Jayani Jayawardhana**, University of Georgia

Variation in Initiation, Engagement, and Retention on Medications for Opioid Use Disorder Based on Health Insurance Plan Design

PRESENTER: **Jake Morgan**

Background

The United States is facing an opioid-driven health crisis of mortality and morbidity, but medication treatment for opioid use disorder remains underutilized and discontinuation is common. While insurance coverage is central to treatment access in the United States, and previous work has documented heterogeneity among insurance types, the role of cost-sharing in treatment for opioid use disorder is unknown.

Aim

Estimate the association between insurance plan design and initiation, engagement, and retention to medication treatment for opioid use disorder.

Methods

We used OptumLabs Data Warehouse, a large, national database with inpatient, outpatient, and pharmacy claims for more than 125 million enrollees with commercial insurance, to identify a cohort of individuals with opioid use disorder enrolled between January 2015 and July 2019. Individuals entered the cohort upon diagnosis with incident opioid use disorder. Incident opioid use disorder was defined using an algorithm based on diagnostic coding of opioid use, abuse, or dependence and confirmatory diagnoses (such as injection related infections), excluding long-term opioid prescribing episodes, and preceded by at least 90 days without an indication of opioid use disorder. We identified FDA-approved medications for opioid use disorder – buprenorphine, naltrexone, and methadone – with outpatient pharmacy claims and outpatient in-person administration (for injectable formulations and methadone). The three primary medication outcomes were: **initiation**, or receiving medication treatment within 14 days of first opioid use disorder diagnosis; **engagement**, receiving a second medication within 34 days of the first, and; **retention**, receiving medication consistently over 180 days (without a gap of more than 14 days between the end of one prescription and the beginning of a second). We calculated the proportion of individuals diagnosed with opioid use disorder in each treatment group to summarize the cascade of care. We assessed four primary plan design exposure variables: the level of pharmacy and medical deductible (where over $1,000 was a high deductible plan), pharmacy copay for a tier-2 drug, and outpatient office co-pay (high copays were the highest 25% of all copays). We evaluated the effect of plan design on medication outcomes with logistic regression controlling for other demographic and clinical factors. We conducted a sensitivity analysis stratifying these results based on medication type (buprenorphine, naltrexone, or methadone).

Results

We identified 10,827 individuals with opioid use disorder. Of those, 1,230 (11%) **initiated** medication treatment, 762 (7%) were **engaged** in treatment, and 266 (2%) were **retained** at 6 months. We found that a medical deductible of more than $1,000 was associated with a lower odds of

initiation compared to no deductible (odds ratio 0.86, 95% confidence interval 0.75-0.98). We did not find any significant association between plan design and engagement or retention. Our sensitivity analyses did not reveal any differences in the effect of plan design among medication types.

Conclusions

Initiation, engagement, and retention after incident opioid use disorder diagnosis is low. A high medical deductible was associated with lower odds of initiating medication, but we failed to detect a sustained effect of plan design after initiation.

The Effect of Gender-Affirming Care Bans on HIV Prevention and Care Engagement Among Transgender Medicaid Enrollees

PRESENTER: **Jacqueline Ellison**, Brown University

Transgender adults have a higher burden of HIV than their cisgender counterparts. This population also disproportionately experiences financial and other structural barriers to care. Research suggests that state-level nondiscrimination policies improve mental health outcomes among privately-insured transgender individuals. However, no research to date has evaluated the role of such policies on HIV prevention or care outcomes among transgender people, or the impact of state-level Medicaid policies on coverage for gender-affirming care. This is important because insurance coverage for gender-affirming procedures may lead to improved engagement in all types of care, and bans on such coverage may obstruct engagement while exacerbating the stigma experienced by transgender people. The objective of this research is to evaluate the impact of discriminatory gender-affirming care bans on HIV prevention and care engagement among transgender Medicaid enrollees. We use national Medicaid data from 2004-2014 to obtain measures of HIV prevention and care engagement.

Applying a difference-in-differences design, we compare HIV prevention and care outcomes among transgender enrollees living in states that implemented gender-affirming care bans within their Medicaid programs with transgender enrollees in similar states that did not implement a ban. We use a validated algorithm that leverages diagnosis codes for unspecified endocrine disorders, prescriptions for cross-sex hormones, and specific procedures to identify our study sample. This algorithm allows us to capture transgender enrollees in states where Medicaid does not reimburse for gender-affirming surgery. Prevention outcomes among HIV negative enrollees include: 1) HIV testing (lab code count), 2) PrEP use (any prescription claim), and 3) PrEP adherence (persistent medication exposure [i.e., no prescription claim gap > 90 days]). Care engagement outcomes among HIV positive transgender enrollees include linkage to care (2 or more physician visits), antiretroviral use (any prescription claim) and antiretroviral adherence (persistent medication exposure [i.e., no prescription claim gap > 90 days]).

To assess outcomes before and after coverage bans among transgender enrollees living in states that implemented bans relative to transgender enrollees in states without bans, we use linear probability models, adjusting for patient sociodemographic characteristics, comorbidities, and zip code and year fixed-effects. We hypothesize worse HIV prevention and care engagement outcomes after implementation of gender-affirming care bans among transgender enrollees as compared to their counterparts living in states without discriminatory bans.

Medicaid Expansion Under the Affordable Care Act and Hospital Inpatient Mortality in Deprived Areas

PRESENTER: **Dr. Meng-Yun Lin**, Wake Forest School of Medicine

Rationale

There is emerging evidence that Medicaid expansion under the Affordable Care Act (ACA) was associated with a decline in population-level mortality rates overall or for specific marginalized populations. However, the potential mechanism underlying the reduced mortality is unclear. As more than one-third of deaths nationwide occur in hospital inpatient settings, the observed reduction in mortality may materialize through changes in inpatient death. This study aims to examine the association between ACA Medicaid expansions and inpatient mortality overall and by race/ethnicity subgroups.

Methods

We used all-payer inpatient discharge data from 16 states for the period 2010 to 2016. Data were acquired from either the Healthcare Cost and Utilization Project or individual states. Among the 16 states, ten opted to expand Medicaid eligibility in 2014 or later (AR, AZ, CA, CO, IA, IL, KY, NJ, OR, PA); while the other six did not (FL, GA, NC, TX, VA, WI). The study sample was hospital admissions of near-elderly adults (aged 55-64) residing in high-poverty areas, defined by zip codes with baseline (2010) poverty rates >=33%. We also conducted sensitivity analyses using residents of high-uninsurance zip codes (baseline uninsurance rates >=50%).

The analysis units were hospital admissions. The primary outcome was death during hospitalization. We also examined hospital admissions by payer type (Medicare, private, Medicaid, or uninsured) as secondary outcomes. This study applied an event study design to compare changes in inpatient mortality between states with and without ACA Medicaid expansion. This approach allows the association between treatment and outcomes to vary over time. Specifically, we estimated the change in inpatient mortality in expansion states relative to non-expansion states in each post-expansion year, as compared to the year immediately before the expansion. The models adjusted for state fixed effects, year fixed effects, and a secular trend varying by expansion status. We also conducted subgroup analyses by race and ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and Others) for the primary outcome.

Results

We identified 751,405 hospital admissions, with 433,417 (57.7%) in expansion states. Before 2014, average inpatient mortality rates was 2.44% in non-expansion states and 2.04% in expansion states. Preliminary findings indicate that the ACA Medicaid expansion was not associated with a change in inpatient mortality rates. However, Medicaid expansion increased Medicaid-paid hospital admissions by 12.9 percentage points (pp) (95% confidence interval [CI]: 11.3-14.6), decreased uninsured admissions by 4.9 pp (95% CI: 3.8-6.0), and decreased privately insured admissions by 1.9 pp (95% CI: 0.4-3.5) one year after the expansion. The estimated change in the second year was slightly larger for private coverage but smaller for uninsurance, compared to the first year. Subgroup analyses suggest that the finding of no association between Medicaid expansion and inpatient mortality rates consistently hold across racial/ethnic groups. Sensitivity analyses focusing on residents of high-uninsurance areas reveal similar overall patterns.

Conclusions

The ACA Medicaid expansion changed the payer mix of inpatient admissions but had no significant impact on inpatient mortality rates. The reduced mortality rates observed by other studies may occur in other places (e.g., home or hospice facilities).

The Effects of Hospice Palliative Care Program on Rural and Poor Population Among Various Life Stages: A 18-Year Observation

PRESENTER: **Tsung-Hsien Yu**, National Taipei University of Nursing and Health Sciences

Rationale

With the rapid advancement of medical services, people are living longer, in line with the ageing of the population, the pattern of diseases that people suffer and die from is also changing. More people die as a result of serious chronic disease, and elders in particular are more likely to suffer from multi-organ failure towards the end of life, which cause a wide range of physical, psychological and social problems. Hospice palliative care (HPC), compared to aggressive treatment, might be more likely to satisfy patient's need and benefits, dignity and quality of life, the cost of end of life treatment was reduced as well. Although there are a lot of studies in exploring the trend of the HPC use, however, whether sociodemographic characteristics affect the use of the HPC in eastern countries is still unknown. Therefore, the purpose of this study is using the population in Taiwan as the example to explore the trend of the HPC use between various income status and residential areas.

Methods

A 18-year retrospective observational study was conducted. Taiwan National Health Insurance claims data and death registry were used as the data source. Patients who died during 2000-2017 were enrolled as the study population. Residential area and income status data were used to represent the socioeconomic status of patients. The location of the most outpatient and pharmacy visits of each study population was recognized as either urban or rural type according to the definition of urbanization published by Taiwan's National Health Research Institutes. The NHI premium of each study population was used as a proxy for income status. The study population whose premium below the median was be identified as the lower income population from others. The study population was be classified as into groups according to their age- <18, 18-40,40-65,65-85, and >85 years old. Gender and cause of death were be collected as the covariates. The mixed effect model was used to examine statistically significant changes over the entire study period.

Results

A total of 2,835,822 died during the study period, and 424,620 of them received HPC care in their end stage of life. The results showed the rate of the HPC use was increased from 3.32% in 2000 to 23.96% in 2017. Deceased people who were aged at 40-65, lived in urban areas, had higher income and died from cancer had higher proportion of HPC utilization (22.46%, 26.23%, 24.53%, and 43.72%) than their counterparts, and the trend of HPC utilization was increased over time. Finally, the results also showed that the growth rate of HPC use were varied between advantaged and disadvantaged group (OR=0.72 for rural, OR=0.82 for lower income, all p-values were less than 0.001).

Conclusions

The utilization of HPC use increased in Taiwan over time, however, the growth rate among various sociodemographic groups were varied, advantaged group had higher growth rate. Thus, understanding the difference in HPC use between advantaged group and disadvantaged group may be the next issue that needs to be addressed and resolved.

11:30 AM –12:30 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: The Economics of HIV Self-Testing in Six African Countries- Insights from a Large Multi-Country, Multi-Year Economic Analysis Project

SESSION CHAIR: **Linda Sande**, Malawi-Liverpool-Wellcome Trust

DISCUSSANT: **Thato Chidarikire**, Department of Health

The Costs and Outcomes of HIV Self-Test Kit Distribution Along the Care Cascade: Results from Two Economic Evaluations in South Africa and Eswatini

PRESENTER: **Kathleen McGee**, London School of Hygiene & Tropical Medicine

AUTHORS: Gesine Meyer-Rath, Katleho Matsimela, Linda Sande, Mohammed Majam, Ralitza Dekova, Lenhle Dube, Sanele Masuku, Makhosazana Dlamini,, Karin Hatzold, Elizabeth L. Corbett, Cheryl Johnson, Mr. Marc d'Elbée, Fern Terris-Prestholt

Background: Countries are looking for innovative and cost-effective measures to close the remaining gaps towards the 95-95-95 targets for the effective diagnosis, treatment, and viral suppression of people living with HIV/AIDS (PLHIV). Offering HIV self-testing (HIVST) kits across multiple distribution channels may help countries with high HIV prevalence achieve these targets. Measuring both costs and outcomes of providing HIVST kits along the client care cascade can further inform countries of the value offered by adding HIVST distribution to their existing HIV testing programs.

Methods: Data were collected over a 1-year period in South Africa (2018-2019) and Eswatini (2019-2020) alongside primary and secondary distribution of HIVST kits, across community-, facility-, and workplace-based models. Community-distribution further consisted of 6 sub-models, including fixed-point distribution, flexible distribution, mobile integration, transport hubs, key populations and sex worker networks.

Outcomes were based on distribution data and telephonic surveys of 5% and 21% of recipients in South Africa and Eswatini, respectively. Costs were calculated based on project expenditures, as well as, in South Africa, micro-costing and time-motion analyses. Costs were calculated from the provider's perspective in 2019/20 US dollars, as incremental costs in integrated and full costs in stand-alone models.

Results: Over 2.2 million HIVST kits were distributed in South-Africa and Eswatini. Screening positivity or reactivity estimates across models ranged between 4% and 6%, linkage to confirmatory testing at the clinic between 19% and 96%, and ART initiation between 2% and 83%. Average cost per kit distributed varied from $4.18 to $17.68, with kit volumes driving most of the difference. Average cost per client with a reactive self-test ranged from $24 to $521, cost per client confirmed positive from $52 to $1,176, and cost per client initiating ART from $104 to $4,612. In South-Africa, the sex worker network model was the most cost-effective distribution model across all cascade outcomes and, together with the index testing at facilities, identified the largest number of PLHIV for the least cost. The large-volume models, such as workplace, transport hub or fixed-point community distribution models achieved greater demand but did so at the cost of smaller HIV positivity - in some cases augmented by lower linkage to onward care. In Eswatini, community and workplace distribution models had comparable costs, though the latter presented smaller cascade costs as clients had higher screening positivity. Personnel and HIVST kit costs were the largest cost items across models and countries.

Conclusion: In both countries, HIVST distribution models varied along four characteristics: distribution volume; screening positivity; linkage to care; and costs. Cost per outcome increased by one to three orders of magnitude once positivity, linkage to care, and ART initiation rates were evaluated, demonstrating the importance of including successive cascade outcomes when comparing HIVST cost and cost effectiveness with other testing modalities. Identifying the remaining HIV-positive cases will cost more as countries draw closer to reaching the first 95 target and testing yields continue to decrease. Efficient delivery and effective linkage to care strategies are paramount to improving the cost effectiveness of HIVST distribution.

Characterising Methods to Project Health Care Costs at Scale in Low- and Middle- Income Countries: A Case Study of Scaling up Community-Based HIV Self-Testing Programme in Lesotho

PRESENTER: **Mr. Marc d'Elbée**, London School of Hygiene & Tropical Medicine

AUTHORS: Linda Sande, Lawrence Mwenge, Cheryl Johnson, Elizabeth L. Corbett, Gesine Meyer-Rath, Fern Terris-Prestholt

There is a dearth of evidence on methods for projecting costs at scale for programming and planning. Accounting cost functions (ACF) identify fixed and variable costs through stepwise analysis of a production process; econometric cost functions (ECF) apply statistical inference to project costs; and simple cost multipliers (SCM) multiply a single unit cost by quantities of outcomes such as patient years covered. While ACF and ECF estimate production costs at scale while accounting for variable returns to scale, in most cases we do not have the luxury of collecting large amounts of location-specific cost data, and SCM is commonly used. This study compares and contrasts these approaches, and identifies factors guiding the selection of a cost projection method fit for purpose. We use site level cost data for community-based HIV self-testing (HIVST) programmes across five countries in Southern Africa, including Lesotho as our case study.

Under the STAR project, we estimated the incremental economic costs of community-based HIVST kit distribution in 79 sites between June 2016 and June 2019. For SCM and ACF we used cost and programme data from Lesotho only, for ECF we used data from Malawi, Zambia, Zimbabwe, South Africa and Lesotho to allow for a sufficient sample size. For Lesotho, we analysed differences between observed scale-up costs and costs projected through cost function approaches at different levels of scale-up, accounting only for scale economies. In addition, we conducted a series of scenario analyses using ACF and ECF to assess the cost impact of contextual factors changing at scale-up (e.g. need for additional human resources, transition from international to local programme ownership), thus accounting for variable returns to scale.

Overall for Lesotho, all three projection methods gave highly accurate scale-up cost estimates compared to observed scale-up expenditure records (with <50,000 kits distributed yearly), but were much less consistent for cost projection at larger scale. While SCM costs are increasing steadily, ACF costs capture increasing returns to scale. ECF first exhibit scale economies, then costs grow exponentially at larger scale, however, this is highly dependent on the scale functional form chosen. ACF and ECF can be adjusted to various (and distinct) scale-up factors, making difficult the comparison of projected costs. However, the use of the three complementary approaches is informative and can help to estimate a reliable range of projected costs.

In summary, the choice of cost function should account for the intended use of cost estimates and the characteristics of the intervention being evaluated. Factors to consider for method selection are (1) the policymaker's interest for assessing constant vs. variable return to scale and whether there is information on the expected functional form of the scale component, (2) an interest in the variation of cost composition during scale-up (fixed vs. variable costs and inputs), (3) the intervention level of analysis (national, regional), (4) the determinants of scale-up costs and whether they are related to programme design (change of funders), and/or to contextual determinants (characteristics of the population reached), and (5) the expected magnitude of scale-up.

Cost-Effectiveness of HIV Self-Testing in Southern Africa: A Comparison

PRESENTER: **Valentina Cambiano**, University College London

AUTHORS: Nurilign Ahmed, Lise Jamieson, Collin Mangenah, Katleho Matsimela, Lawrence Mwenge, Linda Sande, Helen Ayles, Elizabeth L. Corbett, Frances Cowan, Karin Hatzold, Cheryl Johnson, Leigh Johnson, Jason J Ong, Andrew Phillips, Fern Terris-Prestholt, Gesine Meyer-Rath

Introduction: Remarkable progress has been achieved towards HIV elimination goals, with 81% of people living with HIV(PLHIV) in 2019 aware of their status worldwide. Although the cost-effectiveness of HIV testing has decreased due to fewer undiagnosed PLHIV remaining in the population. SARS-CoV-2 has increased costs and stressed global finances, making choices regarding which HIV testing modalities to scale-up or scale-down urgent. HIV self-testing(HIVST) provides an attractive alternative to standard facility testing that is private, convenient, and minimises direct health worker contact. Costs, however, vary substantially by distribution model. Here, we compare cost-effectiveness analyses conducted under the STAR Initiative, covering several countries and distribution modalities.

Methods: Three independent groups, using mathematical models parameterised with STAR data were involved. Two used transmission models (Thembisa[T],Synthesis[S]) and one used a Markov microsimulation model[M]; two modelled specific countries (South Africa[T], Zambia[M]) while the third(S) simulated a range of HIV epidemics in Southern Africa. The HIVST distribution models considered were: community models(S,T,M); facility models(T); secondary-distribution(T,S) and workplace models(T). M and S evaluated the cost-effectiveness of introducing HIVST for one year(M) or for the next 50 years(S), while T evaluated distributing a target of 6 million HIVST (achieved by 2030) using one single distribution-channel rather than a combination over 20 years. Incremental or, for stand-alone models, full economic cost was estimated from the provider perspective. Model projections including treatment costs were run over 20(T,M) or 50(S) years, with cost-effectiveness evaluated in terms of cost per DALY-averted(S,M), cost per life-year saved(T), and cost per HIV infection averted(T) and using a cost-effectiveness threshold of US$500(S) and US$1,430(Zambia GDP-per-capita; M) per DALY-averted. Both costs and outcomes are presented undiscounted(T) and discounted at 3%(T,S).

Results

HIVST interventions reaching high risk or underserved populations tend to be highly cost-effective (ranging from cost-saving to US$345/DALY-averted). However, focusing on targeted interventions to very high-risk populations only is unlikely on its own to lead to HIV elimination, as their health benefit is relatively limited. In Zambia (prevalence of undiagnosed HIV[PUHIV]:3.4%) door-to-door HIVST was found to be cost-effective (ICER below US$200/DALY-averted). In South Africa (PUHIV:0.9%), distributing HIVST in taxi ranks and through workplaces was cost-saving, while primary-distribution in PHC clinics and secondary-distribution to the partners of antenatal clinic (ANC) attendees was dominated, regardless of outcome metric. S found that community-distribution to women having transactional sex was cost-effective (less than US$500/DALY-averted) in the context of the PUHIV being between 0.3% and 7.4% [all countries in the region], while targeting adult men was cost-effective only if the programme was limited to five years or the PUHIV was above 3% and impact was enhanced with linkage to voluntary medical male circumcision. Similarly to T, S found that secondary-distribution to partners of ANC attendees was only borderline cost-effective(US$522/DALY-averted), while secondary-distribution to partners of FSW offered value for money(US$345/DALY-averted).

Conclusions: There are HIVST distribution models that are cost-effective. The main factors influencing cost-effectiveness are: prevalence of undiagnosed HIV, size and risk of HIV in the sub-population receiving HIVST, linkage to treatment or prevention following the HIVST, and costs of HIVST distribution.

11:30 AM–12:30 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Development, Harmonization and Validation of Standardized Generic Multi-Sectoral Resource-Use Measurement Instrument: The PECUNIA Project

SESSION CHAIR: **Silvia Evers**, Maastricht University

ORGANIZER: **Irina Pokhilenko**, Maastricht University

DISCUSSANT: **Dyfrig Hughes**, Centre for Health Economics and Medicines Evaluation (CHEME), Bangor University

Development and Harmonization of a Resource-Use Measurement Instrument for the Assessment of Health-Related Multi-Sectoral Resource-Use in Europe: PECUNIA Project

PRESENTER: **Irina Pokhilenko**, Maastricht University

AUTHORS: Luca Janssen, Aggie T. G. Paulus, Ruben Drost, William Hollingworth, Joanna Thorn, Sian Noble, Judit Simon, Dr. Claudia Fischer, Susanne Mayer, Luis Salvador-Carulla, Dr. Alexander Konnopka, Leona Hakkaart-van Roijen, Dr. Valentin Brodszky, A-La Park

Objectives. Measuring true resource-use quantities is important for generating valid cost estimates in economic evaluations. Due to the absence of acknowledged guidelines, measurement method is often chosen based on practicality rather than methodological evidence. Furthermore, few instruments focus on the measurement of broader resource-use and their development process is rarely described. This study describes the development process of a resource-use measurement (RUM) instrument developed within the PECUNIA project.

Methods. For the development and harmonization of the PECUNIA RUM, the methodological approach was based on best practice guidelines. The process was included five steps starting with the definition of the instrument attributes. Methodological literature was reviewed to develop a harmonised approach. The main cost driving elements in each sector were identified and matched with questions based on the existing instruments where possible. Questionnaire modules with questions in each sector were combined and harmonised concerning format and wording.

Results. The PECUNIA RUM instrument comprises eight modules: residential care, health and social care, medication, unpaid help, education, employment and productivity, (criminal) justice, and other expenses. The setup of each module and the routing are intended to reduce respondent fatigue by allowing the respondents to skip irrelevant questions or modules.

Discussion. The PECUNIA RUM instrument can be used with the compatible PECUNIA valuation tools for producing comparable cost data in economic evaluations across different settings. This is the first study that transparently describes the development process of a generic multi-sectoral RUM instrument and it can provide guidance for researchers who undertake RUM instrument development.

The Self-Reported PECUNIA Resource Use Measurement Instrument Module for the Health and Social Care Sectors: Item Development and Questionnaire Structure

PRESENTER: **Dr. Claudia Fischer**

AUTHORS: Michael Berger, Susanne Mayer, Dr. Alexander Konnopka, Dr. Valentin Brodszky, Irina Pokhilenko, Leona Hakkaart-van Roijen, Luis Salvador-Carulla, A-La Park, Joanna Thorn, Judit Simon

BACKGROUND: Economic evaluations for evidence-based decision making depend crucially on the availability of valid and comparable resource utilization measures. In absence of an established methodological framework, different resource use measurement (RUM) instruments apply variety of methods leading to incomparable cost estimates. Intransparency regarding the methods applied further aggravates this problem.

Therefore, one objective of the ProgrammE in Costing, resource use measurement and outcome valuation for Use in multi-sectoral National and International health economic evaluAtions (PECUNIA) (funded by EU H2020 GA No 779292) is to develop a modular, internationally standardised and validated, generic, self-reported RUM instrument consistent with a harmonised costing concept and unit costing approach. This paper presents the development process of the PECUNIA RUM instrument module for the health and social care services, describing selected service items, questionnaire structure and methodological foundation.

METHODS: In course of step 'Identification' a comprehensive list of international health and social care service items was identified and prioritized in six European countries. These service items were linked to the Description and evaluation of services and directories in Europe Pecunia (DESDE-Pecunia) coding system in course of step `Description´. The development process of the RUM module was guided and harmonized by step 'Measurement' and linked with the PECUNIA unit costing tools and reference unit costs developed in step 'Valuation'. Consequently, the first draft of the health and social care PECUNIA RUM instrument module has undergone several validation activities, including a first external validation with a health economic expert focus group, a wording review, professional language editing and initial translations, while piloting with end users (service users and carers) and professional translatability assessment are ongoing.

RESULTS: The health and social care module covers services in multiple domains such as residential/inpatient care, day care and vocational services. The measurement unit for resource use in all domains was defined as per the PECUNIA harmonised costing concept using contacts with a service or times a service was used with the exception of the residential/inpatient sector (nights), and the day care sector (days). The standard recall period was set at three months. All service items listed were linked to prototype DESDE PECUNIA codes. This will facilitate valid comparisons and costing of the listed items across countries based on service content rather than linguistic equivalence. Next to this basic version of the health and social care PECUNIA RUM instrument module, also more extended versions were developed allowing to collect additional levels of information including length of a contact and service funding.

DISCUSSION: Following several harmonisation steps with the other modules, piloting in several countries are ongoing. Based on these, a comprehensive multi-sectoral, multi-national harmonized PECUNIA RUM instrument will be finalized, covering not only the health and social care sectors, but also the education and (criminal) justice sectors, productivity losses, as well as patient and family costs and informal care. The PECUNIA RUM instrument is developed with a strong focus on the methodology for the appropriate measurement of resource use data, presenting a methodological evidence-based tool for future national and multi-national economic evaluations.

Think-Aloud Interviews in Health-Related Resource-Use Research: Application in the PECUNIA Project

PRESENTER: **Joanna Thorn**, University of Bristol

AUTHORS: Luca Janssen, Ruben Drost, Aggie T. G. Paulus, William Hollingworth, Sian Noble, Judit Simon, Susanne Mayer, Michael Berger, Irina Pokhilenko, Silvia Evers

Objectives: Individuals may encounter various problems when completing resource-use measurement (RUM) instruments for health economics research purposes. Such problems can entail, for example, understanding the questions or recalling information and can compromise the validity of the responses. These problems are often overlooked during the development stage of RUM instruments, yet they can be mitigated if respondents are involved in the development process. One way to incorporate their perspective is by employing qualitative methods such as the think-aloud (TA) approach. TA methodology is a qualitative research method based on individuals verbalizing their thoughts when completing a task. This method allows researchers to gain insight into the thinking processes and experiences of the respondents when completing a RUM instrument. Nevertheless, the application of qualitative methods in RUM-related research is limited and little methodological guidance on the use of these methods is available. Transparent publication of qualitative research protocols can contribute to reducing this knowledge gap. Therefore, this study describes the protocol for employing TA interviews in the development process of the PECUNIA RUM instrument with the aim of gaining insight into the cognitive processes and experiences of the potential respondents while completing the instrument.

Methods: The protocol for conducting TA interviews was iteratively developed by a multi-national working group of health economists from the PECUNIA consortium. Additional expertise was sought from the literature on qualitative research methods and by consulting persons with experience in qualitative research. The protocol serves to harmonize the TA interviews in four countries (Germany, Netherlands, Austria, and the United Kingdom) by describing a uniform approach. The protocol describes the steps in chronological order including a description of the events before (translation, recruitment, training), during (setting, opening, completing the instrument, open ended questions, closing), and after the interview (transcription, data analysis).

Discussion: As qualitative methods have not been widely used in RUM-related research, this study adds value by increasing transparency in applied qualitative research in the field of health economics. This protocol was developed within the PECUNIA project and aims to harmonize multi-national TA interviews for pilot testing of the PECUNIA RUM instrument. This protocol can also serve as a guide for researchers who want to conduct TA studies in the field of health economics.

Results of the Qualitative Validation of the PECUNIA Resource-Use Measurement Instrument with Potential Respondents

PRESENTER: **Luca Janssen**, Maastricht University

AUTHORS: Joanna Thorn, Ruben Drost, Aggie T. G. Paulus, William Hollingworth, Sian Noble, Judit Simon, Susanne Mayer, Michael Berger, Kimberley Hubens, Leona Hakkaart-van Roijen, Louisa-Kristin Muntendorf, Dr. Alexander Konnopka, Dr. Valentin Brodszky, Luis Salvador-Carulla, A-La Park, Irina Pokhilenko

Objectives. Self-reported resource-use measurement (RUM) instruments are often subject to various limitations such as inclusion of unvalidated questions or alack of transparency regarding the development process of the instruments. Literature suggests that inclusion of stakeholders (e.g. potential respondents) in the development process of such instruments can help mitigate these limitations. It is often assumed that self-reported resource-use allows accurate estimates to be obtained, while, in fact, there is limited insight into the cognitive processes that individuals go through from reading the question to writing down their recalled resource-use. Such knowledge could help in the development of RUM instruments that are better tailored to potential respondents by enhancing their understandability. Encouraging individuals to verbalize their thoughts when completing RUM questions can help gain insight into these processes. In this study, we aimed to gain insight into the cognitive processes and experiences of individuals when completing the PECUNIA RUM instrument by employing think-aloud (TA) interviews.

Methods. TA interviews were executed in four countries (Austria, Germany, The Netherlands, and The United Kingdom) with former mental health care users and current informal caregivers. Participants were asked to verbalize their thoughts while completing the PECUNIA RUM instrument with a researcher present. Afterwards, twenty minutes were dedicated to a semi-structured interview in which the participants were asked to reflect on the experience of completing the questionnaire such as perceived difficulty of the questionnaire, difficulties with recall, and how they felt while filling in the questionnaire. The interview transcripts were analysed using the survey response process model of Tourangeau and a phenomenology approach. Transcripts were analysed by creating open, axial, and selective codes. Findings were discussed with the PECUNIA consortium to formulate concrete recommendations for optimizing the RUM instrument.

Results. The minimum amount of five participants per country was obtained. Health literacy differed among respondents and affected their ability to understand what resource-use was required. Respondents did not find it objectionable to be asked about their resource-use and they were eager to report it to the best of their knowledge, even for the more stigmatized resource-use categories, such as mental health care use or involvement in criminal activities. Respondents were sometimes aware that they were not able to precisely recall their resource-use; this then resulted in "well-educated guesses" or in writing down answers other than the ones provided as answer options. Questions that required a high level of detail were perceived as particularly difficult. Some individuals reported that being unable to understand a caused distress.

Discussion. This study gives insight into the experiences of respondents when completing the PECUNIA RUM instrument. The findings highlight the difficulties that respondents may encounter while completing a RUM instrument which should be taken into account during the development of RUM instruments. These findings will also provide valuable input to optimize the PECUNIA RUM instrument.

11:30 AM –12:30 PM WEDNESDAY [Supply Of Health Services]

HEALTH WORKFORCE SIG SESSION: Health Workforce Motivation, Earnings and Quality of Worklife

MODERATOR: **Ian Weijie Li**, The University of Western Australia

Intrinsic or Extrinsic Characteristics? What Motivate Australian Pharmacists to Work? Evidence from a Discrete Choice Experiment

PRESENTER: **Thao Thai**

AUTHORS: Gang Chen, Emily Lancsar, Jean Spinks, Sonja de New

Background: Increasing the contribution of pharmacists to public health has been long discussed, mainly around the potential deployment of their clinical skills and knowledge to optimise medication. As Quality Use of Medicine becomes one of national priority in Australia, intensive policy discussions have been focusing on role expansions of community pharmacists.

Objectives: To facilitate evidence-based policy reform, this study examines the strength of the employment preferences of Australian pharmacy degree holders using a discrete choice experiment (DCE). Additionally, we harness this case study to provide a comparison between forced and unforced choices in the context of a dual response DCE to better understand the external validity of the DCE method.

Methods: A labelled DCE was developed incorporating the six main sectors of employment for pharmacy degree holders: hospital pharmacy, community pharmacy, primary healthcare setting, pharmaceutical industry, government/academia, and non-pharmacy related sector. Each alternative is described by five attributes: role, flexible work schedule, career opportunities, geographic location, and annual salary. The DCE was embedded in the PAMELA (Pharmacy in Australia: Measuring Employment, Labour decisions, and Activity) survey. We used conditional logit models to elicit preferences from both forced and unforced choice sets.

Results: Based on a sample of 824 PDHs, we provide evidence that hospital pharmacy was generally preferred to non-pharmacy related sector and community pharmacy while pharmaceutical industry is the least preferred sector. Intrinsic characteristics have significant impact of the employment choices of Australian PDHs in which intellectual roles and recognition for work in the forms of promotion and/or specialisation opportunities were highly regarded. In terms of extrinsic characteristics, our results show that salary is the most important factor across all alternatives, followed by geographic location. We found that employment choices are independent from household income but strongly influenced by choice inertia. While the direction of attributes' influence on the employment choices are consistent in forced and unforced choice sets, welfare measures for some attributes are significantly different.

Conclusion: This is the first study to provide a comprehensive picture of what pharmacy degree holders value when making choices between various employment options in the labour market. We suggested utilizing the role expansion reform to mitigate the workforce shortages in rural and remote areas.

Microeconomic Institutions and Labour Economics for Health Service Delivery: Exploring Quality of Worklife and Motivation of Nurses in Private Hospitals in Enugu State, Nigeria.

PRESENTER: **Daniel Ogbuabor**, University of Nigeria

AUTHOR: Nwanneka Ghasi

Background: Despite improved quality of worklife being essential to recruit and retain nurses, relatively little is empirically known about quality of worklife among nurses in private hospitals in sub-Saharan Africa. We evaluated nurses' worklife experiences to understand factors influencing their quality of worklife and explore the link between quality of worklife and motivation of nurses in Nigerian private hospitals.

Methods: This study was conducted in Enugu metropolis, Enugu State, Nigeria. Eight private hospitals (four private-for-profit and faith-based hospitals respectively) were purposively selected because of their noted ability to recruit and retain registered nurses into an environment, which is normally beset with problems of attrition. A qualitative, exploratory design was adopted guided by a quality of worklife framework and interpretive paradigm. Eight focus group discussions were held with registered nurses (n = 66), who were purposively chosen based on inclusive criteria for the study. Focus discussion guide was used to facilitate the focus group discussions held in English and at locations that were convenient to nurses with their written, informed consent. Data were analysed using a thematic approach, verbatim transcriptions of focus group discussions and NVivo 11 software.

Results: Nurses understood quality of worklife from four main perspectives: work-family life, work design, work context and work relevance. Opportunity for nursing skill acquisition, resource availability, planned preventive maintenance of equipment, cordial interaction and co-operation with nursing colleagues, uninterrupted supply of public utilities, and hygienic work environment contributed to good nurses' quality of worklife and hospital's ability to motivate and retain qualified nurses. Work-family life factors comprising unmet family needs, night shifts, working long hours, burnout, and inappropriate leave policies; work design factors including declining autonomy, inadequate staffing, and high workload; work context consisting of lack of participation in decision-making, blaming nurses for gaps, restrictive training policy, limited opportunity for continuing professional education, and insecurity; and work relevance related to poor remuneration, poor community view of nursing and ease of job termination undermined quality of worklife and demotivated nurses. Strategies identified by nurses to improve their quality of work life include improving staffing, revising policy on vacation, adherence to personnel policies, introduction of annual appraisal, recognition by management, promotion, sponsorship to conferences and workshop, and timely hand-over of shifts. Special emphasis was placed on improvement in salaries.

Conclusion: This study provides rich insights into the context of human capital management and underscores a need to institute quality of worklife improvement programme in private hospitals. To improve hospital efficiency, quality of worklife must be mainstreamed into personnel policies and plans of private hospitals and monitored.

The Impact of the Change in Nurses' Entry-Level Education Requirements on Wages: Evidence from Canada

PRESENTER: **Lady Bolongaita**, University of Toronto

AUTHORS: Jasmin Kantarevic, Raisa Deber, Dr. Andrea Baumann, Audrey Laporte

Many countries have introduced enhanced entry to practice (ETP) requirements for nurses to practice in the profession. By 2010, most Canadian provinces had changed their minimum ETP requirement for Registered Nurses (RNs) from a diploma to a baccalaureate degree in nursing. This change gradually increased the supply of baccalaureate RNs relative to the number of diploma RNs. The impact of such a policy-induced shift in the relative supply of RNs on their wage structure is still not well understood. In this paper, we study whether the change in RNs' ETP requirement had an impact on the aggregate and relative wages of nurses and whether this impact varied between new and experienced nurses. We also study the change in the wage structure of closely related Licensed Practical Nurses (LPNs) induced by the change in RN's ETP requirement as well as the change in LPN's ETP requirement (from a certificate to a diploma).

The data comes from the Survey of Labour and Income Dynamics (SLID), a longitudinal survey that contains rich information regarding respondents' socio-demographic information, labour force activity and financial status over time. Our sample consists of 4,283 nurses (RN=3,397, LPN=886) from 1996 to 2010. Nurses' wages is modelled using a two-step estimation strategy. In the first step, nurses' labour force participation (working as a nurse, working in another occupation, not working) is modeled using a panel multinomial logistic regression. The predicted probabilities are then included as explanatory variables in the second stage that models nurses' wage using a difference-in-difference framework that exploits the differential timing of changes to ETPs across Canadian provinces.

We find that the change in RNs' ETP requirement had a positive impact on the RNs' aggregate wage in some but not all Canadian provinces, but no impact on the wage differential between diploma and baccalaureate RNs nor between new and experienced RNs. We also find that this change had a negative impact on the aggregate wage of LPNs who were not targeted by this policy change. On the other hand, we find no impact of the

change in LPN ETP requirement on the wages of either RNs or LPNs. Our findings have policy implications for other jurisdictions considering changes to their entry to practice requirements for nurses.

11:30 AM –12:30 PM WEDNESDAY [Supply Of Health Services]

Economics of Pharmaceuticals and Medical Devices

MODERATOR: **Izabela Jelovac**, GATE UMR CNRS 5824

The Role of Spillover Effects in the Uptake of Medical Guidelines: A Hospital-Level Spatial Analysis on the Diffusion of Drug-Eluting Stents in Germany and Italy

PRESENTER: **Meilin Möllenkamp**, Hamburg Center for Health Economics, University of Hamburg
AUTHORS: Benedetta Pongiglione, Stefan Rabbe, Aleksandra Torbica, Jonas Schreyögg

Objective

Medical guidelines aim to promote patient health and control of healthcare costs by setting evidence-based standards of care, thereby simplifying medical decision-making and addressing variations in medical practice. Nevertheless, both the overall adoption rate as well as the time lag in the adoption of a new guideline often vary considerably between hospitals.

This study builds on the existing literature by exploring spatial dependencies and other influencing factors in the adoption of drug-eluting stents (DES) in Germany and Italy, two of the largest medical device markets in Europe. We specifically investigate spillover effects in 2012-2016, after the European Society of Cardiology issued a medical guideline (Class IIa, Level A) generally recommending the use of DES.

Methods

We base our analysis on administrative data of patients with ST-elevation myocardial infarction (STEMI), who were admitted to a hospital in 2012-2016. Our dependent variable is the use of DES to total stents in patients with a STEMI diagnosis. In addition, we control for relevant hospital and regional factors.

First, we test for the presence of spatial autocorrelation in the outcome variable using the global Moran's I test. Subsequently, we estimate spatial panel models allowing for global spillover effects. The relative contribution of geographic proximity between a hospital and its peers is examined by applying a spatial weight matrix based on the inverse distances between neighboring hospitals.

Results

We find significant positive spatial autocorrelation between neighboring hospitals in Germany and Italy in most years of our observation period based on the global Moran's I test. Furthermore, the spatial lag parameter is significant and positive across different model specifications and weight matrices. In other words, for the case of DES, we find that a given hospital responds to the DES use of its peers in both countries.

Beyond that, we find that the average number of comorbidities of patients treated in a given hospital to be negatively associated with the use of DES in Germany. In Italy, we find that the density of general practioners is positively associated with the use of DES.

Discussion

Our results suggest the existence of spillover effects between neighboring hospitals for the case of DES in Germany and Italy in the years 2012-2016.

Our key finding is that spillover effects between peers remain to play an important role for DES utilization in the context of a medical guideline and in view of scientific evidence recommending their use. This may imply that the adoption of medical technologies is not influenced solely by the existence of medical guidelines or the scientific discourse. Furthermore, it indicates that guidelines cannot replace the informal communication channels or the importance of observational learning between peers.

Pricing of New Pharmaceuticals: Impact of Inflation Constraints in India

PRESENTER: **Vasudha Wattal**, University of East Anglia

As close to 80% of its population remains without any health expenditure support, pharmaceutical price regulation in India has a broader aim of ensuring affordable access to medicines. A new regulation (Drug Price Control Order), announced in 2013, sought to contain annual price increases for all generic pharmaceuticals. However, this new `inflation cap' regulation is likely to increase launch prices of new non-patented pharmaceuticals.

In the first part of this paper, we consider a simple two period sequential entry game, and build upon the impact of an inflation cap that the originator faces in the second period. We show that in response to the regulation, the originator increases their launch price, in order to secure a higher second period price. Next, using retail level data on new molecules launched between 2007-16 in India, we empirically test the impact of inflation caps. The initial empirical results reveal that launch prices are significantly higher after the regulation is announced. According to our model predictions, we expect the competitor in the second period to price below the originator's launch price, however, we do not find significant results for this. This could account for the fact that the competitor may not enter immediately after and therefore, might benchmark to the originator's price in the period preceding its entry.

This study contributes to the literature on dynamic pricing in the presence of price regulation. Given our assumptions on the distribution of consumer risk aversion to switching brands, it appears that inflationary caps might prove counter-intuitive as they reduce consumer welfare.

Competition in Off-Patent Biologic Drug Markets: A European Comparison of Competition Induced Price Trends and Market Diffusion

PRESENTER: **Anna-Katharina Boehm**, Hamburg Center for Health Economics
AUTHORS: Ms. Isa Maria Steiner, Tom Stargardt

Background

During the last decades, the first expensive biopharmaceuticals began to lose their patent protection, offering biosimilars the possibility to enter the market. However, in contrast to generics, biosimilars are no exact copies of the innovator, and substitution policies are more conservative. Therefore it is unclear if and to what degree biosimilars take on the role of generics in reducing pharmaceutical costs. It is the aim of this study to analyze the effect of biosimilar competition on market diffusion and prices among European countries.

Methods

We used quarterly data from IQVIA on revenues and units sold of all biologics in 25 European countries from 2014 until 2020. The data set covers the pharmaceutical retail as well as the hospital market. Both markets were examined separately and the analysis was conducted on substance level. Prices of biosimilars and innovators as well as average market prices were calculated relative to the 1 year average brand-name prices before biosimilar entry. To evaluate the effect of biosimilar competition on market outcomes, we estimated mixed generalized linear models (GLM) including substance and country fixed-effects. To measure competition, we controlled for time since first biosimilar entry and the number of competitors. The Hausmann test was used to assess the appropriateness of the fixed-effects estimators.

Results

Within our study period, up to 12 substances experienced first biosimilar competition in our 25 countries, resulting in 1401 observations in the pharmaceutical retail market and 1354 observations in the hospital market. On average, biosimilars enter the market at 78% and 76% of the price of the brand-name biological in the hospital market and in the retail market, respectively. The innovators decrease their prices by on average 6% in the hospital market and 5% in the retail market as biosimilars penetrate the market, which indicates the absence of a "'generic' paradox" for biologicals. Preliminary regression analyses reveal that the time since first biosimilar entry and the number of competitors are significant drivers of the decrease substance prices over time in the hospital ($p<0.01$) and in the retail market ($p<0.01$) as well as for the diffusion of biosimilars in both markets. Highest market share of biosimilars across countries in the hospital sector after four years was 90% (Austria, Infliximab) whereas lowest was 7% (Finland, Insulin glargine).

Conclusion

Results indicate that the market penetration of biosimilars in Europe increases over time while prices decrease. However, compared to existing literature on generics, the effects are (much) smaller.

11:30 AM–12:30 PM WEDNESDAY [Health Care Financing And Expenditures]

FINANCING FOR UNIVERSAL HEALTH COVERAGE SIG SESSION: Financial Protection and Universal Health Coverage in the Context of Demographic and Epidemiological Transition

MODERATOR: **John Ataguba**, University of Cape Town

Effect of Chronic Diseases on Catastrophic Health Expenditure on Kenyan Households

PRESENTER: **Vivian Nyansarora Nyakangi**, APHRC

Background: One of fundamental goals of universal health coverage (UHC) is to protect households from financial risk as a result of seeking healthcare. Out-of-pocket health expenses create barriers to healthcare utilization and expose households to potential financial catastrophe. While it has been consistently shown that households with chronically ill members face higher financial risks, there is a dearth of information on the variation of catastrophic health spending across the different types of chronic illnesses in Kenya and sub-Saharan Africa as a whole. Studies from other contexts have shown the incidence of catastrophic spending may vary across the different types of chronic illnesses due to differences in severity and associated treatment costs of the different chronic diseases.

Objective: The aim of this study was i) to compare catastrophic spending in households with and without chronic illnesses and across the different types of chronic diseases ii) to determine the effect of each chronic illness on catastrophic health expenditure in Kenyan households.

Methods: We used data from Kenya Household Healthcare Expenditure and Utilization Survey (KHHEUS) 2018. The survey was administered to a total of 31,655 households comprising of 141,132 individuals. Overall, 37.8% (11,978) of households and 13.8% (19,534) of individuals reported to suffer from at least one chronic disease. The study estimated the incidence of catastrophic health expenditure in households with and without chronic illnesses and across the different types of chronic illnesses. Catastrophic health expenditures were estimated using the WHO methodology where a household whose out-of-pocket expenses for health were more than 40 percent of total expenditure on non-food items was deemed catastrophic. The effect of each chronic disease on catastrophic health expenditure (CHE) was assessed using logistic regression.

Results: The overall CHE incidence was estimated to be 7.96%. The incidence was higher amongst households with chronically ill members (10.12%) as compared to those without (5.89%). The incidence of CHE was highest for households with cancer at 22.72%, followed by TB 15.19%, diabetes 14.86%, hypertension 12.21%, other cardiac diseases 11.03%, mental disorders 9.68%, asthma 9.12%, other chronic respiratory diseases 9%, and HIV/AIDS 8.26%. Cancer increased the likelihood of a household incurring CHE by 7.6%, diabetes 3.5%, TB 3.4%, hypertension 1.9%, and other cardiac diseases by 0.9%. Overall, having a chronically ill member increases the likelihood of a household incurring CHE by 2.2%. Asthma, other respiratory diseases HIV/AIDs and mental disorders did not have a significant effect on the likelihood of a household incurring CHE.

Conclusion: Chronic illnesses expose households to the negative effects of out-of-pocket health spending such as catastrophic health expenditure, which limits spending on other basic necessities. There is a need for greater financial protection of households with chronically ill members to not only cushion them from out-of-pocket but also help them access much needed healthcare on an ongoing basis without forgoing other basic needs.

Financial Protection in Health Among the Elderly: A Global Stocktake

PRESENTER: **Patrick Eozenou**, The World Bank

AUTHORS: Sven Neelsen, Marc Francois Smitz

Universal Health Coverage is one of the key targets of the Sustainable Development Goals and it implies that everyone can access the healthcare they need without suffering financial hardship. In this paper, we use a large set of household surveys to examine if older populations are facing different degrees of financial hardship compared to younger populations. Our analysis is novel in at least two regards. Firstly, it provides the first between-country estimates of the relationship of population aging with catastrophic and impoverishing out-of-pocket medical expenditures using a panel of 118 countries which represents 86% of the world population. Secondly, it presents a massive and, to the best of our knowledge, the first systematic multi-country analysis of the relationship between the share of elderly household members and financial protection within countries, including an investigation of wealth gradients in the excess financial risk faced by households with a high elderly share. The analytical sample for this analysis includes over 9.6 million household-level observations from 519 surveys collected over the 1991-2018 period in 133 countries representing 89% of the world population. We find that while differences in average age structures between countries are not systematically associated with higher financial risk related to out-of-pocket health expenditures, there are large differences in financial hardship between younger and older households within countries. Households with more elderly members are more likely to face catastrophic and impoverishing out-of-pocket health payments compared to younger households, and this age gradient is stronger for the poorest segments of the population. Making progress towards Universal Health Coverage will require extension and improved targeting of benefit packages and financial protection to meet the health needs of older adults, and especially the poorest and most vulnerable segments of elderly populations.

Assessing the Trends in Non-Communicable Diseases Among Brazil, Russian Federation, India, China and South African Nations: An Investigation of the Risk Factors and Healthcare Financing

PRESENTER: **Dr. Sridevi Palli**, ICMR-National Institute of Nutrition

AUTHORS: Naveen Kumar Boiroju, Khadar Babu Ch

Background: Globally, 41 million people (71%) die annually from non-communicable diseases (NCDs), which includes 15 million young people in the productive age group of 30-70 yrs. 86% of the burden of these premature deaths are from low- and middle-income countries, leading to economic losses of nearly US$7 trillion over the next 15 years and engendering millions of people into poverty. NCDs represent a huge disease burden and have a substantial impact on individuals, communities, and societies around the globe. In this background, the main aim of this study is to assess the trends in non-communicable diseases among BRICS nations and investigate the impact of health financing on the NCD mortality rate. The main types of NCDs are cardiovascular diseases, cancers, chronic respiratory diseases and diabetes, accounting for over 80% of all premature NCD deaths. The main risk factors for NCDs are tobacco use, physical inactivity, harmful use of alcohol and unhealthy diets.

Methods: This study is based on secondary data from World Health Organization (WHO). The data for all the BRICS nations was obtained from the health repository of WHO for the period of study from 2000 to 2016. This study analyses the trends in deaths due to NCDs across the BRICS nations. Growth rates were estimated to assess the trends in NCD deaths during the period of study. To estimate the association between NCD deaths and the period of study, linear regression was modelled. To underscore the importance of health financing on health outcomes, the association between current health expenditure and NCD mortality rate was modelled through linear regression analysis.

Results: The growth rate estimates reveal that deaths due to NCDs were increasing across these countries except in Russia, where the number of deaths was declining during 2000 to 2016. The trend analysis reveals that cancer is the disease contributing to majority of NCD deaths in Brazil, while in China, India and South Africa cardiovascular diseases were majorly contributing to NCD deaths, and COPD (respiratory diseases) is majorly contributing to NCD deaths in Russia. Deaths due to NCDs were increasing by 13.58 thousand per annum, 154 thousand, 108 thousand, 5.12 thousand per annum in Brazil, china, India and South Africa respectively, while in Russia NCDs declined by 16.14 thousand per annum during the period. On the other hand, the risk factors for NCDs, which are, per capita alcohol consumption is the highest in Russia and lowest in India, while physical inactivity is the highest in Brazil and lowest in China followed by Russia. Tobacco consumption is the highest in China and lowest in India during the year 2016. Further regression estimates between current health expenditure (CHE) per capita and NCD mortality rate reveals that for every 1US$ increase in CHE per capita, NCD mortality rate declined by 0.32, 0.27, 1.68, 0.49, and 0.12 per 100,000 population in Brazil, China, India, Russian Federation and South Africa respectively. Thus, this study emphasizes the need for investing in strategies to avert deaths due to NCDs and reduce the losses to the economies.

Health Financing Under Demographic and Epidemiologic Transitions: Modeling the Growing Cost of Claims for the Tanzanian National Health Insurance Fund

PRESENTER: **Brianna Osetinsky**, Swiss Tropical and Public Health Institute

AUTHORS: Günther Fink, Brady Hooley, Fabrizio Tediosi

Background: Current efforts to strengthen health systems and health financing in low- and middle-income countries must account for demographic and epidemiologic transitions, the related rise in non-communicable diseases, and the increasing cost of health technologies. While Tanzania is aiming to move towards a Single National Health Insurance, the current fragmented health insurance programs can provide insight to how these considerations can influence health financing needs. The National Health Insurance Fund (NHIF), the most comprehensive health insurance program in Tanzania, covers approximately 8% of the population, with mandatory enrollment and contributions for public employees, and some provision for private membership.

Methods: In this study, we used over 35 million claims for 3.2 million individuals from the 2016 NHIF data to quantify the cost by treatment condition. We attributed claims to broad treatment categories of cardio-metabolic NCDs, cancer, mental health and neurological disorders, communicable diseases, injury/surgery, dental work, maternal care and childbirth, and other. We calculated the cost per enrollee within five-year age groups, and across the broad treatment categories. We then predicted the costs for the NHIF from 2020-2050 using the projected population growth scenarios from the UN World Population Prospects for Tanzania under a conservative estimation reflecting the current enrollment coverage and additional scenarios of increasing enrollment rates.

Results: The total cost of claims for the NHIF are projected to increase 174% from 2020-2050 in the most conservative scenario of current enrollment coverage. This is partially attributable to population growth, but also is due to an increase in per person cost as the enrolled population ages. The cost per enrollee is projected to increase 14% over this time, driven primarily by increases in per-person claims costs for cardio-metabolic NCDs, which rise 28%. While communicable disease treatment for viral and bacterial infection continue to hold a large share of the total costs, the per-person cost increase is only 3%.

Conclusions: Even under the conservative growth scenario that restricts enrollment to current levels of the total Tanzanian population, the growing and aging population will result in a significant increase in financial burden. Projections of health financing needs for expanding health insurance coverage will therefore need to account for the demographic and epidemiological transitions in health and society.

11:30 AM –12:30 PM WEDNESDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: Covering New Ground in DCE Methodology

SESSION CHAIR: **Matthew Quaife**, London School of Hygiene & Tropical Medicine

DISCUSSANT: **Arne Hole**, The University of Sheffield

Coherent but Arbitrary: Understanding Ordering Effects in Health Preference Elicitation Tasks

PRESENTER: **Verity Watson**, University of Aberdeen

AUTHORS: Jonathan Sicsic, Patricia Norwood, Mandy Ryan

A criticism of stated preference research is that individuals who respond to hypothetical surveys are influenced by irrelevant cues or anchors in the framing of the task. As a consequence, responses may be arbitrary because they are influenced by the order of choice tasks. We provide evidence for the 'coherent arbitrariness' hypothesis (Ariely, Lowestein, Prelec, 2003). According to this theory, people develop coherent relative valuation of goods, but their absolute valuations (total Willingness to Pay (WTP)) are sensitive to irrelevant anchors. Much methodological research in the stated preference or health economics literature has focussed on tests of coherence with little attention on arbitrariness of preferences.

We present a novel within sample test of coherent arbitrariness in discrete choice experiment (DCE) responses. Data are from a study of preferences for the management of three different conditions of varying severity: diarrhoea, dizziness and chest pain. Whilst respondents all completed the same set of DCE tasks for each symptom, the order of symptoms varied across respondents.

Our study design allows us to test for coherent arbitrariness in respondents' preferences for symptom management in two outcomes: respondents' propensity to manage their symptoms (opt-in) rather than take no action (opt-out), and respondents' WTP for symptom management. Higher opt-in and higher WTP for symptom management in more severe conditions would provide evidence for coherence. Differences in opt-in or WTP for symptom management when the symptom is presented second or third compared to first would provide evidence for arbitrariness in stated preferences for health services.

We find that opt-in and WTP increases with symptom severity (respondents are 'coherent'). However, we find that the proportion of respondents choosing to manage a symptom (opt-in) depends on the symptom order. We find respondents are 21% more likely to choose to manage diarrhoea when it is presented after chest pain compared to when it is presented first (unframed). Similarly, respondents are less likely to choose to manage chest pain when presented after a less severe symptom. We also find that WTP depends on symptom ordering: WTP for symptom management is higher when evaluated after more severe symptoms and lower WTP when evaluated after less severe symptoms. Our results are consistent with the coherent arbitrariness hypothesis.

Why Do People Fail Dominance Tests?

PRESENTER: **Stuart Wright**, Manchester Centre for Health Economics

AUTHORS: Garima Dalal, Martin Eden, Katherine Payne

Introduction

A range of internal validity tests are used by researchers to check the quality of data collected in discrete choice experiments (DCEs). The most commonly used being dominance-check tests. A dominance-check test asks respondents to complete a choice question in which the levels of the attributes in one profile are *a priori* set to be inferior to those in the other profile. There is ongoing debate about whether to discard the data from respondents who fail the dominance-check test. This study aimed to explore what proportion of participants fail dominance tests because they have preferences that the researchers deem to be irrational as opposed to due to random error.

Methods

Data (2,327 respondents) from three DCEs (different health topics) containing dominance-check tests was used. These dominance-check tests varied in content and format of attributes (continuous quantitative; ordinal qualitative; non-ordinal qualitative). Random parameter logit models with correlated parameters were estimated using each dataset from the three DCEs. Individual utility functions were estimated for each participant using the method proposed by Revelt and Train (2000). The probability of each respondent failing the dominance test was calculated. The number of respondents expected to fail the dominance test was compared with the proportion expected to pass the test but who actually failed in practice.

Results

The proportion of respondents who failed the dominance-check test varied between the three DCEs (17.6%; 10.6%; 13.2%). Based on the estimated individual utility functions from collated data 16.4%, 1.1% and 3% (respectively) of respondents were predicted to fail the dominance-check test. Of the people who failed the dominance-check test, 45%, 1%, and 12% were deemed to be consistent with the expression of their "irrational" preferences. Of the respondents, expected to fail the tests due to their "irrational" preferences 51%, 92%, and 50% passed the dominance-check test in practice.

Conclusions

Most people who fail dominance tests in DCEs appear to do because their choices are random rather than because they have consistent "irrational" preferences. In addition, the majority of people with who would be expected to fail the dominance test due to their "irrational preferences" actually passed the tests. The results suggest that it is quite hard for participants to fail a "strong" dominance test (with many continuous or ordinal variables) because they would have to have "irrational" preferences for multiple attributes. The stronger the dominance test the more likely people are to fail because they have higher error variance and the more valid it may be to exclude these participants from the analysis. However, researchers should be more cautious about removing the data of participants who fail "weak" dominance tests with only a few continuous variables as it is feasible for participants to fail because they have consistent "irrational" preferences for one or two variables.

Accounting for Attribute Non-Attendance and Preference Heterogeneity in the Analysis of Discrete Choice Experiments: A Health Workforce Example from Ethiopia

PRESENTER: **Nikita Arora**, London School of Hygiene & Tropical Medicine

AUTHORS: Romain Crastes dit Sourd, Kara Hanson, Mylene Lagarde, Dorka Woldesenbet, Abiy Seifu Estafinos, Matthew Quaife

When measuring preferences, discrete choice experiments (DCEs) typically assume that respondents consider all available information before making decisions. However, many respondents often only consider a subset of the choice characteristics, a heuristic called attribute non-attendance (ANA). Failure to account for ANA can bias DCE results, potentially leading to flawed policy recommendations. While standard latent class models have previously been used in health economics to assess ANA in choices, these models may not be flexible enough to distinguish non-attendance from respondents' low valuation of certain attributes, generating inflated estimates of ANA. In this paper, we show that semi-parametric mixtures of latent class models can be used to disentangle successfully inferred non-attendance from low valuation for certain attributes. In a DCE study of the job preferences of health workers in Ethiopia, we demonstrate that such models provide more reliable estimates of inferred non-attendance than other alternative methods currently used. Moreover, since we find heterogeneity in the rates of ANA exhibited by different health worker cadres, we highlight the need for well-defined attributes in a DCE, to ensure that ANA does not result from a weak experimental design.

11:30 AM–12:30 PM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ORGANIZED SESSION: Causes and Consequences of Children's Health: Sleep, Intensive Care Units, and Family Well-Being

SESSION CHAIR: **Joaquim Vidiella-Martin**, University of Oxford

DISCUSSANT: **Fabrizio Mazzonna**, Universit&#65533; della Svizzera italiana; **Ana Costa-Ramón**, University of Zurich

The Career Costs of Children's Health Shocks

PRESENTER: **Ana Costa-Ramón**, University of Zurich

I provide novel evidence on the impact of a child's severe health shock on parental labor market outcomes. To identify the causal effect, I leverage long panels of high-quality Finnish administrative data and exploit variation in the exact timing of the health shock. Identification comes from comparisons of same-aged parents with same-aged children, whose children experienced the health shock at different ages. The results show that parental earnings suffer a substantial decline following their child adverse health event, and that the fall is persistent: five years after a child's severe hospitalization, maternal earnings have dropped by more than 7.5%, while father's earnings are 2.5% lower. Notably, the shock also impacts parents' mental well-being.

Sleep and Children's Health and Educational Outcomes

PRESENTER: **Ms. Lisa Vooi**s, Erasmus University

Background: Short sleep duration is linked to health problems and poorer cognitive performance in children. Studies consistently show that short childhood sleep is associated with short attention spans, depressive symptoms, obesity and even driving accidents in adolescents. It is important to establish the extent to which these correlations represent causal relationships, yet relatively few papers have attempted to do so. This is especially important considering that children are sleeping less and less. Early school start times and the increasing temptation of technology, such as social media and Netflix, make it difficult for children to get sufficient sleep. Reports show that more than two-thirds of US high school students sleep less than 8 hours – the minimum recommended amount – on school nights. In this paper, I investigate the impact of sleep duration on the health and long-run educational outcomes of middle and high school students in the US using exogenous variation in sleep duration.

Method and results: There are various potential explanations for why short sleep duration is linked to detrimental health and educational outcomes in children, besides a causal relationship. Short sleep duration itself could be a consequence of these outcomes, or unobserved determinants correlated to sleep duration can be responsible for the observed relationship. To overcome this and identify a potential causal link, I propose to use an instrumental variable (IV) – average yearly sunset time – to capture exogenous variation in sleep duration. To the best of my knowledge, this is the first paper to use an instrumental variable approach to analyse the causal effect of childhood sleep duration on health and long-run educational outcomes.

I use data from the Child Development Supplement (CDS) and the Transition into Adulthood Supplement (TAS) of the Panel Study of Income Dynamics (PSID) to analyse the impact of sleep for US adolescents aged 12-19. Due to the longitudinal nature of the data, I can follow the children from their middle and high school years to early adulthood. I will use the exogenous variation in sleep duration, driven by sunset time, to investigate whether sleep duration causally impacts adolescents' health and educational achievement. Preliminary results indicate that, although sunset time is a significant predictor of sleep duration, the instrument is weak. Nevertheless, the reduced from effects indicate that a delay in sunset time, which translates into less sleep, decreases the probability of graduating from high school and attending some college, and increases depressive symptoms, although these results are not very precisely estimated, in part due to the small sample size.

Discussion: The preliminary results show some suggestive evidence that sleep has a positive impact on the mental health and educational outcomes of US teenagers. However, the small sample size and the weak IV prevent me from saying anything conclusive about the causal effect. I have recently obtained access to additional data which I hope will solve these problems, and will also allow me to shed some light on children's behavioural responses to exogenous changes in sleep.

Too Young to Live? Lessons from Neonatal Intensive Care Units

PRESENTER: **Joaquim Vidiella-Martin**, University of Oxford

Active care management of extremely preterm infants is decided based on gestational age thresholds. In this paper, I exploit a discontinuity in the probability of receiving treatment to evaluate its effectiveness. I find that intensive treatment of extremely preterm infants increases survival rates by 44 percentage points after one year of life. Next, I leverage random ordering of patients within intensive care units to evaluate how medical outcomes in a high-stakes setting are shaped by the outcomes of previous patients. I show that exposing the unit to more vulnerable patients in the four weeks before a newborn comes in improves the health of such infant. To conclude, I show how these gains can be scaled up by centralising highly specialised care.

1:00 PM–2:00 PM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Impact of Early Life Events

MODERATOR: **Juan Carlos Caro**, University of Luxembourg

When the Lightning Strikes Twice: Long Run Effects of Early Life Famine and Subsequent War Exposure in Vietnam

PRESENTER: **Dr. Laura Viluma**, Rijksuniversiteit Groningen

Famines and malnutrition are not yet a concern of the past. New evidence shows a rise in world hunger in recent years after a long decline. Currently, about 11% of the people in the world are undernourished. On top of this, the Covid-19 pandemic is expected to exacerbate the situation in vulnerable regions. The mounting evidence from epidemiology and economics shows that early-life exposure to famine and malnutrition has long-run adverse effects on individual health and economic outcomes. In this context, it is conceivable that the impact of early-life conditions on later-life health depends on the interaction of the individual with the environment. This idea can be tested by examining the dynamic complementarities of two separate shocks.

In this paper, we jointly estimate the effects and interactions of two extreme shocks – early-life exposure to the great Vietnam famine (1945) and adult exposure to the US bombing of North Vietnam (1965–1975), on economic and health outcomes in late adulthood. For this we apply a "difference in differences in differences" approach, using the IPUMS Vietnam census data from 1989, 1999 and 2009. We combine this data with historical records on the flooding that caused the famine in 1945 and with records on the intensity of the bombing activities by the United States Air Force and Navy during 1965–1975 in Vietnam. Both exposure variables are measured at the province level.

Some methodological issues complicate the estimation of the long-run effects of famines. First, the individuals who are most affected by the famine do not survive until the moment of data collection and thus, are not observed in the data. As a result, famine effects are often underestimated. Our results demonstrate that the selection effects are strong. For example, those exposed prenatally to the famine have a narrower distribution of education, especially at the left tail of the distribution, suggesting that the most vulnerable individuals have not survived. Our paper demonstrates an innovative econometric approach to controlling for selection by exploiting the two separate exposures, based on the dynamic evolution of the composition of survivors as cohorts become older.

The second methodological issue is accounting for parental investment decisions when facing a famine. Even if the famine is an exogenous shock to the nutritional conditions, the individual responses can change the intensity of exposure. For instance, there is anecdotal evidence that pregnant women and children tend to be somewhat protected from the worst exposure by inter-household allocation of available food. In this paper, we demonstrate the importance of parental investment decisions by showing that the effects of in utero exposure (before the gender of the child is known) can be explained by biological gender differences, while the gender differences in the effects of the exposure in the first year of life (when the gender is known by parents) suggest gender-specific differences in parental investment.

In conclusion, more accurate estimates of long-term effects on famine survivors' human capital might help governments to rebalance the costs of famine prevention against other long-term policy goals.

Movin' on up? The Economics of ACEs in Terms of Healthcare Costs and Social Mobility

PRESENTER: **Huw Lloyd-Williams**

AUTHORS: Rhiannon Tudor Edwards, Mark Bellis, Rebecca Hill

Abstract

Just under 1 in 2 children in Wales are affected by adverse childhood experiences. ACEs are defined as one of ten possible experiences that affect children as they grow up, ranging from physical abuse to having a parent with mental illness. Much is known about ACEs and how they affect the lifetime health of individuals. Relatively little is known, however, about how ACEs affect lifetime costs and socioeconomic status and social mobility. This project is in two parts. The first part deals with testing a methodology for attributing lifetime health costs to the presence or absence of ACEs across seven main causes of premature mortality. This project proposes a novel approach to achieve this which can be broadly defined as performing an extrapolation of the data that *is* available or a pro-rata approach to estimate the missing data. The second part of the project addresses the issue of whether ACEs are associated with a degree of lifetime social mobility defined by wealth in adulthood compared with wealth in childhood. Both parts of the project employ systematic informed reviews of current evidence. In part 1, looking at attributable health costs, a PAF methodology is used. In part 2 social mobility is explored using the ACEs dataset (which is a large survey dataset conducted in Wales, England, Blackburn with Darwen and southern England between 2012 and 2015 (N=13,130) of the general public asking them to reflect on their ACEs). This project provides two novel findings. First that it was possible to find lifetime attributable costs for mental health, cancer and respiratory disease but not across the other four areas. This was because of a lack of information on ACE counts for the other four diseases. Secondly with respect to social mobility this project found a counter intuitive outcome where increasing ACEs is associated with an increased likelihood of upward social mobility. This may be because access to health and social care increases as ACE counts increased. Another explanation may be that people become upwardly mobile *despite* ACEs by having access to a trusted adult and developing resilience. The project also notes the presence of a trusted adult which is inversely related to the number of ACEs.

In terms of policy recommendations ACEs are almost completely explained by poverty and public policy should focus on maximising opportunity for social mobility. ACEs costs society in terms of direct health costs and indirect costs of lost productivity. Health and social support can help mitigate the effect of ACEs. Social programmes focused on trusted adults can also help mitigate the effects of ACEs.

How Do Childhood ADHD Symptoms Affect Labour Market Outcomes? Evidence from 46 Years of Data on 11,000 People in the British Cohort Study

PRESENTER: **Nasir Rajah**, University of Leeds

AUTHOR: Adam Martin

Background: Attention deficit hyperactivity disorder (ADHD) affects 2%-10% of children in the UK, EU and USA, and includes symptoms of inattentiveness, hyperactivity and impulsiveness. In many cases, ADHD continues into adulthood. Existing studies show ADHD is associated with poorer exam performance and increased likelihood of exclusion from school. However, little is known about the longer-term consequences, including how ADHD affects labour market outcomes during adulthood.

Data: The British Cohort Study (BCS) tracks 17,196 individuals born in April 1970, to the present period. Surveys are conducted every 4 years (11 surveys to date). The BCS is unique amongst panel datasets because childhood ADHD symptoms are recorded (n=11,295, 66%). Symptoms are reported at age 10 by a proxy-respondent (schoolteacher) using 9 questions; and the responses are converted to a continuous scale which ranges from 0 (no symptoms) to 231 (extreme symptoms) using recognised methods.

Method: First, concentration curves and indices are used to explore how socioeconomic status at birth, educational outcomes at 21 and earnings during adulthood are distributed across the range of ADHD symptoms. Second, we use a two-part mixed effects multilevel model; the first part examines the relationship between childhood ADHD symptoms on labour market participation (logit) and the second part examines log-transformed annual earnings (linear mixed effect) observed between ages 26 and 46. We also examine how this relationship varies by subgroups (i.e., by gender and employment type) and the role of childhood/family circumstances in explaining observed differences. Covariates include: higher education qualification; educational attainment in school, gender; ethnicity; geographic location; hours worked; parents' education.

Results: Socioeconomic status at birth and educational outcomes at 21 are more evenly distributed across the spectrum of ADHD-related symptoms than are earnings during adulthood. ADHD symptoms in childhood were also negatively associated with earnings and the likelihood of labour market participation during adulthood. Those in the top 90th percentile of ADHD symptoms in childhood have on average a 6% reduced probability of being in the labour market (ages 26 to 46) when compared to those in the bottom 90th percentile; and those in the top 90th percentile have on average a 14% reduction in earnings across a 20-year period. We find that these effects are consistent within this 20-year period, suggesting that the magnitude of the effect is reasonably constant over time. Sensitivity analyses included taking complete cases (i.e., those present throughout the dataset), imputing missing data, using alternative measures of educational attainment, and using categories based on severity of ADHD symptoms, rather than the binary (90th percentile) variable.

Conclusion: Ours is the first study to examine labour market consequences of ADHD symptoms and to analyse long-term effects of ADHD symptoms. We use a novel approach to capturing ADHD that focused on symptoms rather than a clinical diagnosis, which according to literature may be less reliable indicator of ADHD because of variation in diagnosis by geographic area and socioeconomic background. Our findings demonstrate the potential value of measures designed to support people with ADHD to realise their full potential in the labour market.

1:00 PM –2:00 PM WEDNESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: The Challenges of Modelling Health Care Expenditures

SESSION CHAIR: **Francesco Paolucci**, University of Newcastle

ORGANIZER: **Josefa Henriquez**, University of Newcastle

Improving Diagnoses-Based Cost Groups in the Dutch Risk Equalization Model: The Effects of a New Clustering Method and Allowing for Multi-Morbidity

PRESENTER: **Michel Oskam**, Erasmus School of Health Policy & Management

AUTHORS: Richard van Kleef, René van Vliet

Background: In order to enhance fairness and efficiency in social health insurance markets, regulators typically rely on premium-rate restrictions and risk equalization (RE). RE compensates insurers for predictable variation in health expenditure of consumers through a predefined set of risk adjusters (e.g. age, gender and health status). Despite notable gains in predictive strength that RE systems incrementally accumulated through expansion and refinement of the set of adjusters, groups of chronically ill individuals are undercompensated. The resulting risk selection incentives towards these groups threaten the functioning of the market, suggesting a need for further improvement of RE models.

Objective: This study examines the effects of a new method for compiling one of the key morbidity adjusters of the Dutch RE model, the Diagnoses-based Cost Groups (DCGs). Through revising the underlying hospital diagnoses and treatments ('dxgroups') that make up the DCGs, applying a new clustering procedure and allowing multi-qualification for the same adjuster, the proposed method is designed to tackle inherent flaws of the morbidity adjuster.

Methods: We combine data for spending, risk characteristics and hospital claims for all individuals with basic health insurance in the Netherlands in 2017 (N = 17m) and data for morbidity information from electronic patient records of roughly 400 Dutch general practices (GP) (N = 1.3m). First, we derive a baseline Dutch RE model as applied in 2020. We then revise the dxgroups that underlie the DCGs and evaluate the effect on measures of fit. Afterwards, we develop a new clustering method for compiling the DCGs and test the effect thereof on fit and in terms of under/overcompensation for subgroups that are potentially vulnerable to risk selection.

Main results: Our results demonstrate notable gains in measures of fit of the RE model through redesign of the DCGs. Moreover, we find that our approach substantially reduces under/overcompensations for individual dxgroups and groups of individuals that have multiple dxgroups. These results are to a far lesser extent found for subgroups based on the chronic illnesses derived from the GP data. The under/overcompensations for individual chronic conditions, as well as for multimorbid individuals are hardly affected by the new method.

Conclusion: By revising the dxgroups and applying a new clustering method that accommodates multi-qualification, we find that a redesign of DCGs can substantially reduce incentives to apply service-level selection in Dutch health insurance.

Comparing Risk Adjustment Estimation Methods Under Regional Data Availability Constraints

PRESENTER: **Savannah Bergquist**, University of California, Berkeley

AUTHORS: Marica Iommi, Gianluca Fiorentini, Francesco Paolucci

The Italian National Healthcare Service relies on per capita allocation for healthcare funds, despite having a highly detailed and wide range of data to potentially build a complex risk-adjustment formula. However, heterogeneity in data availability limits the development of a national model. This paper implements and evaluates machine learning and standard risk-adjustment models on different data scenarios that a Region or Country may face, to optimize information with the most predictive model. We show that machine learning slightly improves fit of adjusted R^2 and MSE in every data scenario compared to linear regression, although in coarse granularity and poor range of variables scenario differences are negligible. The advantage of machine learning algorithms is higher in the coarse granularity and fair/rich range of variables set and limited with fine granularity scenarios. The inclusion of detailed morbidity- and pharmacy-based adjustors generally increases fit, although the trade-off of creating adverse economic incentives must be considered.

Should the Loading Fee in Health Insurance be Included in a Risk Adjustment System? – an Analysis of Four Countries

PRESENTER: **Rudy Douven**, CPB Netherlands Bureau for Economic Policy Analysis

AUTHORS: Lukas Kauer, Sylvia Demme, Fransesco Paolucci, Wynand van de Ven, Jürgen Wasem, Xiaoxi Zhao

Risk adjustment in health insurance has been implemented in many countries as a successful tool to curb inefficient risk selection among insurers. While it is uncontested to compensate insurers with higher morbidity among their enrollees, loading fees are often overlooked. In practice, we observe that risk equalization is applied to the medical claims plus a certain percentage of the loading fee. This percentage ranges from 0% to 100%: 0% in e.g. the Netherlands and Switzerland, 50% in Germany, and 100% in the marketplaces under the Affordable Care Act and in the Medicare Advantage market, both in the USA. The reason for including the loading fee is that at the insurer level loading fees are positively correlated with high morbidity within insurers. In this paper, we study whether this correlation is present at the insurer level in the four countries of Germany, the Netherlands, Switzerland and the US. We discuss to what extent the loading fee should be equalized, and whether the loading fee fulfills the requirements of an effective and efficient risk adjuster. Furthermore, we discuss how in practice the loading fee can be implemented as a risk adjuster.

1:00 PM –2:00 PM WEDNESDAY [Specific Populations]

ECONOMICS OF PALLIATIVE AND END-OF-LIFE CARE SIG SESSION: Theory and Evidence in the Economics of End of Life Care

MODERATOR: **Gudrun Bjørnelv**,

Do Patients and the Public Value Outcomes Beyond Health? An Empirical Assessment of Value Frameworks in Oncology

PRESENTER: **Andrew Briggs**, LSHTM (London School of Hygiene and Tropical Medicine)
AUTHORS: Anna Kaltenboeck, Susan Chimonas, Sara Tabatabai, Matthew Quaife, Emma McIntosh, Peter Bach

Background.

Responding to rising oncology therapy costs, multiple value frameworks are emerging. However, input from economists in their design and conceptualization has been limited, and no existing framework has been developed using preference weightings as legitimate indicators of value. Qualitative methods were previously employed to identify treatment attributes (treatment inconvenience, evidence quality, and uncertainty in outcome) that go beyond the health benefits of treatment (measured using quality adjusted life years (QALYs)) together with contextual considerations (current life expectancy). These attributes were then valued using a discrete choice experiment (DCE).

Methods.

A DCE designed on the basis of a previously reported nominal group study to explore the extent to which subjects will trade health (measured in QALYs) for other treatment attributes that are not captured in the QALY. Subjects were identified from both a public and cancer panel in the US and the DCE was administered using a 2x2 sampling design between public and patient panels tested across two levels of background life expectancy (6months and 24 months without treatment). Each subject was offered a choice between treatment A, treatment B or no treatment (C), with attributes including treatment inconvenience, benefit of treatment (incremental QALYs), uncertainty in receiving the benefit, and quality of the evidence on treatment benefit. The DCE was designed in such a way that it could be analysed either using uncertainty and benefit as separate attributes, or by combining them into a single attribute of expected benefit. This design allowed for the analysis of treatment benefit continuously (rather than categorically) facilitating the representation of the value of other attributes in terms of equivalent Quality Adjusted Life Months (QALMs). Conditional logit was used to model choices with levels of attributes included as dummy variables and a dummy for option C (opt out) included. Alternative model specifications were compared using Akaike's Information Criterion (AIC).

Results.

The DCE was administered to over 900 subjects by the research company Dynata. On the basis of AIC, the model with four separate attributes was superior to the three-attribute model based on expected benefit. All attributes and levels were significant in the model across the whole sample. No significant differences were found between the public and cancer panels, nor between the background life-expectancy of 6 versus 24 months. Analysing treatment benefit continuously rather than categorically, thereby generating QALMs, resulted in a model with slightly lower AIC and showed that: reducing treatment inconvenience from 48 hrs a month to 4 hrs a month was worth 40 QALMs; increasing evidence quality from low to high was worth 45 QALMs; and increasing uncertainty related to treatment benefit from 10% to 100% was worth 151 QALMs.

Conclusions.

In a carefully constructed DCE based on attributes identified in qualitative research, subjects were prepared to trade health benefit for attributes beyond health. Nevertheless, the magnitude of the estimated benefits appears high relative to the levels of benefit posed to the subjects in the experiment (max 60 QALMs) which leaves remaining questions around the legitimacy of DCE results.

Can Informal Care Help Preserving Mental Health in Nursing Homes? Evidence of Gender Effects

PRESENTER: **Quitterie Roquebert**

Population aging is associated to an increase of long-term care needs and costs. Informal care, defined as unpaid care provided by relatives, plays a major role in long-term care provision. Much attention has been paid to informal care provided to older persons in the community. However, in a more recent literature, evidence suggest that relatives are still providing substantial concrete care for people living in nursing homes.

This paper analyses the causal effect of informal care on mental health for individuals living in nursing homes and takes into account the heterogeneity of the effect according to gender. The gender analysis is motivated by the fact that different trends are observed for men and women with respect to informal care and mental health. Women are more likely to receive informal care than men, everything else being equal, in nursing homes, and they are also more likely to have a poor mental health. Several studies have found gender differences in the factors influencing mental health, and in particular those related to social support.

We exploit the cross-sectional French survey Care-Institution (2016) which provides a sample of 2,422 individuals representative of the 60+ individuals living in a nursing home and having children. Mental health variables are the probability to declare depression, sleeping disorder, poor appetite and feeling of fatigue. To deal with the endogeneity of informal care to health variables, I exploit an instrument variable strategy. The important point here is to find an instrument correlating to informal care receipt and being relevant for both the subsamples of women and men. Taking this constraint into account, the probability to receive informal care is instrumented by the geographical proximity of children.

Results show that informal care receipt decreases the probability to declare poor appetite and feeling of fatigue for women only. No effect is observed for men. Given these results, public policies should take into account the role played by relatives in institution in the definition of long-term care policies - especially when implementing caregiver support. They could in addition make sure that the intervention of relatives in nursing homes for informal care is always made possible so as to encourage its beneficial effects on elderly women.

Initiating End-of-Life Conversations from an Economics Lens

PRESENTER: **Wen Qiang (Wally) Toh**, Erasmus University Rotterdam

Economists working on end-of-life (EOL) care have largely concentrated on supply-side topics, such as cost-effectiveness evaluations. In comparison, little attention has been paid to individual decision-making and the interactions among individuals on the demand-side of EOL care, such as the communication of EOL preferences between individuals. This deviates from the extensive work that has been done using standard economics frameworks in other areas of health, such as preventive behaviours against chronic diseases. This paper frames the willingness to have an advanced care planning (ACP) conversation as a standard utility maximisation problem. It also incorporates information asymmetry, as doctors are unable to discriminate between patients who are ready for an ACP conversation, versus those who are not. On this basis, we discuss various issues that may affect the incentives of doctors and/or patients to delay having these conversations. We also look at whether patients and doctors have additional incentives to procrastinate in a multi-period setting. Furthermore, we propose areas that may be interesting for further research.

1:00 PM –2:00 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Economics of HIV

MODERATOR: **Susan Cleary**, University of Cape Town

Costs Associated with HIV Patient's Follow-up Who Discontinue Antiretroviral Treatment Due to Lack of Efficacy or Toxicity in Routine Clinical Practice in Spain

PRESENTER: **Ms. Susana Aceituno**

AUTHORS: Angeles Castro, Pilar Diaz, Pere Domingo, Cristina García-Yubero, Juan E. Losa-García, Neus Vidal-Vilar

BACKGROUND AND AIMS: Antiretroviral therapy (ART) has achieved significant benefits in reducing morbidity, mortality and transmission of human immunodeficiency virus (HIV) infection since combinations of different antiretroviral drugs are available. However, several reasons could lead to the change of ART, including lack of efficacy or the occurrence of adverse events (toxicity). Following the change, the clinician should assess the maintenance of virological suppression, and make the relevant laboratory determinations and clinical tests, depending on the reason for the change. We aimed to assess the follow-up costs of HIV patients after discontinuation of the current regimen and switching to a new ART, compared to the routine patient follow-up on ART.

MATERIALS AND METHODS: A literature review and cost analysis was performed. The main recommendations for routine patient follow-up and follow-up after discontinuation and switching to a new ART were identified from clinical guidelines. A multidisciplinary expert panel (n=5) defined real-life follow-up for each patient profile, and the main adverse events leading to discontinuation. Consensus was reached on the resource use required (clinical tests and specialist visits) for the follow-up of these patients. Unit costs were identified from a Spanish healthcare costs database. Follow-up costs (€, 2020) were calculated for a routine patient, and after discontinuation due to lack of efficacy and toxicity, with a time horizon of two years.

RESULTS: The total cost of routine patient follow-up was calculated on 3,774€ (clinical tests: 2,293€; visits: 1,481€); the total follow-up cost after discontinuation due to a lack of efficacy and switching to new ART was calculated on 4,998€ (clinical tests: 2,777€; visits: 2,221€), which represents an increase of 32.4% (39.5% corresponding to additional clinical tests and 60.5% to additional visits) compared to the routine follow-up. Gastrointestinal, renal, bone, musculoskeletal, dermatological, hepatic and lipid profile alterations, as well as neuropsychiatric and sexual disorders, were defined as the main adverse events leading to discontinuation. The total follow-up cost after discontinuation due to toxicity and switching to new ART varied depending on the nature of the adverse event, and ranged between 3,884€-4,868€ (clinical tests: 2,403€-3,017€; visits: 1,481€-2,277€), which represents a mean increase of 18.9% (35,4% corresponding to additional clinical tests and 64.6% to additional visits) compared to the routine follow-up.

CONCLUSIONS: Use of resources and costs for HIV patient's follow-up after discontinuation and switch to a new ART are higher than the routine follow-up. Discontinuation of treatment is a factor that influences the cost of patient follow-up. This cost analysis emphasizes the importance of considering treatment discontinuation rates when choosing the most appropriate treatment for the patient.

Scaling-up Postpartum Models of Care for Mother-Infant Pairs in South Africa: A Budget Impact Analysis

PRESENTER: **Lucy Cunnama**, University of Cape Town

AUTHOR: Edina Sinanovic

In the age of universal antiretroviral therapy (ART), three postpartum models of care for mother-infant pairs in the Western Cape, South Africa, were assessed in terms of their relative cost-effectiveness. The three models were Routine Care, with women being cared for in general ART services and infants in well-baby clinics; an integrated maternal and child approach (Integrated Care) with women and infants being retained together during the postpartum breastfeeding period; and Community Care, where women are directly referred to community adherence clubs, with their infants receiving care at well-baby clinics. The purpose of this study was to assess the budget impact of nationally scaling up a more cost-effective postpartum model of care than current Routine Care.

The empirically collected annual cost per mother-infant pair of the three models of care were inflated to 2019 US $. The target population of women living with HIV in the reproductive age group of 15-49 years, who had delivered a baby in the last year in the public sector, was estimated through a series of steps using publicly available data. The cost of implementing the most cost-effective model of care was compared to the cost of Routine Care at scale. In order to assess the robustness of results, four additional scenario analyses were performed.

Implementing a relatively more cost-effective model of care, Community Care at scale, resulted in an increased budget requirement of US $5 720 096, in comparison to Routine Care. The total budget requirement of US $52 751 995 for Community Care, represents an additional 0.2% of the total health budget and additional 0.5% of the HIV and AIDS Component of the HIV, TB, Malaria and Community Outreach Grant for 2020/21. In the scenario analyses a coverage of 12%, 23%, 65% for the three models respectively, Scenario A, an additional US $9 303 763 is required. If an equal weighting (Scenario B) between the three models of care is used, then an additional US $9 886 016 is required. Scenario C found the extra budgetary need for Integrated Care at scale was US $23 939 660, which is a 51% increase compared to Routine Care. The fourth scenario, Scenario D, would only require an additional US $3 260 455 to implement Community Care (in place of Routine Care), but would only cover 57% of those in need of care.

The net budget impact to introduce a more cost-effective model than the current standard of care represents an increase of 0.9 - 2.2% of the national healthcare budget. However, the different models are designed to suit different women's preferences, for instance towards facility- or non-facility-based care. One of the alternate scenarios providing differentiated care, although more expensive, may be more acceptable to mothers. The potential implications are that affordable and more cost-effective novel options for postpartum maternal and child health have been established in the Western Cape which if scaled up countrywide could have particular impact on the health of the next generation as well the mothers of our country.

Estimating the Benefit Incidence and Distribution of Donor Funded Free HIV Treatment Services in Southeast, Nigeria.

PRESENTER: **Ifeyinwa Arize**, University of Nigeria Nsukka, Enugu Campus

AUTHORS: Uchenna Ezenwaka, Eric Obikeze, Obinna Onwujekwe

ABSTRACT

Background: Globally, health is experiencing a series of rapid and intense transitions that are interlinked and these transitions especially donor exits and domestic health financing have brought with it a new set of challenges. Nigeria's national HIV response has been largely donor driven and rely mostly on external funds for providing free treatment services at designated health facilities for the target population. The programme was specifically designed to improve financial access to the target beneficiaries and reduce the incidence of high mortality due to HIV. This study aims to examine the benefit incidence of donor funded free HIV treatment services and the distribution of benefits across different population groups.

Methods: Exit poll of patients attending anti-retroviral therapy (ART) clinics in health facilities were conducted in six selected facilities (3 urban, 3 rural) in Enugu State, using pre-tested interviewer administered questionnaire on 212 respondents accessing HIV services at the selected facilities. Data were collected for medical and non-medical costs of accessing services and treatment of HIV/AIDS for both in –patient and out-patient hospital visits using. SPSS and STATA were used for data analysis.

Results: Free ARV drugs worth N5,241,240 ($14,559) was consumed by respondents annually which implies a total benefit of N24,840 ($69) worth of free ARV drugs per person per year for a lifetime. A total benefit incidence measured by the value of services was N9,275,340 ($25,765) comprising N4,073,700, ($11,316) and N5,201,880 ($ 14,450) was utilized by urban and rural dwellers respectively, in a year. Out of pocket (OOP) expenditure in a month totalled N174,880 ($486) comprising N80,200 ($223;45.9%) spent by urban dwellers while rural dwellers spent a total of N94,680 ($263; 54.1%) on other medical expenses. Findings on distribution of net benefits across the population groups showed that it was in favour of the poor and females which implies that they consumed slightly more free HIV services when compared to the rich and males.

Conclusion: The distribution of the net benefits of the donor funded free HIV treatment service and OOP payments were pro-poor. This suggests that the programme is achieving the desired aim of enhanced access to the poorer population groups. Considering that the programme

was set up to ensure equitable access to HIV services especially for the poor and evidence of low hospitalization rate associated with the service users, which ensures cost-savings for the health system, there is need to continue mobilizing funds to sustain the programme.

Keywords: Donor funded HIV services, Benefit incidence Analysis, Out-of-pocket payments, Equity.

Cost-Effectiveness of a Family Economic Empowerment Intervention Addressing HIV Treatment Adherence for Perinatally Infected Adolescents

PRESENTER: **Yesim Tozan**, New York University

AUTHORS: Ms. Ariadna Capasso, Sicong Sun, Torsten Neilands, Ozge Sensoy Bahar, Christopher Damulira, Fred M. Ssewamala

Background: Poor adherence to antiretroviral therapy (ART) among HIV-infected youth has been attributed to economic insecurity. Family-based economic empowerment interventions, which aim to increase household financial stability, have the potential to mitigate the challenges in accessing treatment due to economic insecurity and to improve adherence outcomes in this vulnerable population. We present efficacy and cost-effectiveness analyses of the Suubi Adherence study, a savings-led family-based economic empowerment intervention aiming to improve ART adherence among adolescents living with HIV (ALWHIV) in southern Uganda.

Methods: Adolescents (mean age 12 years at enrollment; 56% female) receiving HIV treatment at 39 health centers were randomized to Suubi+Adherence intervention (n=358) or bolstered standard of care (BSOC; n=344). Viral load was measured at the centers following blood draw. A difference-in-differences analysis was employed to assess the change in the proportion of virally suppressed adolescents (HIV RNA viral load <40 copies/ml) over 24 months. The cost-effectiveness analysis examined how much the intervention cost to virally suppress one additional adolescent relative to bolstered standard of care.

Findings: At 24-months, the intervention was associated with an 8.85-percentage point (95% confidence interval, 0.80-16.90 percentage points) difference in the proportion of virally suppressed adolescents between the study arms (p=0.032). The total per-participant cost was US$177 for the BSOC group, and US$263 for the intervention group. Given the mean net change of 8.85 percentage points in the proportion of virally suppressed adolescents across the study arms at 24-months, the intervention was estimated to virally suppress, on average, an additional 32 adolescents over this period. The per-participant cost difference between the two arms was US$86 over the same period. Hence, the incremental cost of virally suppressing one additional adolescent was estimated at US$970 (95% confidence interval, US$508-10,725).

Conclusions: Our study addresses an identified evidence gap on the costs and cost-effectiveness of adherence interventions in the context of randomized control trials and contributes to the establishment of cost-effectiveness benchmarks for behavioral trials in such settings. Our results support integration of family-based economic empowerment interventions into adherence-support strategies as part of routine HIV care for ALWHIV in low-resource settings. Further research on combination interventions at the nexus of economic security and HIV treatment and care is needed to inform the development of feasible and scalable HIV policies and programs.

1:00 PM –2:00 PM WEDNESDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: Exploring Heterogeneity of Treatment Effects

SESSION CHAIR: **Richard Grieve**, LSHTM (London School of Hygiene and Tropical Medicine)

ORGANIZER: **Stephen O'Neill**, London School of Hygiene and Tropical Medicine

DISCUSSANT: **Andrew Jones**, University of York

Sustainability and Heterogeneity in the Effect of Educating Mothers on the Benefits of Child Vaccination in Uttar Pradesh, India

PRESENTER: **Dr. Stephen O'Neill**, London School of Hygiene and Tropical Medicine

AUTHORS: Kultar Singh, Varun Dutt, Timothy Powell-Jackson, Richard Grieve

Childhood vaccination is one of the most cost-effective health technologies available in low- and middle-income countries. Yet a substantial proportion of children in the poorest states of India are not fully immunised despite widespread availability of free immunisation services in public health facilities. We study a randomised controlled trial of a door-to-door information intervention that sought to educate mothers in Uttar Pradesh on the benefits of child vaccination. An initial analysis found a large effect of the information intervention on vaccination uptake as well as on knowledge of the causes, symptoms, and prevention of tetanus. We use follow-up data to address two policy relevant questions. Were these effects sustained over time? Who benefited from the intervention? Answers to these questions can shed light on how the intervention worked and who should be targeted by it.

We used longitudinal data from an experimental evaluation of the brief information intervention. Participants were 722 mothers of children aged 0–36 months who had not received 3 doses of diphtheria–pertussis–tetanus (DPT3) vaccine, with follow-up data analysed for 651 mothers. The main outcomes were the proportion of children who received DPT3, the proportion who received measles vaccination, and the proportion who were fully immunised. We first examined whether the effect of the intervention was maintained after two years of follow-up. We then examined heterogeneity in treatment effects for each outcome using Causal Forests' (CF), an ensemble Machine Learning method based on decision trees.

The large effect of the information intervention on vaccination uptake was sustained at 24 months follow-up, with treatment effects very similar to those obtained at 7 months follow-up. At 24 months, the intervention increased the proportion of children who received DPT3 by 15.8 (CI: 8.5 to 23.1) percentage points, the proportion who received measles vaccination by 23.9 (CI: 17.5 to 30.2) percentage points, and the proportion who were fully immunised by 18.2 (CI: 11.2 to 25.2) percentage points, as well as having large effects on the mothers' knowledge around tetanus. However, there was considerable heterogeneity in the individual level effect estimates, ranging from 0.1 to 29.6 percentage points for DPT3, 4.8 to 41.3 percentage points for measles, and 3.9 to 32.8 percentage points for full immunisation.

Overall we conclude that providing mothers of unvaccinated/incompletely vaccinated children with information on tetanus and the benefits of DPT vaccination substantially increased immunisation coverage and that these effects were maintained upto 24 months after the intervention date. Effects of the intervention on knowledge of the causes, symptoms, and prevention of tetanus were also maintained albeit at somewhat reduced levels than at 7 months. The effectiveness of the intervention varied by individual indicating potential to improve the targeting of scarce resources.

Causal Machine Learning and the Heterogeneous Impacts of Indonesia's National Health Insurance Scheme

PRESENTER: **Vishalie Shah**, University of York

Exploring treatment effect heterogeneity can inform decision-makers on how to target policies more efficiently according to observable population characteristics. Traditional methods for subgroup analyses that involve pre-defining covariates of interest have various limitations that increase with high-dimensional data. Machine learning (ML) offers a flexible solution, using data-driven algorithms to identify effect heterogeneity in a more structured way. We develop a framework for estimating and making inferences on heterogeneous treatment effects using a combination of innovative statistical tools, including predictive and causal ML. We apply our framework to evaluate the average and heterogeneous effects of Indonesia's subsidised health insurance programme on health care utilisation. Through the evaluation, we solve a number of challenges common to health policy evaluations: confounding in the policy allocation, an outcome with a larger number of zeros, and a rich set of potential effect modifiers beyond those driven by theoretical considerations.

Using large-scale, household survey data, we evaluate the policy impact on outpatient and inpatient demand for one million respondents in 2017. We model the outcome regression and propensity score using an ensemble prediction algorithm, the "super learner", that combines multiple ML algorithms to optimise predictive performance through cross-validation. For the outcome regression, we incorporate a two-part "hurdle" model to

address the point mass at zero. The resulting predictions are inputted into a "causal forest", which generates a non-parametric prediction of the conditional average treatment effect (CATE) function, capturing heterogeneity in treatment effects. Finally, we apply a classification analysis to explore which covariates are the strongest predictors of heterogeneity.

In terms of average effects, being enrolled into subsidised health insurance increases the total length of inpatient stay in the previous year (0.13 +/- 0.00 days), and the number of outpatient visits in the previous month (0.04 +/- 0.00 visits). The causal forest detects substantial heterogeneity in treatment effects; the difference in CATE estimates between the 20% most and least affected populations is statistically significant, with age being the most important driver. Our subgroup analysis finds that the policy impact is greater for older, wealthier and urban-based populations. There is also a greater inpatient effect among households where access to health care is difficult.

Our study demonstrates the potential of ML within a framework for estimating and making inferences on CATEs. Our causal forest analysis identifies additional effect modifiers that were not specified a priori, providing new and important insights into the heterogeneous impacts of the health insurance policy, including which population subgroups have benefitted the most and least. These findings are extremely valuable to decision-makers designing optimal treatment allocation rules; a rapidly-evolving area of research.

Local Instrumental Variable Methods to Estimate Heterogeneous Treatment Effects: A Case Study of Emergency Surgery for Appendicitis in the UK

PRESENTER: **Silvia Moler-Zapata**, LSHTM (London School of Hygiene and Tropical Medicine)

AUTHORS: David Lugo-Palacios Lugo Palacios, Dr. Stephen O'Neill, Andrew Hutchings, Tommaso Kircheis, Richard Grieve

Acute appendicitis (AA) is amongst the most common reasons for emergency admissions into NHS hospitals. In the UK, the overall incidence of AA is 11 cases per 10,000 population per year, which represents a substantial economic burden. Emergency surgery (ES) continues to be the standard of care in the UK. However, the empirical evidence on the relative benefits, harms and risks associated with it remains scarce. Likewise, the distribution of the consequences of ES provision across population subgroups is unknown; making this a clear instance of where evidence is required to inform how medical interventions should be targeted. The need for this type of evidence has been acknowledged by several decision bodies and has become even more apparent during the COVID-19 pandemic, which caused guidelines to promote conservative management (CM) strategies for certain groups of AA patients. However, with the number of ES going back to pre-COVID-19 levels in the UK, it has become apparent that the debate is very far from over. Aiming to shed light on this matter, this paper harnesses innovative causal inference methods and a large-scale dataset of patient medical records to characterise the distribution of the health and economic implications of ES across AA patient subgroups in the UK.

When the effects of health technologies differ across population subgroups, allocative efficiency gains can be achieved by informing decision-making processes with evidence on Heterogeneity of Treatment Effects (HTE). With the increased interest in 'precision' or 'stratified' medicine across all medical fields, electronic Health Records (EHRs) systems are being increasingly used to inform the effectiveness and cost-effectiveness of health technologies. However, the nature of this type of data poses serious challenges for the estimation of HTEs. For instance, in the presence of essential heterogeneity, i.e. heterogeneity in outcomes according to unobserved characteristics that are also predictive of treatment allocation, traditional Instrumental Variable approaches and risk adjustment methods are not appropriate.

Recently-developed Local Instrumental Variable (LIV) approaches can be used to characterise HTEs even in the presence of essential heterogeneity through the estimation of Person-centered treatment (PeT) effects. This paper applies the LIV methodology to around 320,000 emergency AA admissions to NHS hospitals recorded in the Hospital Episode Statistics (HES) database from 2009-2020. Drawing on available data on hospitals' preferences for ES over CM strategies which served as instrument, PeT effects were computed for each patient in the sample and then aggregated to obtain estimates at the subgroup-level. Our identification strategy relies on the validity of the instrumental variable, which was found to deliver sufficient strength (Cragg-Donald Wald F-statistic > 100) and to achieve good balance in observed covariates. This paper reports the relative effectiveness and cost-effectiveness of ES according to policy-relevant patient subgroups. We identify the subgroups where there may be cost savings from the uptake of ES or CM strategies. This paper will inform the literature of causal inference methods for personalised medicine. More generally, it will illustrate how reflecting HTE in cost-effectiveness analysis could help inform prioritisation decisions in budget-constrained settings.

Estimating Person-Level Effects of Treatment Intensification for Type-2 Diabetes Mellitus

PRESENTER: **David Lugo-Palacios Lugo Palacios**, London School of Hygiene and Tropical Medicine

AUTHORS: Patrick Bidulka, Dr. Stephen O'Neill, Richard Grieve

In the UK, 3.5 million people have been diagnosed with type 2 diabetes mellitus (T2DM), accounting for approximately 10% of NHS expenditure and expected to rise to nearly 17% by 2035-36. T2DM is a progressive disease and international clinical guidelines recommend additional drugs if glycaemic control is inadequate following metformin monotherapy. This first-stage intensification can be with a sulfonylurea (SU), or newer, more costly classes of drugs, most commonly a dipeptidyl peptidase-4 inhibitor (DPP4i) or sodium-glucose co-transporter-2 inhibitors (SGLT2is). There is international consensus in taking a personalised approach to treatment choice; however, most studies to date rely on head-to-head randomised controlled trials (RCTs) to compare the effectiveness of SGLT2is or DPP4is to placebo or to clinician choice which makes the results difficult to interpret. Furthermore, the range and number of patients typically included in previous RCTs are insufficient to provide reliable estimates of heterogeneous effects that can truly inform personalised clinical decision making.

Therefore, using primary and secondary care records from more than 25,000 patients included in the Clinical Practice Research Datalink (CPRD) and Hospital Episodes Statistics (HES) during 2011-2019, we evaluate the effectiveness of alternative drugs for first-stage intensification on haemoglobin A1c (HbA1c) and other biomarkers at 12 months according to individual risk factor profiles.

We use a Local instrumental variable (IV) approach to estimate personalised treatment effects for each first-stage intensification regimen, while minimising bias due to unobserved confounding. The IV, prescribing history at the CCG level, is anticipated to influence the treatment an individual patient receives, but is not expected to otherwise influence their outcomes. Bias from unobserved confounding is minimised with an instrumental variable (IV) study design in which the IV –the clinical commissioning group (CCG) prescribing history– encourages specific treatment receipt, but does not have a direct effect on the outcome.

Preliminary analysis suggests that the CCG's prescribing history is a strong predictor of the choice of first-stage treatment intensification and balances key prognostic variables like age and baseline HbA1c. We will estimate the relative effect of prescription for SGLT2i or DPP4i versus SU, and the relative effects of SGLT2i versus DPP4is. The primary analyses will report relative effectiveness for the primary outcome (HbA1c) and other biomarkers at 12 months post first-stage intensification. The secondary analyses will report relative effectiveness for each biomarker by contrasting the means across the treatment groups at three-monthly intervals. Person-level treatment effects will be calculated as the difference in predicted outcomes following the prescription of alternative drugs. These person-level treatment effects will be aggregated to report the relative effectiveness of the treatments prescribed overall and for each pre-specified subgroup (including age, gender, ethnicity, comorbidities, BMI).

The person-level effects identified in this study can be used by future microsimulation models to provide long-term estimates of comparative effectiveness of alternative drugs for first-stage intensification. In this way, the present study has the potential to inform future T2DM management guidelines for providing personalised treatments to improve clinical outcomes and value for money.

1:00 PM –2:00 PM WEDNESDAY [Demand And Utilization Of Health Services]

ORGANIZED SESSION: Targeting Screening for Cardiovascular Disease Risk Factors: Experimental and Quasi-Experimental Evidence from 4 Low- and Middle-Income Countries

SESSION CHAIR: **Carlos Riumallo Herl**, Erasmus University Rotterdam

DISCUSSANT: **Eeshani Kandpal**, The World Bank; **Aurelia Lepine**, University College London; **Pascal Geldsetzer**, Stanford University; **Marcel Bilger**, Vienna University of Economics and Business

Experimental Evidence of the Effect of Risk-Adjusted Incentives on the Demand for Preventive Check-Ups

PRESENTER: **Carlos Riumallo Herl**, Erasmus University Rotterdam

Financial barriers, present bias or under-valuation of benefits of preventive services are responsible for the low uptake of preventive care in many settings. While financial incentives can encourage individuals to visit healthcare services, they may not be an efficient solution if they fail to target high-risk individuals. In this study, we test whether adjusting the value of an incentive to the individual's risk can provide a more efficient solution to increase the demand of at-risk individuals for preventive screening for cardiovascular diseases (CVDs). We designed a randomized experiment in El Salvador where we allocated N=913 individuals into one of three treatment groups: no incentive, a standard or a risk-based incentive. In the standard incentive group, individuals received USD5 immediately after completing a full medical checkup for CVDs (blood exam and medical consultation). In the risk adjusted group, individuals received a low (US2), medium (US10) or high (US20) reward depending on the outcome of the check-up, as given by the 10-year CVD mortality risk. On average, we find that the standard and risk-adjusted financial incentive increased the uptake of preventive screenings in a similar way, by approximately 8.5 percentage points. However, the risk-adjusted incentive was more effective for people with a higher baseline risk of CVDs. On average, at-risk individuals were 14.6 percentage points more likely to complete the medical screening in the risk-adjusted arm compared to 3 percentage points in the standard incentive arm. Our findings suggest that adjusting the value of incentives to the potential benefits of the preventive service can be an effective and efficient strategy to target high-risk individuals in settings where risk status cannot be easily manipulated.

Invitations, Incentives, and Conditions: A Randomized Evaluation of Demand-Side Interventions for Health Screenings

PRESENTER: **Damien de Walque**, The World Bank

AUTHORS: Adanna Chukwuma, Nono Ayivi-Guedehoussou, Marianna Koshkakaryan

The study is a randomized controlled trial that investigates the impact of four demand-side interventions on health screening for diabetes and hypertension among Armenian adults ages 35-68 who had not been tested in the last 12 months. The interventions are personal invitations from a physician (intervention group 1), personal invitations with information about peer screening behavior (intervention group 2), a labeled but unconditional cash transfer in the form of a pharmacy voucher (intervention group 3), and a conditional cash transfer in the form of a pharmacy voucher (intervention group 4). Compared with the control group in which only 3.5 percent of participants went for both screenings during the study period, interventions 1 to 3 led to a significant increase in the screening rate of about 15 percentage points among participants. The highest intervention impact was measured among recipients in intervention group 4, whose uptake of screening on both tests increased by 31.2 percentage points. The levels of cost-effectiveness of intervention groups 1, 2, and 4 are similar while for intervention group 3 it is about twice more expensive per additional person screened.

The Effects of Hypertension Screening on Blood Pressure-Related Outcomes in South Africa

PRESENTER: **Fabrice Kampfen**, University of Pennsylvania

AUTHORS: Owen O'Donnell, Carlos Riumallo Herl, Xavier Gomez-Olive

Population-based health screening has been advocated as a promising way to address the rising burden of Cardiovascular Diseases in Low- and Middle-Income Countries. Evidence of its effectiveness in such contexts is very limited, however. We use longitudinal data from a study of ageing in Agincourt, South Africa to investigate the potential health effects of screening for hypertension. We exploit the study protocol that stipulated that survey respondents identified as having elevated blood pressure at the time of the interview be recommended to seek further medical assessment. Using a regression discontinuity design based on the blood pressure threshold at which a recommendation was issued, we find that receiving a referral letter did not have any effects on measured blood pressure and on the probability of being hypertensive four years later. We do not find any effect on the probability of having ever had one's blood pressure measured by a medical doctor at follow-up among those who have never had their blood pressure measured at baseline, which suggests that failure of the respondents to act on receipt of the referral letter likely contributed to the negative result. Our results also suggest that screening may have limited effect where access to treatment is high and increasing over time: among individuals who had been diagnosed with high blood pressure prior to baseline, 86% were under medication at that time. This percentage increased to 90% four years later. Overall, we find significant improvements in blood pressure indicators over time, which cannot be attributed to screening.

Leveraging Probability Distortion to Target Prevention? A Lottery Experiment on Cardiovascular Risk

PRESENTER: **Owen O'Donnell**, Erasmus University Rotterdam

AUTHORS: Aurelien Baillon, Joseph Capuno, Aleli Kraft, Ms. Evgenia Kudymowa

Targeting is critical to cost-effective disease prevention. We use a randomized experiment to test whether a lottery incentive for a medical check-up succeeds in targeting those who would otherwise underinvest in primary prevention of cardiovascular disease (CVD) because they distort probabilities. In theory, a lottery is more appealing to those who display inverse S-shaped probability distortion – a bias that discourages prevention of intermediate risks. We elicited risk attitudes, including the tendency to distort probabilities, and CVD risk perceptions from participants (n=3795) of a cluster randomized experiment conducted in Nueva Ecija, the Philippines in 2018. The treatment group was offered the opportunity to enter a lottery with a money prize equivalent to 3-weeks minimum wage earnings conditional on going to a health clinic for a check-up. We find that probability distortion is associated with underprevention at baseline: participants with inverse S-shaped probability distortion who perceive intermediate CVD risk are 3.9 percentage points (pp) (83%) less likely to have gone for a check-up prior to baseline. The lottery has a very strong average effect: it raises the probability of going for a check-up by 49 pp. However, contrary to theory, the lottery is not particularly effective in targeting those inclined to distort probabilities and underinvest in prevention without any financial incentive to do so.

1:00 PM –2:00 PM WEDNESDAY [Supply Of Health Services]

ORGANIZED SESSION: New Insights on the Impact of Payment Models and Training on Provider Behavior from Field and Natural Experiments in China

SESSION CHAIR: **Terence C Cheng**, Harvard T.H. Chan School of Public Health

DISCUSSANT: **William Hsiao**, Harvard T.H. Chan School of Public Health; **Anthony Scott**, University of Melbourne

Can Global Budget Improve Health Care Efficiency and Quality? Experimental Evidence from China

PRESENTER: **Dr. Hao Zhang**, Harvard T.H. Chan School of Public Health

Countries worldwide have been confronting the challenge of providing accessible, high-quality, and efficient health care. In China, the challenge is rooted in a flawed provider incentive system that has created (1) substantial allocative inefficiencies in the health care delivery system as manifested by the heavy use of tertiary hospitals, and (2) technical inefficiencies within providers as manifested by the over-prescription of advanced drugs and tests. To realign provider incentives with the social goal of improving health care efficiency and quality, the Analysis of Provider Payment Reforms on Advancing China's Health (APPROACH) project designed an innovative global budget payment system. In addition to incentivizing technical efficiency within providers as traditional global budgets do, this global budget also incentivizes allocative efficiency by rewarding rural county hospitals for reducing the loss of local treatable patients to urban hospitals. APPROACH rolled out this new payment method in a large-scale randomized experiment involving all 56 eligible rural counties (21 million population) in Guizhou province,

China during 2016-2017. Utilizing randomization inference, this study examined its short-term impacts and effect heterogeneity using inpatient claims and hospital survey data. Our results suggest that the APPROACH global budget led to a significant decrease in out-of-county (OOC) admissions, measured both by the absolute number and by the share of total OOC and county hospital admissions. However, the case mix index at county hospitals did not increase. Technical efficiency improved for the most common type of county hospitals – the county general hospitals – in the form of a significantly lower average expenditure. The 30-day all-cause readmission rates at county hospitals experienced an insignificant increase, driven entirely by same-hospital readmission rather than different-hospital readmission. We could not rule out the possibility that the increase was a result of county hospitals gaming the system by breaking one admission into two. Removing same-hospital readmissions did not change the findings on admissions and average expenditure. Effect heterogeneity analysis suggests that efficiency improvement was larger in hospitals of a smaller size or a higher management level. In sum, our findings suggest that the APPROACH global budget may offer a framework for improving allocative and technical efficiency without significantly compromising the quality of care.

The Impact of Hospital Internal Pay-for-Performance on Clinical Departments' Health Services – Evidence from a Single-Center Study in Shanghai, China

PRESENTER: **Min Hu**, Fudan University

Supplier-induced overuse of drugs due to distorted incentives offered under the fee-for-service approach was recognized as a substantial problem in the Chinese healthcare system. Provider payment reforms in public hospitals, such as the implementation of global budgets, were applied by some local governments to help control costs and restrain irrational drug use. However, such approaches hardly incentivized hospitals to improve service quality. In response, some public hospitals piloted an internal pay-for-performance (P4P) program to strengthen quality. A tertiary hospital in Shanghai, China, applied P4P in some of its clinical departments to replace the old cost-assessment approach based on medical cost structures (mainly on proportion of drug/consumable costs of total medical costs). The P4P program aimed to financially reward labor intensive services and penalize irrational prescribing, linked to a maximum of 30% of the department's bonus.

Objective

This study aimed to evaluate the impact of the P4P program on service outcomes including prescribing practices, and volumes, costs and their structures as well in the sample hospital.

Methods

From August 1, 2018 (index date), 19 out of 40 departments in the hospital implemented the P4P program (categorized as the 'intervention group'), and the remaining 21 departments continued using the previous assessment approach (the 'control group'). Data were extracted from the hospital electronic medical records. Healthcare services 1 year before and after the index date were compared between the two groups. Outcomes, measured monthly, included service volume (numbers of outpatient/emergency room [ER] visits, inpatient visits, and surgeries), overall medical costs (average outpatient/ER/inpatient cost per visit), inpatient costs by service category (average inpatient drug/consumable/examination/service cost per visit), and inpatient prescribing (prescribing rate of inpatient auxiliary drugs/antibacterial drugs). Difference-in-difference (DID) analysis was used to estimate the impact of P4P on monthly health service outcomes. A trend analysis, using ANOVA, explored whether the two groups were parallel before the index date. Department characteristics (disciplines, number of beds, size of department, risk of treatment) were adjusted as co-variates in the DID regression models.

Results

The two groups were parallel before the reform ($P>0.05$), indicating that differences between the two groups after the reform could be attributable to the reform. DID analysis showed that the two groups had no significant differences in service volume and overall medical cost during the year after the index date. However, P4P had a statistically significant impact on inpatient cost by service category and prescribing practice. P4P reduced average inpatient drug cost per visit by approximately 20%, also increased service cost per visit ($P<0.05$). Consumable costs and examination costs slightly increased. Inpatient prescribing practice improved under P4P, reflected by a reduced prescribing rate of auxiliary drugs and antibacterial drugs (both approximately 5% reduction, adjusted $P<0.01$).

Conclusions

This study showed that P4P encouraged doctors to provide services beyond prescribing drugs during the 1-year intervention period. However, it should be noted that this new approach may also induce increased consumable costs and examination costs to compensate for the reduced drug costs. Intended and unintended outcomes of P4P programs require further systematic monitoring and management.

Impact Evaluation of an In-Service Training Program for Non-Physician Clinicians in Southwest Rural China: A Randomized Controlled Trial

PRESENTER: **Hao Xue**, Stanford University

In-service training is a common approach to update and maintain clinician knowledge. Yet, rigorous evidence of the impact of broad-based in-service training for village clinicians in China is limited. We present a randomized trial of broad-based in-practice training for village clinicians across 330 randomly selected villages in Yunnan province. The Red Cross Society of China offered the treatment group an opportunity to attend a broad-based training, consisting of 26 sessions. We assessed the impact of the training on NPC clinical knowledge and practice. We evaluated clinician knowledge using clinical vignettes and practice quality through interactions with unannounced standardized patients (SPs). Intention-to-treat (ITT) estimates show that, in clinical vignettes testing knowledge, clinicians in the treatment group completed 9.5% more diagnostic process checklist items [1.5 percentage points, 95% CI 0.1-2.9, p=0.037], but there was no effect on practice as measured in unannounced standardized patient visits. Limited take-up of the training, with only 47% of the treatment group attending training sessions, reduced the program's average impacts. Our results highlight the need for approaches to encourage participation in in-service training, but also that training alone may be insufficient to improve clinical practice.

1:00 PM –2:00 PM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

ORGANIZED SESSION: Advances in Research on Healthcare Spending and Outcomes in the Context of Health Systems

SESSION CHAIR: **Robert Dubois**, National Pharmaceutical Council

ORGANIZER: **Marcia Weaver**, University of Washington

Are Medical Care Prices Still Declining? A Systematic Examination of Quality-Adjusted Price Index Alternatives for Medical Care

PRESENTER: **Abe Dunn**, Bureau of Economic Analysis

AUTHORS: Anne Hall, Seidu Dauda

More than two decades ago a well-known study on heart attack treatments provided evidence suggesting that, when appropriately adjusted for quality, medical care prices were actually declining (Cutler et al. 1998). Our paper revisits this subject by leveraging estimates from more than 8,000 cost-effectiveness studies across a broad range of conditions and treatments. We find large quality-adjusted price declines associated with treatment innovations. To incorporate these quality-adjusted indexes into an aggregate measure of inflation, we combine an unadjusted medical-care price index, quality-adjusted price indexes from treatment innovations, and proxies for the diffusion rate of new technologies. In contrast to official statistics that suggest medical care prices increased by 0.53 percent per year relative to economy-wide inflation from 2000 to 2017, we find that quality-adjusted medical care prices declined by 1.33 percent per year over the same period.

Assessing Taiwan's Pay-for-Performance Program for Diabetes Care

PRESENTER: **Jui-fen Rachel Lu**, Chang Gung University

AUTHORS: Ying Isabel Chen, Karen Eggleston, Chih-Hung Chen, Dr. Brian Chen

Objectives: To evaluate the net value of Taiwan's Pay-for-Performance (P4P) program for the management of diabetes mellitus (DM), based on overall resource use and quality of care as measured by predicted risks and survival.

Methods: We collected clinical, demographic, and healthcare utilization data on DM P4P participants and non-participants in a regional hospital in northern Taiwan from 2007-2013. We conducted two analyses. First, we assessed the change in net value between the baseline and final periods of P4P participants continuously enrolled in the program throughout the observation period (Continuous Enrollment Model). Second, we conducted an additional analysis using as the intervention group patients not in P4P at baseline (2007-2009), but enrolled in P4P in the final period (2010-2013) (Newly Enrollment Model). We used propensity score matching to select a comparison group of non-P4P DM patients who are demographically and clinically similar to the P4P patients at baseline.

Results: Our results show that the P4P program generated a greater positive net value for DM patients, relative to comparable non-P4P patients. The P4P program effects, measured as the difference in net value between P4P and non-P4P participants, range from $32,613 - $260,552 (Continuous Enrollment Model) and $23,144 - $184,814 (Newly Enrollment Model) with value of a life-year in the range of $25,000 - $200,000. In other words, the value of the health improvements outweighed the additional costs of care. For both analyses in both the baseline and final periods, the P4P program achieved positive net value, as measured by the value of life lived during the period plus the value of remaining life given predicted mortality risks, minus total healthcare spending. The overall net value of the P4P participants - the difference between the net value in the final period versus the baseline period - was positive and significantly higher than that for the matched non-P4P participants.

Discussion: These results provide valuable empirical evidence on the value and cost-effectiveness of the Taiwan's P4P program. This program was introduced to improve the quality of care and reduce cost for diabetic patients through incentive for pay-for-reporting of outcome metrics. Prior literature assessing the program tended to focus on health expenditures or mortality rates separately. Our study, to our knowledge, is the first to apply a net value approach in a consistent framework applied in other diabetes care settings (such as the Mayo Clinic) to estimate the net value of P4P relative to matched non-participants. Our results suggest that additional efforts to enhance the P4P program's scope may benefit more patients and enhance the "value for money" of chronic care.

A Satellite Account for Health in the United States

PRESENTER: **David Cutler**, Harvard University

AUTHORS: Kaushik Ghosh, Kassandra Messer, Trivellore Raghunathan, Allison B Rosen, Dr. Susan T Stewart

Estimating medical care productivity is a central economic challenge. This paper develops a satellite account for the US health sector that appropriately measures health care productivity and applies that to the elderly population between 1999 and 2012. The central output of the satellite account is health. The primary input is medical care; we also examine the impact of behavioral risk factors. Using the Medicare Current Beneficiaries Survey as our primary dataset, our empirical work measures the change in medical spending and health outcomes for a comprehensive set of 80 conditions. We estimate that medical care has positive productivity as a whole, with aggregate productivity growth of 9% over the time period. However, there is significant heterogeneity in productivity by condition. At the upper end, care for cardiovascular disease has been extremely productive. In contrast, care for people with mental illness and musculoskeletal conditions has been costly but not productive.

Health Spending Efficiency in the United States: Cause-Specific Health Spending per Disability-Adjusted Life-Year Averted from 1996 to 2016

PRESENTER: **Marcia Weaver**, University of Washington

AUTHORS: Jonah Joffe, Michael Ciarametaro, Robert Dubois, Arjun Singh, Gianna W Sparks, Lauryn Stafford, Christopher Murray, Dr. Joseph Dieleman

Background: Research on healthcare spending per health outcome for each major health condition could provide estimates of the value of spending across conditions. Research on this important topic is limited however, by the absence of estimates of healthcare spending and population health outcomes by condition, and methods to combine these estimates into meaningful measures. We used comprehensive estimates of personal healthcare spending and burden of disease, and novel methods to explore the efficiency of spending by condition, and estimate a quality-adjusted healthcare price index.

Methods: We extracted personal healthcare spending estimates by health condition from the United States (US) Disease Expenditure Study, and disability-adjusted-life-years (DALYs) by cause are from Global Burden of Disease, Injuries, and Risk Factor Study (GBD). We measured healthcare spending efficiency as the change in healthcare spending per incident case effect relative to DALYs per incident case effect, after adjusting for changes in population size, age structure, and incidence of the condition. We applied cost-benefit analysis to calculate the quality-adjusted price index as the ratio of 2016 healthcare spending to 1996 spending, adjusted for the dollar value of DALYs averted from 1996 to 2016. All spending was reported to 2016 US dollars.

Results: Across all ages and conditions median personal healthcare spending was US$114,339 (inter-quartile range (IQR): 110,303, 118,758) per DALY averted from 1996 to 2016, after adjusting for changes in population size, age structure, and incidence. Among 41 conditions with highest spending or DALYs, only Breast cancer was cost-saving, meaning that both spending per case effect and DALYs per case effect decreased. For 27 conditions, the spending per case effect increased and DALYs per case effect decreased; median healthcare spending was less than US$50,000 per DALY averted for 11 of these conditions, and greater than US$500,000 for nine. The other conditions were dominated, meaning that both spending per case effect and DALYs per case effect increased. Comparing age groups, healthcare spending was US$236,005 (IQR: 221,997, 251,559) per DALY averted for ages 0 to 64 years, and US$43,779 (IQR: 41,812, 45,828) for 65 or more years. The quality-adjusted price index was 0.80 (IQR: 0.79, 0.82), meaning health care prices increased 20% less than prices in the broader economy.

Conclusion: Healthcare spending efficiency differed substantially by condition, and was higher for ages zero to 64 than ages 65 or more. Contrary to popular belief, healthcare spending increased at a slower rate than the US economy from 1996 to 2006 when improved health outcomes were valued in dollars.

1:00 PM–2:00 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Modelling Methods and Theory

MODERATOR: **Arindam Nandi**, Center for Disease Dynamics, Economics & Policy

Measuring Care Coordination Based on Administrative Claims Data: A Network Analytic Approach to Assess the Meaning of Shared Patients

PRESENTER: **Alexander Engels**, University Medical Center Hamburg-Eppendorf (UKE)

Accountable care organizations and e.g. collaborative care interventions expect effective care coordination to be a core mediator for their presumed cost-effectiveness. To evaluate these interventions, it is essential to be able to measure care coordination to detect implementation failures or explain heterogeneous findings. In this study, we propose an extension for the metric "care density", which alleviates several empirical drawbacks of the available options for measuring care coordination (e.g. proneness to outliers or the inability to weight different relationships based on their importance). To demonstrate the utility of our approach, we compare care density with our extension in the ability to predict inpatient costs. We use patients with schizophrenia as an example, because we assume that effective care coordination should prevent avoidable hospitalizations for these patients.

We identified patients with schizophrenia in 2015 based on German claims data of the AOK Baden-Württemberg and assessed their individual 12-month pre-period to determine control variables and a 24-month follow-up to assess inpatient costs. To measure care coordination, we constructed patient-sharing networks analogous to the established metric "care density", but derived an alternative formula that allowed us to determine weights for different relationship types based on their significance for preventing hospital admissions. We employed 10-fold cross validation and two-part models to compare the metrics in their AUC and R^2 when predicting either hospital admissions or inpatient costs.

For N=23,009 patients with schizophrenia, we found that our extension was superior both in terms of AUC and R^2 when compared to regular care density. While the AUC increased from 0.707 to 0. 717, the R^2 increased from 10.97% to 12.01%. Contrary to our metric, care density did not account for any additional variation after confounders were included in the two-part models. The expected inpatient costs of a patient varied between 4088€ and 6395€ based solely on their respective quintile on the proposed metric.

Our extension of care density represents a flexible and transparent metric for care coordination. One particular strength of the method is its ability to weight relationships based on their importance for achieving a specific outcome (e.g. preventing hospitalizations). A post-hoc analysis of these weights may offer insights into the relevance of certain provider relationships when treating a chronic disorder. Furthermore, these weights could be optimized to predict alternative outcomes (e.g. quality of life). Hence, the metric can be adapted to a variety of settings. For patients with schizophrenia, our results indicate that care coordination could be a neglected cause for inpatient costs.

A Bargaining Approach: A Theory on ICER Pricing and Optimal Level of Cost-Effectiveness Threshold

PRESENTER: **Mikel Berdud**, The Office of Health Economics

AUTHORS: Adrian Towse, Jimena Ferraro

Objectives: Cost-effectiveness thresholds (CETs) can be used to identify what is good value for money for reimbursement decisions. Although the mechanism (which we call "ICER pricing") is well defined, there is a lack of theoretical economic models exploring the allocation of consumer and producer surplus, and social welfare generation under ICER pricing and different CET levels. This paper addresses this gap in the theoretical literature by generalizing the model proposed in Pandey, Paulden and McCabe (2018).

Methods: we propose a general model based on economic theory that incorporates the payer's and the developer's bargaining power through the Nash bargaining approach. We propose a baseline model based on existing theoretical approaches and we create different price setting scenarios by assuming different distributions of players' bargaining power, the role of R&D costs as a sunk cost, dynamic price competition, non-uniform distributions of developers' reserve ICERs (prices) – willingness to enter in the market – and mid-/long-term health budget flexibility. For each scenario we explore the implications of the ICER pricing on the optimal level CET and the distribution of the consumer and producer surpluses.

Results: Results show that when the payer has effective bargaining power (e.g. therapeutic competition, budget constraints, price caps), an efficient CET value could be higher than the supply-side CET with sufficiently large payer bargaining power. This level of CET does not involve a net loss for consumers in terms of surplus. The same implication draws from the case of flexible /increasing health budgets. However, for the latter, both players obtain additional surplus due to the extra funding, while in the former, the benefit comes from transferring some of the surplus of the developer to the payer via a price effect. By the incorporation of R&D investments as a sunk cost we show that CET values that are efficient in the short run and maximise access may force industry to supply at cost to cover, in part, the R&D investment. In such cases, the optimal CET, the one that incentivizes innovation in the long-term at the maximum achievable short-term access to medicines may be higher than the one that only maximises the short-term benefit of the payer. Finally, if reserve ICERs of the industry concentrate around a narrow range of threshold values, then the optimal threshold, or alternatively the threshold that equates the surpluses of the payer and the developer, might increase depending on the shape skewness of the distribution.

Conclusion: under the four implications discussed above, applying a supply-side CET to maximise consumer surplus in the short-term may result in inefficient allocations of health resources, where new and cost-effective technologies could be denied access in the long term. This could subsequently reduce overall benefit to society in both the short run – patients not having access to valuable interventions, and developers making a loss – and the long run – reduced investment in R&D. Regulation of pharmaceutical prices should be informed by a clear understanding of both the market structure, and the procurement and contracting environment.

Reflecting Uncertainty in Health Benefits Package Design: Implications for Research Priorities and Investment Decisions

PRESENTER: **Laetitia Helene Marie Schmitt**, Centre for Health Economics at the University of York

AUTHORS: Beth Woods, Jessica Ochalek, Prof. Karl Claxton, Paul Revill, Dominic Nkhoma

Introduction: Health benefits packages (HBPs) are increasingly used in many countries to guide spending priorities on the path towards Universal Health Coverage. Their design is, however, informed by an uncertain evidence base but research funds are limited. This gives rise to the question of which piecea of research relating to the cost-effectiveness of interventions would most contribute to improving resource allocation.

Method: We propose to incorporate research prioritization as an integral part of HBP design. We have therefore developed a framework and a freely available companion stand-alone tool, to quantify in terms of net DALY averted, the value of research for the interventions considered for inclusion in a package. Using the tool, the framework can be implemented using sensitivity analysis results typically reported in cost-effectiveness studies. To illustrate the framework, we applied the tool to the evidence base that informed the Malawi Health Sector Strategic Plan 2017-2022.

Findings: Out of 21 interventions considered, eight investment decisions were found to be uncertain and three showed strong potential for research to generate large health gains: 'male circumcision', 'community-management of acute malnutrition in children' and 'Isionazid preventive therapy in HIV+ individuals', with a potential to avert up to 65,762, 36,438 and 20,132 net DALYs respectively.

Interpretation: Our work can provide a useful basis for communication between national health authorities and research funders to help ensure research funds are invested where they have the largest potential to impact on the population health generated via HBPs.

Funding: The study was supported by the GCRF *Thanzi la Onse* (Health of All) research programme (MR/P028004/1).

Exploring the Impact of Stochasticity in Individual-Level Models of Infectious Diseases with Low Incidence Rates

PRESENTER: **Stephen Mac**, Institute of Health Policy, Management and Evaluation, University of Toronto

AUTHORS: Marina Richardson, Beate Sander

Introduction

Individual-level models have been increasingly used for model-based economic evaluations of infectious disease interventions where individual-level characteristics, dynamic transmission, and stochasticity are important considerations. Stochasticity, or randomness, reflects uncertainty from random processes and is often embedded in parameters not attributable to the disease or intervention. For low-incidence diseases, stochasticity can have a considerable influence on outcomes such as quality-adjusted life years (QALYs). Using two individual-level models as examples, this paper discusses the trade-off between the model's verisimilitude and its ability to assess the overall burden of disease, or benefit of an intervention.

Methods

Two examples of low incidence infectious diseases in Canada are Lyme disease (LD) and Group B Streptococcus (GBS). An individual-level state-transition LD model was developed to estimate the attributable health burden, in QALYs lost and health outcomes. The model follows 100,000 individuals over their lifetimes comparing a LD scenario where incidence rate is 6.7/100,000 to a scenario with no LD. Since LD-associated death is rare, only other-cause mortality was captured. However, small differences in the number and timing of these deaths affected

the QALYs lost due to LD, at times showing that QALYs are gained in the LD scenario. An individual-level state-transition GBS model was developed to simulate 150,000 pregnant women (with dynamic inclusion of their babies born over time) to assess the cost-effectiveness of a potential vaccine compared to the standard of care (SOC), i.e., screening, alone or in combination with a vaccine. Current screening protocols reduce the incidence of GBS in mothers and babies, and a vaccine has the potential to prevent pre-term births and stillbirths. However, given the low incidence of GBS (2.12 cases/1,000 live births), variation in non-GBS stillbirths and deaths (for women and babies) due to stochasticity often outweighed the benefits achieved from the interventions. We explored the effects of stochasticity using discounting, running scenarios limiting non-disease and non-intervention stochasticity, categorizing outcomes, and using different outcomes.

Results

The use of discounting showed that the random timing of the non-disease or non-intervention parameters affected overall QALYs to the extent where conclusions were reversed. Seeding was successful in identifying stochasticity-driven parameters in both models (i.e., other-cause mortality). Using 10 seeded simulations of 100,000 individuals, the mean QALY difference from LD when probability of other-cause mortality was included vs. excluded was -21 (95% CI, -575, 533), and -82 (95% CI, -87, -77), respectively. Further, with the GBS model, the separation of QALYs gained for the mother, and baby was helpful in identifying parameters (e.g., stillbirth, other-cause mortality during "pregnant years") driven by randomness that disproportionately affect, and hide, QALY gains of GBS interventions. The use of disease-specific outcomes (e.g., cost/case averted) was helpful in deciphering the potential value of the potential vaccine as a standalone intervention or as an add-on to SOC.

Conclusion

Stochasticity is important and can have a significant impact on modeled QALYs for diseases with low incidence rates resulting in conflicting conclusions. Future research is required to achieve optimal balance between meaningful results and accounting for stochasticity.

2:30 PM–3:30 PM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ORGANIZED SESSION: Health, Health Dynamics and Socioeconomic Disparity Quantified with Machine Learning

SESSION CHAIR: **Malene Kallestrup-Lamb**,

DISCUSSANT: **John Kolstad**, University of California, Berkeley; **Eric French**, University of Cambridge; **Jonathan Skinner**, Dartmouth College

Predictive Modelling of Health and the Socioeconomic Disparity

PRESENTER: **Mr. Nikolaj Udengaard Hansen Sr**, Aarhus University

The relationship between socioeconomic status and health over the life-cycle is well established but remains poorly understood. To shed some new light on the evolution and persistence of the socioeconomic health inequality, this paper uses predictive modelling and extensive medical history to form individual health risk scores. The data used stem from rich longitudinal administrative registers on health, demographics, and socioeconomic characteristics. This approach allows for an objective evaluation of health differences over the course of life and deviates from existing literature that has focussed mainly on subjective measures of health such as self-reported health. The novelty of our health scores is that they allow for several competing health risks, that can freely interact to form scores of individual health. We first evaluate the health scores across several definitions of socioeconomic status to gauge their life-cycle health dynamics. Secondly, we exploit the knowledge of the inner workings of our predictive algorithms and extensive set of health characteristics, to dissect the health scores to understand why inequalities may occur and evolve the way they do. In this process, we investigate the within-socioeconomic-group health score heterogeneity to identify whether the low or good health label of certain socioeconomic groups is justifiable or stem from a many-to-one fallacy. Contrary to previous literature, we find that individuals in the lowest educational group remain in lower health on average throughout the life-cycle. In addition, we find that the group with highest economic affluence remains healthier while the health level of the lower ranking affluence groups converges at old-age. The health inequalities seems to stem, in part, from differences in diagnoses patterns over time. Furthermore, we identify a higher degree of health heterogeneity in lower socioeconomic groups.

Differences in Transitions between Health States across Socioeconomic Groups

PRESENTER: **Kenneth Kjaer Jensen**, Aarhus University

The association between health inequality and socioeconomic factors is well documented. This evidence is mostly based on studies focusing on a linear deterioration of health and thus overlooks how differences in health inequality differ across health states. However, for initiatives to effectively counter the negative effect of socioeconomic status on health, further insights on when differences arise and for which groups are needed. This paper estimate discrete health states of patients, allows for bidirectional changes between health states, and analyzes to which extend transitions between health states depend on socioeconomic factors. We use the population-wide Danish National Patient Register which has detailed daily observations on ICD codes for all patients' hospital visits covered by Danish universal health care. For the period 1995-2018, we find how many times each diagnose has been assigned to each patient for all past hospital visits. To find the underlying health states of the patients, we first map the combined history of each patient's ICD codes to a lower dimensional patient representation using an autoencoder and then perform cluster analysis on the patient representations. Autoencoders reduces the dimension in a non-linear way while also modeling similarities between patient representations making it a natural choice. That is, each time a patient visits a hospital and gets assigned additional ICD codes, we use the combined history of the patient to estimate a patient representation which is then assigned to a health state. Movements between health states are used to calculate transition probability matrices between health states of all patients and also for each socioeconomic group. Thus, individuals can move between any health state over time in discrete jumps which allows for more complex developments in health compared to monotonic or binary changes in health. Based on the transition probabilities for different socioeconomic factors, we uncover to what extent such differences are evident and at which health states such differences are most pronounced. This understanding is required to design initiatives aimed at reducing health inequality for sub-populations at an early stage aimed towards reducing social cost from health inequality and improving quality of life at later ages.

The Heterogeneous Risk and Dynamics of Healthcare Expenditures Using Multivariate Generalized Random Forest

PRESENTER: **Mr. Alexander O.K. Marin**

Many Americans face risks of catastrophic healthcare expenditures despite being covered by private or government health insurance and 62 percentage of all bankruptcies in the US were medically related in 2007.

The high persistence of healthcare expenditures contributes to this risk as even small health cost increases persist over time and accumulate to larger sums of out-of-pocket medical costs. To grasp the dynamics of healthcare costs, healthcare expenditures have previously been shown to follow a highly persistent ARMA(1,1) process. However, new research suggests that the persistence of healthcare expenditures differs across subpopulations implying that healthcare expenditure risk is heterogeneous. Despite these recent advances, relatively little is known about the demographic and socioeconomic variation in both healthcare expenditure persistence and risk.

In this paper, we investigate the heterogeneous risks and dynamics of healthcare expenditures using the Health and Retirement Study. We propose a new multivariate version of the generalized random forest to estimate heterogenous healthcare expenditure dynamics. Our new algorithm characterizes subgroups that are similar across several parameters as opposed to existing tree-based methods that consider similarity of a single parameter only. This novelty, is particularly attractive as ARMA(1,1) processes are characterized by three parameters. To our knowledge, this is the first algorithm that can identify heterogenous ARMA processes from short panels in a sample dependent way. Estimating healthcare expenditure processes with our multivariate generalized random forest, we find lots of heterogeneity in the dynamics of healthcare expenditure. Those with low levels of education have more persistent and volatile health costs compared to households with higher levels of education and high incomes.

To gauge each subpopulations healthcare expenditure risk, we use the estimated health cost processes and simulate the lifetime healthcare expenditure effect of an age 65 shock. In the subpopulation with highest income and longest education one percentage of households suffer more than $31,800 in unexpected health costs in remaining life whereas one percentage of the least educated suffer more than $50,700. However, if high income, high education individuals are uninsured their lifetime healthcare expenditure risk approach the level of the least educated and the uninsured in general face a 40 percentage larger healthcare expenditure risk.
Besides contributing with our new multivariate generalized random forest, this paper provides new insights into the social inequalities in healthcare expenditure risks which has relevance for households, health insurers and policymakers.

2:30 PM –3:30 PM WEDNESDAY [Health Care Financing And Expenditures]

Financing to Achieve UHC

MODERATOR: **Bryan Patenaude**, Johns Hopkins Bloomberg School of Public Health

Mortality Reduction and Financial Risk Protection Benefits of Expanded TB Control in Ethiopia: Findings from a Modelling Study

PRESENTER: **Lelisa Fekadu Feka**, UIB

Tuberculosis (TB) represents a large public health threat globally. The economic burden of seeking TB care places people at a high risk of financial hardship. The World Health Organization's TB Strategy aims to end TB and fully shield TB-affected households from catastrophic health expenditure (CHE) by 2035. The impact of expanded TB control on reducing TB deaths and CHE across income quintiles was assessed in Ethiopia. Three TB control strategies were investigated: active case finding; enhancing directly observed therapy, short-course (DOTS) implementation for drug-susceptible TB (DS-TB); and improving multidrug-resistant tuberculosis (MDR-TB) care. We used the TB impact model and estimate (TIME) to project intervention impact on TB incidence, mortality and notifications. Using TIME outputs and costs borne by patients, we projected reductions in TB-related deaths and the incidence of CHE due to scale-up of three TB control strategies over 2018-35. A case of CHE was defined as total costs (both direct and indirect costs) exceeding 20% of household annual income. Intervention impact was quantified by income quintile as changes in the number of households incurring deaths and CHE relative to the baseline. In Ethiopia, around 757,000 TB-related deaths and 601,000 TB-related CHE cases would occur over 2018-35. Active case finding could reduce deaths and CHE by 27% and 32%, respectively; enhancing DOTS for DS-TB would avert 25% of deaths and 15% of CHE; and improving MDR-TB care would avert up to 1% and 6% of deaths and CHE, respectively. Both mortality and financial protection benefits would be greatest for the poorest two income quintiles. Improving the delivery of TB control strategies, such as active case finding and DOTS for DS-TB, reduces mortality and financial hardship for affected households. Ensuring that TB-affected households are given universal access to person-centered care and adequate financial protection is essential in the combat against TB.

Authors*

Lelisa Fekadu Assebe[1], Abdulrahman Jbaily[2], Andargachew Kumsa[3], Mieraf Taddesse Tolla[2], Kjell Arne Johansson[1], Rein Maria Geert Jan Houben[4], Nabila Shaikh[4], Stéphane Verguet[2]

Financing Venezuelan Migrant Integration in Colombia's Health System during the COVID-19 Crisis: An Estimation of the Financial Needs and Funding Alternatives

PRESENTER: **Jose Luis Ortiz**, Abt Associates

AUTHORS: Mr. Jonathan Cali, Michelle Barliza, Otoniel Cabrera Sr.

Background: Approximately 1.76 million Venezuelan migrants reside in Colombia: 760,000 regular migrants eligible to join Colombia's Social Insurance System (SGSSS) and access comprehensive health services, and 1 million irregular accessing only emergency care and vaccinations. Millions more cross the border temporarily for health care and other services. The Colombian government has committed to integrating migrants into the health system, yet only 245,000 regular migrants are enrolled in SGSSS and the economy is projected to contract 7.2 percent[1] due to COVID-19. USAID's Local Health Systems Sustainability Project (LHSS) supported the Ministry of Health (MoH) to analyze the cost of providing health care to Venezuelan migrants and identify new revenue to guarantee sustainable access.

Methods: LHSS estimated costs by analyzing national databases of health services provided to migrants last year and estimating the cost and utilization of defined service packages for maternal and HIV care that MOH would provide for uninsured migrants (regular and irregular). We modelled four scenarios based on insurance coverage and proposed provision of priority services to uninsured migrants:

- the current scenario, with 245,000 insured and 1.52 million uninsured with access to emergency services and vaccinations,
- 425,000 insured and access to emergency, HIV, maternal services, and vaccinations for 1.34 million uninsured,
- 760,000 regular migrants insured and 1 million uninsured with access to emergency, HIV, maternal services, and vaccinations,
- SGSSS enrollment for all migrants

To identify opportunities to mobilize resources, LHSS examined potential cost savings from efficiency gains. We calculated the average unit cost for a sample of procedures provided to migrants and analyzed the variability of costs among providers within Colombia's Departments. We then calculated the savings if the costs for each procedure matched the 25th or 50th percentile of provider costs, depending on the procedure. We reviewed the experiences of 15 model countries and interviewed 13 stakeholders to identify new funding mechanisms, and analyzed their feasibility in Colombia based on support from stakeholders, fiscal impact, and regulatory and operational feasibility.

Results: Costs ranged from US$100 million annually (0.03% of GDP) for the current scenario to US$321 million (0.12% of GDP) for scenario 4. Scenario 3 costs US$206 million annually. Improving efficiency could save up to US$3.1 million, about 3.1% of the current scenario's cost. We identified 11 potential funding sources contributing up to US$548 million annually combined. They include development impact bonds, debt swaps, diaspora bonds, tourist health fees, partial insurance premium contributions, and contributions from migrants shifted to the contributive regime through labor formalization.

Conclusions: Quantifying the costs of integrating migrants into the health system and identifying new funding sources are critical for expanding access to services. Based on this analysis, MoH will pursue scenario 3, enrollment of all regular migrants and expansion of HIV, maternal, and other priority services to the uninsured. The results are informing national budget discussions and the LHSS-supported development of a national migrant health policy, and complement LHSS support to enroll migrants in SGSSS and implement new mechanisms for private and global public funding for migrant health.

[1] https://www.worldbank.org/en/country/colombia/overview

Financial Risk Protection in the COVID-19 Pandemic and Recession for Households Insured By Indonesia's Jaminan Kesehatan Nasional

PRESENTER: **Ms. Lyubov Teplitskaya**, Palladium

AUTHORS: Kevin Ward, Dorit Talia Stein

Background. Globally, households have postponed or cancelled healthcare visits in response to the COVID-19 pandemic, resulting in temporary reductions in out-of-pocket health expenditure (OOPHE). However, the accompanying economic contraction may cause some households to spend a greater share of their total expenditure on healthcare. This risk is greatest among poor households, which tend to experience the largest reductions in consumption during economic contractions. To assess the pandemic-related change in financial risk protection among households insured by Indonesia's national health insurance scheme (JKN), the USAID-funded Health Policy Plus project – in collaboration with the Indonesia Ministry of Health's Center for Health Financing and Insurance – estimated changes in healthcare utilization, out-of-pocket health

expenditure, and household consumption and the impact of these changes on catastrophic health expenditure (CHE) incidence in each of Indonesia's provinces.

Methods. Using 2019 and 2020 JKN claims data from SISMONEV, we estimated the percent change in 2020 healthcare visits to hospitals and primary care clinics at the national level compared to a projected counterfactual without COVID-19. Next, we estimated the change in healthcare utilization at the province level, using Google's COVID-19 Community Mobility Reports to calculate a province-to-national ratio for the change in mobility and applying that ratio to the national estimate of the change in healthcare utilization. We then used these province-level estimates to adjust OOPHE for households sampled in the 2019 National Socioeconomic Survey (Susenas) and covered by JKN. Finally, we estimated pandemic-related reductions in household consumption by pre-pandemic household consumption percentile (using a recent analysis from the SMERU Research Institute) and applied these estimates to the households in Susenas to calculate the change in CHE incidence by province, using a threshold of 10% of household consumption.

Results. Primary care visits by JKN members in Indonesia decreased by 28% in 2020 compared to projected counterfactual visit volumes. Inpatient claims under JKN's diagnosis-related groups payments decreased by 37% and outpatient claims decreased by 36% in hospitals. The estimated change in household OOPHE ranged from -7% in East Nusa Tenggara province to -40% in Bali. Provinces with poorer households and smaller reductions in mobility tended to see increases in CHE incidence, whereas provinces with wealthier households and greater reductions in mobility were more likely to see reductions in CHE incidence. The pandemic-related change in CHE incidence ranged from +15% in Southeast Sulawesi to -43% in Bali.

Conclusions. Healthcare visits in Indonesia have declined due to COVID-19, reducing average household OOPHE in all provinces. Yet poorer households – and certain provinces as a whole – have experienced an increase in CHE incidence due to large reductions in total consumption. Given these results, the Government of Indonesia (GOI) must ensure that subsidized (poor and near-poor) members do not face OOPHE during the COVID-19 crisis. GOI may use the results of this analysis to: (1) prioritize central government transfers for provinces in greatest need of resources for essential healthcare services; and (2) to better target additional cash transfers or social safety net payments for poor households at risk of experiencing CHE.

Illness, Financial Risk, and the Importance of Wage Loss Insurance in the Universal Health Coverage Agenda: Empirical Evidence from India

PRESENTER: **Suhani Jalota**, Stanford University

AUTHORS: Prof. Grant Miller, Aditya Shrinivas, Aprajit Mahajan

Background: A key aim of Universal Health Coverage (UHC) is to protect individuals and households against the financial risk of illness. Large-scale health insurance expansions in low- and middle-income countries are therefore a central part of the UHC agenda. Importantly, however, health insurance does not address the other key dimension of financial risk associated with illness: forgone labor income (due to short-term disability). This concern applies disproportionately to the poor, who overwhelmingly work as day-laborers rather than holding salaried jobs.

Methods: Focusing on India (which accounts for half of those impoverished due to illness globally), we use two rich household panel surveys to provide new empirical evidence on the relative importance of lost labor income and medical care spending during episodes of illness. Specifically, we use both monthly panel data collected from roughly 1,000 households in India's semi-arid regions over 5 years and also nationally-representative panel data collected from more than 40,000 households across the country in a difference-in-difference framework, estimating the differential impact of illness episodes on lost labor income and medical care spending across the socio-economic distribution.

Findings: We find that among the poorest households, lost labor income due to illness is roughly 50% of total household spending – nearly 5 times greater than medical spending. Alternatively, among the most affluent households, lost labor income is less than 5% of total household spending – and medical spending roughly 3 times greater. Put differently, lost labor income accounts for more than 80% of the total economic burden of illness among the poorest, but only about 20% of the economic burden of illness among the most affluent – a socio-economic gradient present in the Indian population generally.

Interpretation: Lost labor income accounts for a substantial portion of the total economic burden of illness in India – and importantly, disproportionately among the poorest households. If Universal Health Coverage truly aims to protect households against the financial risk of illness – particularly poor households, the inclusion of wage loss insurance or another income-replacement benefit is essential.

2:30 PM –3:30 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Costing in a Pandemic: Challenges and Experiences in Costing COVID-19 Health Care Provision

SESSION CHAIR: **Anna Vassall**, London School of Hygiene & Tropical Medicine

ORGANIZER: **Sergio Torres Rueda**, LSHTM (London School of Hygiene and Tropical Medicine)

DISCUSSANT: **Tessa Edejer**, World Health Organization

Resource Estimation for COVID-19 Response: A Comparative Analysis

PRESENTER: **Andrew Mirelman**, WHO

AUTHORS: Odd Hanssen, Tessa Edejer

When the COVID-19 pandemic emerged in 2020, many health systems had to mobilize responses to the urgent situation. In the early and middle stages of the pandemic, various levels of country preparedness and rapid development of information about the disease, lead to uncertainty about the resources needed for the response. Estimates of this cost were critical for mobilizing international funding, developing (sub)national response strategies, and understanding where investments are needed. Costing efforts were undertaken to establish resource needs for health supplies, infrastructure, human resources, as well as diagnostics and therapeutics based on the best knowledge of treatment at the time of the costing. This work presents a comparative view of the resource estimation methods and findings from various efforts by academics and multinational organizations. The results show that there are high levels of variation in costed resource estimates based on the underlying epidemiologic estimates used, the primary costed activities, and the capacity of the health system to respond. The results of costing efforts also depend on whether normative recommendations for treatment are used and how health system constraints enter into the costing equation. The findings from this work show that there is a diversity of costing approaches for the COVID-19 response, and that the objective, perspective and assumptions of COVID-19 costing need to be considered beyond the bottom line.

Inpatient Care Costs of COVID-19 in South Africa's Public Healthcare System

PRESENTER: **Ijeoma Edoka**, PRICELESS SA, University of the Witwatersrand

AUTHORS: Heather Lynne Fraser, Lise Jamieson, Gesine Meyer-Rath, Winfrida Mdewa

Coronavirus disease (COVID-19) has had a devastating impact globally, with severe health and economic consequences. To prepare health systems to deal with the pandemic, epidemiological and cost projection models are required which can inform budgets and efficient allocation of resources. This study estimates daily inpatient care costs of COVID-19 in South Africa, an important input into cost projections and economic evaluation models.

We adopted a micro-costing approach, which involved the identification, measurement and valuation of resources used in the clinical management of COVID-19. We considered only direct medical costs for an episode of hospitalisation from the perspective of the South African public health system. Inpatient costs per patient day were estimated for consumables, capital equipment and human resources for three levels of care: general wards, high care wards and intensive care units (ICU). We carried out a probabilistic sensitivity analysis.

We found that average daily costs per patient increased with the level of care. The highest average daily cost was estimated for ICU admissions: US$ 271 to US$ 306 (financial costs) and ~US$ 800 to US$ 830 (economic costs, excluding facility fee) depending on the need for invasive vs. non-invasive ventilation. Conversely, the lowest cost was estimated for general ward-based care: US$ 62 to US$ 79 (financial costs) and US$ 119 to US$ 278 (economic costs, excluding facility fees) depending on the need for supplemental oxygen. In high care wards, total costs were estimated at US$ 156 (financial costs) and US$ 277 (economic costs, excluding facility fees). Probabilistic sensitivity analyses suggest our costs estimates were robust to uncertainty in cost inputs.

Our estimates of inpatient costs are useful for informing budgeting and planning processes and can feed into cost-effectiveness analysis in the South African context. However, we acknowledge and reflect on key methodological limitations specific to the pandemic context. These stem from the impossibility of primary data collection and the significant uncertainty on certain parameters inherent when dealing with a new virus. Some important resource quantity estimations were based on evidence from other countries. Although our final cost estimates were robust to uncertainty in these inputs, variations in disease severity and risk factors may result in variations in these inputs across settings, potentially resulting in biased estimates of our average inpatient care costs. For other resources, we used normative best practices based on South African clinical guidelines to identify and estimate the average quantities of resource inputs. This may differ from real clinical practices, a limitation further exacerbated by evolving clinical guidelines in South Africa as new clinical evidence becomes available. Therefore, further studies that collect primary data extracted from hospitalised patient records are required to provide further insights into real-world quantities of resources used in the management of COVID-19 in South Africa as well as to inform heterogeneity of costs.

Specifying the 'Ingredients' of Essential Emergency and Critical Care (EECC) to Enable the Costing of Care for Critically Ill Patients in the Context of the COVID-19 Pandemic: A Modified E-Delphi Process

PRESENTER: **Carl Otto Schell**, Karolinska Institutet

AUTHORS: Karima Khalid, Alexandra Wharton-Smith, Jacquie Narotso Oliwa, Hiral Shah, Raphael Kazidule Kayambankadzanja, Maria Jirwe, Lorna Guinness, Tim Baker

In hospitals throughout the world, and especially in low- and middle-income countries, preventable deaths due to insufficient identification and care of critically ill patients are common. Now, as a result of the COVID-19 pandemic, the world is faced with a surge in critically-ill patients, hospitals are operating above capacity, and care is often provided at lower resource levels than usual.

Care for critical illness saves lives. Essential Emergency and Critical Care (EECC) has been defined as the basic, effective care that all critically ill patients should receive in all hospitals in the world. EECC is feasible to implement, low cost, and universal across diagnoses. However, despite its simplicity, the interpretation of EECC can challenge traditional hospital organisation, both structurally and socially, leading to reduced implementation. In the context of developing an affordable treatment strategy for critically ill patients with COVID-19, a clear consensus on the content of EECC is needed, which will furthermore enable a description of the 'ingredients' for cost estimation exercises that can be used to leverage financing and evaluate value for money.

This study aimed to generate a global expert consensus on the specific clinical processes that constitute EECC and the care of critically ill COVID-19 patients, and to determine the costable 'ingredients' required for EECC's provision.

A modified eDelphi technique was used comprising three rounds of online surveys. Two hundred and seventy global experts with clinical experience in critically ill patients participated, covering diverse specialties and geographic settings. The experts provided iterative input to the proposed content until consensus was reached. The output from the eDelphi was adjusted by the study team and a group of specialist reviewer, to ensure that the included clinical processes fulfilled the criteria of effectiveness, universality, feasibility and coherence. Evidence from the literature and the expertise of the specialist reviewers were used to develop a list of costable 'ingredients' for the provision of care.

We identified 82 clinical processes in the eDelphi process and of those, 30 were determined to fulfil the criteria. From these, a list of 79 'ingredients' was derived. The 'ingredients' list is a first and necessary step to obtain resource use estimates and estimate cost-effectiveness of EECC and to compare EECC with other care approaches, such as advanced critical care using mechanical ventilation. Our study uses a rapid method to fully describe a healthcare approach and its associated resource use for costing in the context of a global pandemic.

Costs of COVID-19 in Pakistan: National Health Sector Estimates and Reflections on the Health Benefit Package

PRESENTER: **Sergio TorresRueda**, LSHTM (London School of Hygiene and Tropical Medicine)

AUTHORS: Ms. Sedona Sweeney, Fiammetta Bozzani, Nichola Naylor, Tim Baker, Carl Pearson, Rosalind Eggo, Nicholas Davies, Matthew Quaife, Simon Procter, Nichola Kitson, Dr. Maryam Huda, CHiL COVID Working Group, Raza Zaidi, Edwine Barasa, Mark Jit, Anna Vassall

COVID-19 has put significant financial strain on health sectors across the world, including in Pakistan. We calculated the full economic health sector costs of COVID-19 management in Pakistan over a 12-month period. We used epidemiological models to determine the total number of cases and deaths under four possible policy scenarios focussing on social distancing: (1) no mitigation, (2) a high level of reduction in contacts among symptomatic people and low levels of reduction in contact in the general population (3) a high level of reduction in contacts among symptomatic people and the general population; and (4) a 30-day lockdown followed by low levels of reduction in contacts in the general population. We carried out a bottom-up, ingredients-based costing from the perspective of the health sector, covering a range of activities including clinical management, screening and diagnosis, surveillance, case finding, and national-level management and sensitisation activities. We adopted a 'real world' perspective when determining resource use for clinical management, taking into account likely human resource constraints. We estimated a number of unit costs (e.g. cost per day in critical care), as well total national costs per year, and total cost per capita per year for each of the four scenarios.

The estimated cost per day of hospitalisation was US$ 33 for a severe case and US$ 221 for a critical case. The total costs at the national level varied by scenario, ranging from US$ 152 million in the scenario with high levels of reduction in contacts across symptomatic people and the general population to US$8.2 billion in the scenario with a 30-day lockdown followed by low reductions in contacts in the general population. The cost per capita ranged from US$0.7 to US$38.8. This represents between 0.1% and 2.6% of the GDP per capital, and between 1% and 59% of total health spending (including out-of-pocket spending).

Given the pervasiveness and potential long-term nature of COVID-19, we situated clinical management costs of COVID-19 within Pakistan's current health benefit package by comparing estimates of cost, cost-effectiveness and population in need across interventions and by modifying COVID-19-related costs imposed on non-COVID-19 interventions (e.g. additional personal protective equipment for all interventions related to respiratory illness). Assuming a number of different budgetary constraints, we reflect on potential trade-offs and opportunity costs of the COVID-19 response in Pakistan.

We conclude that as social distancing is relaxed the choices facing many low- and middle- income countries are likely to remain stark, without further rapid emergency financial support and careful consideration of the opportunity costs of the COVID-19 response within the health sector.

2:30 PM –3:30 PM WEDNESDAY [Health Care Financing And Expenditures]

FINANCING FOR UNIVERSAL HEALTH COVERAGE SIG SESSION: Funding for Effective Access to Services

MODERATOR: **Peter Binyaruka**, Ifakara Health Institute

Paying More to Wait Less: Estimating the Cost of Reducing Ireland's Public Hospital Waiting Lists

PRESENTER: **Aoife Brick**, Economic and Social Research Institute

AUTHOR: Conor Keegan

Aim: For many years investment in public hospital capacity in Ireland has not kept pace with increasing demand for care driven by rapid population growth and ageing. This has manifested itself through large waiting lists and long waiting times for elective treatment. The issue has recently been exacerbated by the service curtailment brought on by the Covid-19 pandemic. The aim of this analysis is to estimate the activity and expenditure required to clear the accumulated waiting list backlogs and maintain waiting times at 12 weeks accounting for future service demand.

Methods: Our methods draw on and refine for the Irish context methods developed in the UK. We use national administrative waiting list data for public hospitals, from January 2015 to October 2020, to examine trends in growth rates of additions to waiting lists and the total lists over time. This allows us to calculate the backlog of cases to be seen or treated at a point in time and the quantity of activity required to stabilise waiting lists at 12 weeks for outpatient, day patient and in-patient services. The required outpatient activity is costed at the average cost of an appointment while for day and in-patient treatment we estimate a complexity-weighted cost based on the procedure requirements, age, and sex of those on the waiting list in December 2018.

Results: We estimate that over an initial five-year period relevant activity across the three services would need to increase by between 10–18 per cent on 2018 levels depending on the service. The initial expenditure over the five-year period would be substantial at up to €1.1bn, or up to €212m per annum.

Discussion: This analysis has estimated that substantial activity and expenditure are required to clear waiting-list backlogs and maintain 12-week waiting times in Irish public hospitals. For this to be realised increases in staffing and bed capacity will be required. It may also be necessary to procure private capacity in the short term. The methods applied in this analysis can be applied at a specialty level to provide more nuanced projections of how long the backlogs will take to clear. In terms of resource allocation, planning and investment, evidence generated in this analysis should act as an important guide to policymakers if key policy reforms to reduce public hospital waiting lists in Ireland are to be realised.

(How) Can Intergovernmental Fiscal Transfers be Used to Transform Devolved Health Systems to Achieve Universal Health Coverage? Kenya's Experience

PRESENTER: **Brendan Kwesiga**, WHO Kenya Country Office

AUTHOR: Martin Sabignoso

Introduction

Effective implementation of health sector reforms for attainment of Universal Health Coverage (UHC) in devolved health systems depends on how the national government is able to leverage the use of intergovernmental transfers (i.e. conditional grants) to align allocation decisions at sub-national level. Since devolution in 2013, Kenya has implemented a number of conditional grants within the health sector. We set out to explore the design and implementation of the conditional grants in Kenya and implications of attaining of UHC.

Methods

Using a cross-sectional qualitative study design, data was collected through document reviews and semi-structured key informant interviews at national level and sub-national level. The analysis framework used considers the internal dimensions related to the conditional grant design and the external dimension focusses on the features in the implementation environment that influence ability to achieve the grant conditions.

Results

The positive design features observed were; ensuring that eligibility to access the funds is based on sub-national entity having the minimum capacity to perform the functions for which the transfers were made, use of allocation criteria that considers equity and performance/efficiency aspects, explicit conditions for use of funds (i.e. who and what is incentivized) and in building sustainability considerations. Even with positive design features, there were implementation challenges. To effectively enforce the conditionalities during implementation, we found that there was need to combine detailed contractual guidelines, technical assistance and application of incentives and sanctions for non-compliance. Implementation support functions like supervision, monitoring and audits were found to be stronger for development partner funded conditional grants.

Conclusions

Conditional grants design components need to explicitly indicate the intended policy goals (equity, efficiency, effective coverage and sustainability). Positive design should be reinforced through strengthening institutional and managerial capacities at national and sub-national level.

Multimorbidity Associated with Health Service Utilization and Out-of-Pocket Health Expenditures Among People with Hypertension in a Low-Resource Setting in Northern Peru

PRESENTER: **Alexander Monroy**, Universidad Peruana Cayetano Heredia

AUTHOR: Maria Kathia Cardenas

Introduction: Non-communicable diseases (NCDs) are one of the most important causes of mortality and morbidity worldwide. Multimorbidity, defined as having two or more chronic diseases, represents a greater disease burden leading to more complications for individuals and higher costs for health systems and society. Thus, multimorbidity leads to a greater utilization of healthcare resources and higher costs that often must be paid by patients through out-of-pocket (OOP) health expenditures. This study aims to assess the association between multimorbidity and the utilization of health services and OOP health expenditures.

Methods: This is a cross sectional study using baseline information from a salt substitution intervention in the northern of Peru (Tumbes region), collected in 2014. The population of this study was over 18 years. We selected those participants with diagnosed or self-reported hypertension. In addition to hypertension, we used the following self-reported NCDs: stroke, heart attack, heart failure, hypercholesterolemia and diabetes. We measured utilization of health services by the number of consultations in the last 12 months in adult people with hypertension. OOP health expenditures were defined by the aggregate payment made by the participant in the last 12 months to cover medications, tests, consultations, transportation, hospitalization, among others. OOP health expenditures were self-reported in local currency (Nuevos Soles) and converted into International dollars (Int.-$, 2014 values). We performed a negative binomial regression of the number of medical consultations. The analysis of OOP health expenditures included an ordinary least squares regression and a Tobit model. All models were adjusted for confounders (sex, age, marital status, level of education, socioeconomic level, type of health insurance, and obesity) and the analysis accounted for the number of clusters.

Results: Out of 2,376 participants in the primary study, only 411 had hypertension and were eligible. The average age of participants was 58.8 years (SD± 16.7), the majority were women (57.4%), most of them had secondary education (56.2%) and access to health insurance (88.3%), and the vast majority were overweight or obese (79.8%). The prevalence of multimorbidity was 40.1%. Furthermore, 10.5% of adults with hypertension had three or more chronic diseases. The average number of consultations for disease control in the last 12 months was 1.91 (SD: 3.37) and the median was 0 (IQR: 0-3). The average OOP health expenditures was Int.-$ 117.62 (SD: 320.34). The results of the regression models showed that having two chronic diseases was associated with a higher number of medical visits (1.42; 95% CI: 1.02-1.98) and higher OOP health expenditures (Int.-$74.86; CI 95%: 16.88-132.85) compared to having only hypertension. Moreover, having three or more chronic diseases was associated with an even greater number of medical visits (1.63; 95% CI: 1.03-.2.59) and higher OOP health expenditures (Int.-$313.67; CI 95%: 142.39 -484.94).

Conclusion: Having multiple chronic diseases is associated with increased health services utilization and increased OOP health expenditures in a low-resource setting in Peru. Future policies should focus on improving universal health coverage in this kind of setting to prevent complications of chronic diseases and to avoid impoverishing health expenditures.

2:30 PM –3:30 PM WEDNESDAY [Specific Populations]

Maternal and Infant Health in Low- and and Middle-Income Countries

MODERATOR: **Matthias Rieger**, Erasmus Universiteit Rotterdam

Socio-Economic Inequalities in Maternal Health Care Utilization in Nigeria.

PRESENTER: **Chukwuedo Oburota**, University of Calabar, Calabar

Socio-economic Inequalities in Maternal Health Care Utilization in Nigeria

Sub-Saharan Africa accounts for approximately 67 percent of global maternal deaths. Nigeria, accounts for 917 deaths per 100,000 live births. Recent data suggest that there are large socioeconomic inequalities in utilization of maternal health care services. For example, delivery at a health facility varies by about six-fold between the poorest and richest households. However, there is little systematic evidence about the extent of these inequalities across the full continuum: from the prenatal to the postpartum period. This study characterizes the extent of socio-economic inequalities in utilization during the prenatal, perinatal and postnatal period. Additionally, factors that contribute to these inequalities are examined. Studies for Nigeria have only focused on socio-economic inequalities in prenatal care and have neglected postnatal care which is a crucial component of maternal health care.

The paper uses data from the 2018 Nigeria Demographic and Health Surveys, a nationally representative survey of women of reproductive age between 15-49 years. The maternal health utilization variables are: receipt of antenatal care from a skilled provider (ANC), deliveries by skilled birth attendants (SBA), delivery in a health facility (FBD) and postnatal care attendance (PNC). The concentration indices are used to determine the extent of socioeconomic inequalities in the measures of health care utilization. The concentration indices (CI) are decomposed by population sub-groups (zone, locality, educational attainment, employment, spouse employment etc) to determine the contribution of each sub-group to inequalities in ANC, SBA, FBD and PNC. This is based on the approach proposed by Araar and Duclos and is useful for obtaining between and within group inequality estimates.

The concentration coefficients of the ANC and FBD (0.12; 0.32) are positive and statistically significant indicating that both utilization indicators are disproportionately concentrated among the wealthy. The CI for SBA and PNC (0.04 and 0.03) are positive and close to zero implying that the utilization of these services is evenly distributed between the poor and non-poor. Inequalities are more prevalent in the northern part of Nigeria and in the rural areas where the poor women do not have access to maternal health care services. The significant contributors to inequalities in the indicators of maternal health care utilization based on sub-group decomposition of the CIs are location of residence (rural area) which contributed 10.4% and 17.5% of inequalities in ANC and FBD. Others include women's education especially those who are not educated, spouse education, marital status, employment level (women who were not employed), geopolitical zone and wealth index. Locality, spouse, employment, marital status and education produced within group inequalities. Geopolitical zones and spouse education induced between group inequalities.

Improving literacy among men and women, enhancing employment opportunities across the gender strata and making maternal health care services accessible and affordable to women in the rural areas and northern parts of Nigeria would greatly reduce inequalities in maternal health care utilization. Also, an optimal combination of within and between group policies are necessary for tackling these inequalities.

The Aftermath of Femicides: Indirect Crime Exposure Effects on Newborn's Health

PRESENTER: **Mr. Henry Bernard Moscoso Miranda**, University of Barcelona

This paper studies mothers' indirect exposure to homicides on newborns' health outcomes.

To do so, I combine two datasets that accounts for mothers' residential address during pregnancy and the geographical coordinates of all homicides occurred in Ecuador in the period 2015-17.

To solve for endogeneity to crime exposure, I use three empirical strategies. First, I estimate the difference in birth weight between infants exposed to high versus low levels of homicide rates at the municipality level. Second, I use a DID estimation approach that analyzes the difference between being exposed to a homicide during pregnancy or not, relative to the analogous difference of being exposed within the 9 months following newborns' birth.

I also examine whether the mothers' stress related to homicide exposure is attenuated when they were previously exposed to other crimes. Finally, I consider a maternal fixed effects estimation that considers mothers that had several children in the period examined and that were subject to different exposure levels.

The results show that exposure to homicides during pregnancy generates a birth weight deficit of between 20 to 31 grams, compared to newborns exposed to homicides post-pregnancy. Moreover, once controlled by the maternal fixed effects, I find that newborns exposed to homicides have a birth weight deficit of between 110 to 257 grams, compared to their non-exposed siblings. Additionally, exposure to homicides generate gestational length reductions, and a decrease in the 1st minute Apgar score.

I further demonstrate no income and nutrition cofounding effects due to the occurrence of violent crimes.

These findings suggest the importance of establishing health policies that address the stress of affected individuals.

The Indirect Impact of COVID-19 Pandemic on Maternal and Child Mortality in Ethiopia: A Modelling Study

PRESENTER: **Mr. Amanuel Lulu Yigezu**, Ethiopian Public Health Institute

Background: According to the Ethiopian Federal Ministry of Health daily pandemic report, COVID-19 has caused considerable morbidity and mortality directly due to the virus. The occurrence of COVID-19 has caused serious interruption to high impact essential health services in Ethiopia like in many other countries. However, the indirect impact of the pandemic due to the interruption of other essential health services on maternal and child mortality has not been examined. Therefore, this study aimed to estimate the indirect impact of the COVID-19 pandemic on maternal and child mortality in Ethiopia.

Methods: We used the Lives Saved Tool (LiST) to estimate the impact of COVID-19. By varying the coverage of essential Maternal and Child Health (MCH) services from the baseline, we build four plausible scenarios that represent possible service interruptions possibilities. Scenario-1 represents a 25% average decrement in MCH service for a year, scenario-2 represents a 35% average service coverage decrement for a year, scenario-3 represents a 50% average service coverage decrement for a year, and the scenario-4 represent a 35% service coverage decrement for a half year duration. The Ethiopian Demographic and Health Survey 2016 (EDHS 2016), the Ethiopia Mini Demographic and Health Survey 2019 (EMDHS 2019) and for those variable which were not included in EDHS 2016 and EMHDS 2019, multivariate analysis estimates conducted on population-level coverage were used to estimate the baseline coverage and the impact of MCH interventions.

Results: Based on scenario-1, additional 10,252 child deaths, 379 maternal deaths, and 1,673 stillbirths would occur per year. Based on scenario-2, over a year, additional 26,307 child deaths, 2,197 maternal deaths and 7,876 stillbirths would occur. Based on scenario-3, additional 41,945 under-5 deaths, 4,038 maternal deaths, and 13,294 stillbirths would result in a year. Wasting was the most predominant factor contributing about 16% to 30% of the additional under-5 deaths.

Conclusion: A significant number of additional maternal and child deaths would occur in Ethiopia if the essential health service interruption persists, as seen in the first few months of the pandemic. This is more than the mortality so far caused by the pandemic itself.

Keywords: COVID-19, Coverage, Essential Health services, Ethiopia. Lives saved tool Maternal and Child Health, Wasting

2:30 PM –3:30 PM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Measuring the Impact of Policies Targeted at Specific Groups

MODERATOR: **Søren Rud Kristensen**, Imperial College London

Epidemiologic and Economic Analysis of Targeted Screening for Human Immunodeficiency Virus in Emergency Department in Spain

PRESENTER: **Maria Presa**, PORIB

AUTHORS: Jose Molto, Juan Gonzalez, Carmen Navarro, Miguel Angel Casado

Introduction:

Nearly of 14% of people living with human-immunodeficiency-virus (PLWH) are unaware of their own status. Decreasing the number of undiagnosed PLWH is key to reducing new HIV infections. HIV testing guidelines recommend strategies, which vary from universal screening to a targeted approach. This study aimed to evaluate the potential epidemiologic and economic impact of HIV screening in emergency departments compared to HIV testing as it is routinely performed in clinical practice, in Spain.

Methods:

A transmission model was used to estimate the cumulative HIV-infections incidence and associated cost in Spain over a 20-year time horizon. The analysis compared directed screening of high-risk patients who visited hospital emergency rooms, following recommendations issued for early diagnosis of PLWH at emergency services with HIV testing as they are routinely performed in clinical practice. HIV diagnoses-rate was considered to increase with targeted screening (0.59%). Population eligible for HIV screening at the emergency room included those patients diagnosed with sexually-transmitted infections, infectious mononucleosis, herpes zoster, pneumonia, drug overdose or prescribe with HIV post-exposure prophylaxis. To reflect their different transmission-risk and HIV-prevalence, population subgroups like men-who- have-sex-with-men (MSM), heterosexual males and females and people who inject drugs (PWIDs) were included. In a one-year cycles, the model represented the prevalent population of individuals with HIV in Spain, divided between different infection states with a different risk of transmission: diagnosed, diagnosed and in care, in care and on antiretroviral therapy (ART), and on ART and virally suppressed. Infectious individuals contribute to the incidence of new HIV infections in that year via their risk of transmission which was estimated by sexual contact among MSM or heterosexual population, and needles and syringes sharing among PWID, state of HIV infection and ART usage. Time from diagnosis to ART initiation was fixed at 44 days. Distribution of third drug in ART regimen was: 49.8%-INSTI, 25.4%-NNRT, and 24.8%-PI. HIV lifetime cost (€325,408; year 2020 values) included HIV-direct and -indirect costs. Healthcare resources consumed in the targeted screening was taken in account. Epidemiologic-, treatment-, transmission- and cost-related parameters were derived from literature and validated by an expert panel. One-way sensitivity analyses (OWSA) were carried out varying diagnoses rate with screening strategy and HIV lifetime cost.

Results:

Screening of high-risk population in hospital emergency departments was estimated to require €20 million investment by the Health System over the next 20 years. By counterpart it was expected to avoid 15,232 new HIV infections, compared to current HIV testing strategies. By population subgroup, with screening strategy, a total of 10,823, 4,157 and 252 HIV infections could be averted amongst MSM, heterosexuals and PWIDs, respectively. Such a reduction in HIV incidence would result in potential savings of €4,937 million over the next 2 decades. Economic return would be €251 per invested euro. The OWSA showed that the results are generally robust.

Conclusions:

The results of the HIV-transmission model suggest that a targeted screening program in emergency departments of Spain could increase HIV diagnoses, averting new HIV infections and resulting in potential savings compared to routine HIV testing.

Quantifying the Technical Efficiency of Annual National HIV Spending: A Data Envelopment Analysis of 81 Countries between 2010 and 2018

PRESENTER: **Kasim Allel**, Centre for Global Health Economics, UCL

AUTHORS: Gerard Joseph Abou Jaoude, Jolene Skordis, Hassan Haghparast Bidgoli

Background: HIV remains as a global concern of population health, and especially in countries with limited funds available to tackle the disease. New approaches to resource allocation and health-spending prioritisation are needed in scenarios of high scarcity.

Methods: We employed a data envelopment analysis (DEA) and a truncated regression to estimate the technical efficiency of 81 countries in delivering HIV/AIDS services from 2010 to 2018. Data were obtained from publicly available resources (UNAIDs, WHO, WB). In the DEA, we considered national HIV/AIDS spending as the input, and prevention of mother to child transmission (PMTCT) and antiretroviral treatment (ART) as outputs. An output-oriented DEA model was calculated to project efficiency scores over time using 3000 replications for bias-correction of technical efficiency scores. The model was adjusted by exogenous variables to account for environment-specific country-level characteristics including different types of spending and human development characteristics.

Findings: Overall, the average of our bias-corrected DEA score was 55.6% over the period. However, efficiency scores varied considerably across countries with means by quartile of 14.5%, 40.7%, 71.5%, and 99%. Rule of Law, Gross National Income, HDI, HIV prevalence, out-of-pocket expenditures, development assistance for health spending, and current health expenditures were the most significant exogenous factors associated with DEA scores. A sensitivity analysis was employed adding other sources of spending, such as government and external expenditures, and the number of nurses and health-posts. Nevertheless, small variations were observed in technical efficiency scores.

Interpretation: There is still a substantial gap for enhancing the efficiency of HIV/AIDs spending, by the use of the existing resources more accurately. Countries with higher HIV-burden were more likely to have higher spending on HIV (Pearson's correlation coefficient=0.19), but they also presented the lowest efficiency scores (e.g., Democratic Republic of the Congo, Iran, Equatorial Guinea, Guinea-Bissau, Somalia). Improving the efficiency of HIV/AIDs spending could reduce additional expenditures to be taken across countries avoiding further burden attributed to HIV/AIDs.

Keywords: HIV/AIDS, Efficiency analysis, Data envelopment, HIV spending, Performance.

Pay for Performance in Primary Health Care: The Contribution of the Program for Improving Access and Quality of Primary Care (PMAQ) on Avoidable Hospitalizations in Brazil, 2009-2018

PRESENTER: **Everton Silva**, University of Brasilia

AUTHORS: Timothy Powell-Jackson, Leticia Xander Russo, Roxanne J. Kovacs, Garibaldi Dantas Gurgel Junior, Luciano Gomes, Juliana Sampaio, Airton Tetelbom Stein, Helena Eri Shimizu, Adriana Falangola Benjamin Bezerra, Allan Nuno, Jorge Barreto

Background: Recent reviews suggest that evidence on the effect of pay-for-payment (P4P) schemes on provider performance, utilisation of services, patient outcomes, and resource use is mixed in low- and middle-income countries (LMICs). Brazil introduced its first national-level P4P scheme in 2011 (PMAQ – Brazilian National Program for Improving Primary Care Access and Quality). During three rounds, the Brazilian Ministry of Health provided financial incentives for a wide variety of structure, process, and outcome indicators. It is expected that PMAQ would improve prevention of prevalent conditions and introduction of effective interventions which would result in fewer hospitalisations for ambulatory care sensitive conditions (ACSCs).

Objective: To estimate the association between PMAQ and hospitalisations for ACSCs based on a panel of 5,564 municipalities.

Methods: We conducted a fixed effect panel data analysis over the period of 2009-2018, controlling for socioeconomic, demographic, and supply-side variables. The outcome is the hospitalization rate for ACSCs among people under 64 years of age per 10,000 population. Our exposure variable is defined as the percentage of the PMAQ teams in terms of total number of family health teams (FHTs), which may better reflect the expansion of PMAQ at each point in time. We included a set of covariates relevant for the hospitalization rate for ACSCs: coverage of primary health care, hospital beds per 10,000 population, education, real GDP per capita and population density. All estimates included year dummies and robust standard errors clustered by municipality. We also provided several sensitivity analyses, by using alternative measures of the exposure and outcome variables, and a placebo test using transport accident hospitalizations instead of ACSCs.

Results: PMAQ expanded rapidly, reaching 50.1% of the FHTs in the first round (2011-2012), 75.7% in the second round (2013-2015) and 86.9% in the third round of implementation (2016-2018). The average adjusted hospitalization rate for ACSCs amongst people aged 0-64 years decreased by 26.8% (from 127.9 per 10,000 population in 2009 to 93.6 per 10,000 in 2018). The results show a negative and statistically significant association between the rollout of PMAQ and ACSC rates for all age groups. An increase in PMAQ participating of one percentage point decreased the hospitalization rate for ACSC by 0.0356 (SE 0.0123, P=0.004) per 10,000 population (aged 0-64 years). This corresponds to a reduction of approximately 60,829 hospitalizations in 2018. The impact is stronger for children under five years (-0.0940 SE 0.0375, P=0.012), representing a reduction of around 11,936 hospitalizations. Our placebo test shows that the association of PMAQ on the hospitalization rate for transport accidents is not statistically significant, as expected.

Conclusion: Although PMAQ was associated with a reduction on the hospitalization for ACSCs across municipalities, its contribution to the ACSCs hospitalizations was relatively modest.

The Impact of the Possible Accountable Care Organization on Maternal and Infant Health in Nepal

PRESENTER: **Ms. Courtney Baird**, Brown University

AUTHORS: Mr. Bishnu Bahadur Thapa, Omar Galarraga

Background: As a developing country, Nepal faces many challenges in providing access to high quality care within severe budgetary constraints. In 2008, the Possible organization entered into a public-private partnership with the government of Nepal to create an accountable care model in the Achham district, which uses financial incentives to align provider payments with quality performance and tracks progress on over 80 performance metrics. To date, one peer-reviewed study has evaluated the impact of the Possible ACO on health outcomes in Nepal. However, the findings were limited by the study's pre- and post-intervention methodology which lacked a control group. The objective of this study is to employ quasi-experimental research methods to evaluate whether women and infants who are aligned with the Possible ACO have better health outcomes than those who are not aligned with the Possible ACO.

Methods: We used data from the 2001, 2006, 2011, and 2016 Demographic and Health Surveys of Nepal (NDHS), which are nationally-representative household surveys that provide data for a wide range of population health indicators. This study employed a difference-in-differences research design with year and district fixed effects and standard errors clustered at the district level to provide a more valid estimate of the effect of the Possible ACO on health outcomes. Using this strategy, causal effects are identified by comparing the change in the quality measures for patients aligned with the Possible ACO to the change in the quality measures for the control group. The treatment group consisted of NDHS respondents who resided in the Achham district. The control group consisted of NDHS respondents who did not reside in the Achham district.

Results: We found significantly greater improvements in three maternal and infant health indicators in the ACO group as compared to the non-ACO group. The change in the probability of a pregnant woman delivering their child in a healthcare facility in the Possible ACO group was 15.23 percentage points higher than the corresponding change in the non-ACO group (p=0.000). Additionally, the change in the probability of a pregnant woman completing four antenatal visits prior to delivery in the Possible ACO group was 30.47 percentage points higher than the corresponding change in the non-ACO group (p=0.000). Furthermore, the change in the probability of a child dying within 12 months of their birth in the Possible ACO group was 0.82 percentage points lower than the corresponding change in the non-ACO group (p=0.001).

Discussion: We found that the Possible ACO was associated with statistically significant improvements in the probability of an institutional birth, the use of ANC visits during pregnancy, and infant mortality, as compared to the non-ACO group. A major strength of this study is the fact that the Possible ACO covers one specific district in Nepal, enabling a simple pre-intervention attribution to the treatment and control groups. Overall, this study leverages a quasi-experimental research design to provide stronger evidence on how accountable care organizations can impact the quality of maternal and infant health in Nepal specifically, and in developing countries more generally.

2:30 PM –3:30 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: A Greener Form of Economic Evaluation

SESSION CHAIR: **Paula Lorgelly**, University College London

DISCUSSANT: **Martin Caunt**, NHS England (Deputy Director Greener NHS)

Expanding the Societal Perspective to Include Environmental Impact: Delivering Health Improvements for Patients and the Planet

PRESENTER: **Paula Lorgelly**, University College London

Background/Objective: Economic evaluations often employ a health and social care perspective. When a societal perspective is employed this will additionally include the costs (and benefits) to patients and their caregivers, productivity losses/gains and depending on the intervention may include broader public sector costs and benefits like criminal justice and education. Given the current climate emergency and the need to be sustainable, we consider whether the societal perspective should be broadened further to include an intervention's environmental costs (and benefits) and if so how. For example, single use plastics are commonplace in medicines packaging and some products require incineration.

Method: Responsible producers should understand the environmental impact of the goods and services they produce. There is a defined mechanism for assessing this: Life Cycle Analysis (LCA) evaluates a product's impact on the environment through its lifetime. LCA often results in an Environmental Product Declaration (EPD), currently there is no legislative requirement to produce EPDs in any sector in the UK. The National Institute for Health and Care Excellence's (NICE's) most recent pharmaceutical approvals were reviewed to identify if EPDs are readily available, i.e. if evidence of a completed LCA is available for newly marketed pharmaceutical products. Additionally we considered how such information can be adapted for use in an HTA, that is whether it is possible to estimate a per dose environmental impact specific to prescribing in the UK (note that the energy used in distribution is often the largest environmental impact). We also consider how to discount the price of a product which may already include the cost of complying with environmental legislation, in order to avoid double counting this in any estimate of the total cost of a product's environmental impact.

Results/Discussion: Most, if not all, pharmaceutical, medtech and biotech companies should be acutely aware of their corporate social responsibility to understand and ultimately minimise the environmental impact of their products. Likewise the NHS – the UK's largest public greenhouse gas emitter – must be environmentally sustainable, and is targeted with achieving net zero carbon emissions by 2050. Given we find that information on the environmental impact of pharmaceuticals is scarce and the information that is available needs adaption for use in HTA, there is a need to improve the evidence base and compel the life sciences industry to produce information on a product's carbon footprint. Only then will it be possible for HTA to inform sustainable adoption decisions which deliver health improvements for patients and the planet.

Can't See the Wood for the Trees: Are the Challenges in Evaluating Interventions and Policies Which Cross the Divide between Health and the Environment Insurmountable?

PRESENTER: **Laura Bojke**, University of York

AUTHORS: Laetitia Helene Marie Schmitt, James Lomas, Prof. Gerry Richardson, Helen Weatherly

Background

To make significant inroads into the evaluation of interventions and policies relating to the natural environment (NE) requires an understanding of the challenges faced in this context. Many of these challenges may be data-related, however, a number are also methodological. This presentation outlines the challenges faced in evaluating NE interventions and highlights some of the potential solutions and areas for further research.

Methods

A number of challenges exist:

Attribution of Effects.

Foremost is to be able to identify whether an NE intervention works, i.e. demonstrate a causal effect. Controlled experimentation is rarely feasible. Evaluations of NE interventions are overwhelmingly based on observational data and any causal inference is limited.

Defining Intervention (Exposure) and Control Groups

Exposure to the intervention in NE interventions is not necessarily straightforward to define and is typically not binary. Exposure misclassification represents a key challenge to be addressed.

Non-Linearity in Effects and Uncertain Dose-Response Function

Many of the health-related benefits derived from NE interventions stem from the provision of services by natural ecosystems. However, typically, the quantity of ecosystems services is not a linear function of the amount of natural ecosystem.

Effects Scope

Environmental interventions are multifaceted and are expected to impact health via several pathways. The links between risk factors and health may be inter-dependent and not independently additive.

Measuring and Valuing Outcomes

With different levels of funding, activity, and efficiency across sectors, the opportunity cost of resources may well differ even if outcomes are reflected in a common measure.

Cross-Sector Considerations

Public sector decision-makers for NE interventions are likely to be concerned with consequences across a range of sectors.

Equity Considerations

Environmental interventions that reduce exposure to health risks should aim towards a fairer distribution of the environmental risk across population subgroups.

Results/discussion

While the totality of these complexities may be large, there have been significant efforts towards overcoming methodological challenges.

NE interventions do often provide a "natural" variation in exposure that can resemble a quasi-experiment. These natural experiments can mimic random assignment and be exploited to "pave the way" for causal inference. Decision-analytic models can also provide a useful framework to link short-term outcomes to longer-term changes in health.

There have been significant efforts to develop methods to value outcomes for interventions that extend beyond health outcomes, for example to capture well-being. This facilitates the adoption of a broader perspective. Further research is needed on how these measures of well-being can be applied to assess the 'value' of policy level initiatives, for example to reduce climate change.

Shared budgets may offer the way forward for many of the practical challenges associated with policies that fall across multiple sectors. Where outcomes cannot be measured using common units, a general equilibrium approach may be more appropriate.

Understanding the equity impacts of interventions has been explored using distributional cost-effectiveness analysis. This approach has not been applied in the context of NE interventions; however, the general approach should be applicable. Research is required on how equity impacts across different sectors can be aggregated and traded off.

Effective Diabetes Management Can be a Step Towards a Carbon-Efficient Planet: A 'Green' Economic Assessment of Alternative Care Pathways

PRESENTER: **Ric Fordham**, University of East Anglia

Background The importance of incorporating environmental benefits of good clinical practice has been reinforced by the International Diabetes Federation in its Diabetes and Climate Change Report, which states that 'inefficient management of diabetes can lead to increased demands on health services and further escalate their already large carbon footprint'. In the UK, data from the 2017 National Diabetes Inpatient Audit showed that approximately 18% of all inpatient beds ae occupied by someone with diabetes. The management of diabetes is a lifetime process and common complications such as uncontrolled glycaemia account for a large share of carbon dioxide equivalent (CO_2e) NHS emissions. We assessed whether improving control in Type-2 diabetic patients (in two different ways) was more cost-effective and at the same time reduced CO_2e emissions, than that of unmanaged glycaemic control.

Methods Using the IQVIA Core Diabetes Model (previously IMS-CDM) described elsewhere, we estimated the impact of maintaining their glycated haemoglobin (HbA1c) at 7% (53 mmol/mol) or reducing it by 1% (11 mmol/mol) on total CO_2e/patient and CO_2e/life-year (LY). Two different cohorts were investigated in the model: those on first-line medical therapy (cohort 1) and those on third-line therapy (cohort 2). CO_2e was estimated using both resource-cost and carbon inputs using the UK National Health Service's 'carbon intensity factor' and other pragmatic conversions. The model was run over a 50-year time horizon, discounting total costs and quality-adjusted life-years (QALYs) up to 5% whilst keeping CO_2e emissions at 0%.

Results Maintaining HbA1c at 7% reduced total CO_2e/patient by 18% (1546 kgCO_2e/patient) vs 13% (937 kgCO_2e/patient) in cohorts 1 and 2 respectively, and led to a reduction in CO_2e/LY gained of 15%–20%. Reducing HbA1c by 1% caused a 12% (cohort 1) and 9% (cohort 2) reduction in CO_2e/patient with a CO_2e/LY gain reduction of 11%–14%.

Conclusions When comparing uncontrolled with well managed diabetes, maintaining glycaemic control at 7% on a single agent, or improving HbA1c by 1% by the addition of more glucose-lowering treatments was associated with a reduction in carbon emissions. To put these savings in context using published data on carbon production in car driving, the emissions avoided (955 kgCO_2e/patient) equate to not driving 4,914 miles (7908 km) over a life-time, or 9 months of energy expenditure of the average UK household.

2:30 PM –3:30 PM WEDNESDAY [Cross-Cutting Themes And Other Issues]

TEACHING HEALTH ECONOMICS SIG SESSION

MODERATOR: **Heather Brown**, Newcastle University

Health Economics Education in India: Current Scenario, Challenges and Opportunities

PRESENTER: **Gogoal Falia**, Indian Institute of Public Health, Delhi

At 3.5% of GDP, India's healthcare spending is paltry compared to 17% in the US, 8.8% in the OECD and 5.1% in People's Republic of China. For a country of 1.38 billion people, there are 550 hospital beds per million population compared to the WHO's recommended 5,000 hospital beds per million. The picture is further complicated by the fact that the majority of Indian healthcare spending is out-of-pocket. To develop a better understanding of healthcare consumption, maximize efficient utilization of scarce resources and undertake research enabling healthcare decision-making at the highest level, an efficient network of health economists is needed. A comprehensive review by the author revealed just three graduate level health economics programs available in India, along with four certificate courses. Apart from limited coursework in medical colleges under the aegis of the Community Medicine Department, there is no undergraduate training for students on the basics of health economics. One concerning factor in particular is the presence of public health research organizations' rather unidimensional approach when it comes to health economics in India. Their research activities involve collaboration with international researchers, but these collaborations have not culminated in the development of teaching and training programs in health economics for the broader healthcare community. Its applied nature places health economics in a precarious situation wherein limited resources force university economics departments to abandon planned health economics awareness initiatives, while healthcare educators lack proper training in economics to provide impactful teaching. Furthermore, India's rigid educational structure and obsession with doctors and engineers provide no incentive to early-stage health economics researchers, often internationally trained, to return to India and address these challenges. Nevertheless, this creates opportunities for international organizations like International Health Economics Association (iHEA), The Economics Network, Health Economists Study Group (HSEG) and public health schools (health economics faculties) to collaborate and develop India-focused training programs and materials, jointly with Indian healthcare research institutes. Government backed initiatives, e.g., promotional drive, incentives to universities, scholarships and so on could help popularize the subject. Curriculum changes especially in health and economics undergraduate programs with greater inclusion of health economics and healthcare finance concepts would be highly beneficial. Postgraduate level health economics electives and running dual-degrees/joint policy master's programs can make health economics a significantly more attractive prospect for students. Covid-19, for all its torment, has brought out in the open the problems faced by the Indian health system. To be better prepared for the next Covid-19 and for the overall welfare of her citizens, India and its government must address the issues raised by the author.

Keyword: India, health economics, training, education, Covid-19, iHEA, health policy

Health Insurance Game Online – a Teaching Tool in the Time of Corona

PRESENTER: **Florian Buchner**, Carinthia University of Applied Sciences

AUTHORS: Jürgen Wasem, Jennifer Kohn, Jan David Wasem, Simone Sigrid Flaschberger

In health insurance markets, several market failures are to be faced which are often counter-balanced by different types of government regulations. There is no first choice solution to this problem but different second choice solutions represented by different kinds of regulatory frameworks for health insurance systems. In general, there is a trade-off between the consequences of market failures of free health insurance markets and the consequences of government regulations resulting in different kind of selection processes.

The health insurance game HIG gives students a kind of real life experience of such effects and confronts them with a situation in which they have to calculate a health insurance premium. It reflects some basic parameters of different health insurance systems in a quite simple way, helping students to get familiar with basic concepts like adverse selection, risk selection and risk adversity and serves as a first step into the quite complex framework of health insurance systems.

This "active learning" approach should help to support deeper learning instead of pure surface learning. A lately published meta-analysis of Chernikova et al. (2020) shows that simulation-based learning is among the most effective means to facilitate learning of complex skills in higher education. And at the end, students learn, how health insurance markets work – or do not work - but they also have fun competing for best performing insurance company or for best citizen spending least money on health care costs over four different regulatory phases.

In the times of Covid19 pandemic and of widespread online teaching, we decided to transfer the concept of the health insurance game into a web-based online version. The original in-person version, which was successfully presented in an on-campus version in the THE (Teaching Health Economics) preconference session at iHEA-conference 2017 in Boston by Jennifer Kohn (Kohn (2020)). It is not that we think, the HIG works better in an online-version, it is that teaching conditions in the time of Corona make it necessary to adapt to the situation given – as the 2021 iHEA congress does.

The basic principle of the game works as follows: participants are divided into health insurers and citizens. Citizens characterized by different risk scores and may negotiate health insurance premiums with insurers under different regulatory frameworks like free market, community rating or premium regulation combined with risk adjustment. And the idea of the submitted abstract is to play at least one round of the health insurance game online with the participants of the session – to show how it works and to show challenges and opportunities of this teaching tool.

Literatur:

Chernikova, O., Heitzmann, N., Stadler, M., Holzberger, D., Seidel, T., & Fischer, F. (2020). Simulation-Based Learning in Higher Education: A Meta-Analysis. Review of Educational Research, 90(4), 499-541.

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Teaching Health Economics in Sub-Saharan Africa: A Cross-Sectional Survey of Teaching Institutions

PRESENTER: **Tommy Wilkinson**, Health Economics Unit, University of Cape Town

AUTHOR: Cynthia Tamandjou

Progress towards UHC globally has led to a proliferation of health economics research and teaching. However, as many countries in sub-Saharan Africa (SSA) seek to achieve UHC for their population, there is an acute shortage of local individuals with skills and knowledge in health economics to support the reforms required.

A 2007 survey of institutions that provided teaching in health economics (THE) in SSA found only two formal master's level programs specializing in health economics, resulting in less than 100 health economists working in public and private sectors across the entire region of 46 countries. Observed institutional development indicates that there has been an expansion of THE in SSA, however there is no empirical evidence on the type and range of teaching in the region which limits attempts to strengthen institutions and engage in network and coordination activities.

Methods

A descriptive, cross-sectional online survey was conducted over 4-month period in 2020 to gather quantitative and qualitative information about institutions and degree programs THE at post-graduate level in SSA in addition to enabling and limiting factors. The survey was administered in English and French to module coordinators and senior staff working at training institutions in SSA that were identified through an online internet search, recommendations by colleagues working in the African Health Economics and Policy Association (AFHEA), the International Health Economics Association (iHEA), and the International Decision Support Initiative (iDSI).

One survey response per degree program was sought, with multiple responses from institutions where more than one THE program was offered. Survey data analysis used quantitative methods to evaluate mean values, measures of variability, and percentages to evaluate the Likert scale. Thematic analysis was used to report qualitative answers.

Results

Thirty-six courses across 15 countries were identified representing 33 Master's programs, two specialist PhD programs and one PG diploma. Programs were based predominantly in schools/departments of public health/medicine (67%), economics (27%) and management (6%), with seven of the 33 Master's programs in Francophone countries. Sixteen programs had been initiated since 2010 and almost two-thirds of units reported five or less faculty. Further survey results included staffing qualifications, student output, teaching materials and methods, and specific health economics topic areas. Major themes identified impacting on sustainability of degree programs included financing, staff learning and advancement opportunities, use of online technology and meaningful teaching and research collaborations with external institutions and global networks.

Discussion

The survey is the first of its kind in the region since 2007 and demonstrates that the THE landscape has changed dynamically in SSA. While new institutions are a positive development, sustainability is uncertain, and the existing volume of student output is a fraction of that required if SSA countries are to general local expertise in support of UHC. The findings of the survey will be instrumental in developing meaningful and targeted capacity and institutional strengthening initiatives and regional collaborative efforts.

2:30 PM –3:30 PM WEDNESDAY [Supply Of Health Services]

Elderly Care and Long-Term Care

MODERATOR: **Ludovico Carrino**, King's College London

Do Subsidized Nursing Homes and Home Care Teams Reduce Hospital Bed-Blocking? Evidence from Portugal

PRESENTER: **Ana Moura**, Tilburg University

Excessive length of hospital stay is among the leading sources of inefficiency in healthcare. When a patient is clinically fit to be discharged but requires support outside the hospital, which is not readily available, they remain hospitalized until a safe discharge is possible —a phenomenon called bed-blocking. I study whether the entry of subsidized nursing homes (NH) and home care (HC) teams reduces hospital bed-blocking. I use individual data on emergency inpatient admissions at Portuguese hospitals during 2000-2015. My empirical approach exploits two sources of variation. First, variation in the timing of entry of NH and HC teams across regions, originating from the staggered implementation of a policy reform. Second, variation between patients in their propensity to bed-block. I find that the entry of HC teams in a region reduces the length of stay of individuals at increased risk of bed-blocking by 4 days relative to regular patients. Reductions in length of stay upon the entry of NH occur only for patients with high care needs. The reductions in length of stay do not affect the treatment received while at the hospital nor the likelihood of a readmission. The beds freed up by reducing bed-blocking are used to admit additional elective patients. I also provide evidence on the mechanisms preventing the complete elimination of bed-blocking.

Ambulatory Care Quality Disclosure and Competition

PRESENTER: **Mr. Maximilian Lückemann**, Institute of Health Economics

AUTHORS: Annika Herr, Olena Izhak

Due to demographic change and higher demand for professional support in everyday life, we observe an increasing number of ambulatory long-term care facilities. After opening the long-term care sector to the private facilities and keeping barriers of market entry low without regulations concerning prices or profits, this market provides elderly care but also competitive structures. However, the most important characteristic from a welfare perspective is the provided quality. Coming from an industrial organizational background, we examine how competition affects quality in the ambulatory long-term care sector.

For our analyses, we use five waves of publicly available quality data of the approximately 14,000 ambulatory care units in Germany reported between 2011 and 2019. We construct competition parameters and add a number of regional demographic and socio-economic controls. We apply an instrumental variable approach using competition in the related but not substitutable nursing home market to account for the endogeneity of quality and competition.

Our results indicate a small but robust quality deteriorating effect due to ambulatory long-term care competition. This is line with one previous study on nursing homes. To analyse the potential mechanisms, we then look at prices and nursing staff shortage as factors through which competition affects the long-term care quality.

We conclude that competition may be harmful to care quality when prices decrease and staff shortages increase. However, demand for ambulatory care is still increasing and cannot be covered by informal care while stationary care is more expensive. Thus, accelerating competition should be accompanied by respective financial support to circumvent negative quality effects.

Life Expectancy in Nursing Homes

PRESENTER: **Robert J Brent**, Fordham University

Objective:

It is well known that life expectancy in nursing homes (NHs) are lower for older adults than those residing elsewhere. In this paper, we attempt to discover the exact extent of this loss of life expectancy, and test the main hypothesis that this loss can be explained away by pre-existing health state conditions, especially the seriousness of dementia.

Methods:

In a large national data set for the US, we were able to track, for some persons over a 12-year period, both what the health states were prior to admittance to a NH, and also after residing in the NH until the time of death. Having this data available meant that we were able to use a parametric survival model that contained time vary covariates of health states to accompany NH residence. In this way, we could explain the risk of dying at each time period according to a person's health state and place of residence. The effect of residency could then be isolated and its separate impact on life expectancy ascertained.

Results:

In the absence of health state controls, using a non-parametric model, the loss of life expectancy is 47 months. Accounting for health states, using a parametric model, still leads to a 41-month (3.4 years) loss of life. Even those with serious dementia would live 8 months longer lives if not residing in a NH.

The 3.4 years weighted average of lost life expectancy was valued using the Value of a Statistical Life (VSL) literature. Based on an EPA VSL of $8.3 million for 2016, a Value of a Statistical Life Year (VSLY) was obtain of $500,000. Using this valuation, the value of the years of life lost was estimated to be $1.7 million per person. Aggregated across all persons living in NHs, produced a national loss of value of $1.87 trillion. This sum

can be considered extremely large, given that this loss was exactly 10% of the entire national income for the US in 2016, which was around $18.7 trillion.

Conclusions:

Surprisingly, the skilled nursing that is supposed to take place, and justify the very existence of NHs, had a worse impact than unskilled family care, or even no care at all. One would have expected the loss of life expectancy with skilled nursing in NHs to have increased life expectancy, and not lowered it by 41 months. In neither of our plausible alternative estimates did life expectancy not fall by being in a NH.

As the population continues to live longer, more and more people will be entering NHs. Unless there is some improvement in the quality of care in NHs, and there are many studies we cited that confirm that the quality of care in NHs is lacking, one can expect that the NH loss of life expectancy will grow exponentially.

It would seem that taking advantage of the diminished cognitive capacity of those with dementia is an important mechanism that this paper has uncovered as to how NHs lower life expectancy.

4:00 PM –5:00 PM WEDNESDAY [Cross-Cutting Themes And Other Issues]

HEALTH PREFERENCE RESEARCH SIG SESSION: Health Preferences in the North American Context

MODERATOR: **Oliver Rivero-Arias**, University of Oxford

Assessment of Payers' Preferences for Real World Evidence: A Discrete Choice Experiment

PRESENTER: **Enrique Saldarriaga**, University of Washington
AUTHORS: A. Brett Hauber, Josh J. Carlson, Doug Barthold, David L. Veenstra, Beth Devine

Background: Real-world Evidence (RWE) uses real world data to evaluate healthcare technologies and information not usually available from randomized controlled trials. Despite its benefits, RWE is rarely used to inform coverage and reimbursement decisions. Evidence suggests that a major barrier is a misalignment between the interests of payer organizations and the attributes of RWE studies.

Objective: We used a discrete choice experiment (DCE) to elicit payer's preferences for attributes of RWE studies to inform coverage and reimbursement decision-making.

Methods: Our target population was individuals in decision-making roles in payer organizations. Using results from literature review and interviews with payers, we created a list of seven attributes with three levels each. We created alternative profiles – each representing an RWE study – defined by different levels of the attributes. In the DCE, participants were asked to choose between two profiles assuming they were collecting evidence to inform formulary decision-making for a chronic disease. Levels were controlled experimentally and the series of responses allowed us to statistically infer the tradeoffs respondents were willing to make. We used a D-optimal main-effects design with two equally-sized blocks, with twelve questions each, and main-effects-only expected utility functions. The instrument was web-based to facilitate remote data collection. Schlesinger Group conducted participant recruitment and survey administration. DCE data were fitted to a conditional logit model using dummy-coding, with the least-preferred level as reference. Estimated coefficients are the un-scaled preference weights (PW) for all levels. We tested for preference heterogeneity using latent-class analysis. The relative importance of each attribute and the marginal willingness to pay (mWTP) were calculated as the ratio between each attributes' PW over the least-preferred attribute's PW and the Cost's PW, respectively.

Results: This table shows the final set of attributes and levels used in the DCE.

Characteristics	**Levels**
Clinical Outcomes	Very informative Moderately informative Not measured
Health-related Quality of Life (HRQoL) Outcomes	Very informative Moderately informative Not measured
Healthcare Resources Utilization	Very informative Moderately informative Not measured
Health-Related Productivity Outcomes	Very informative Moderately informative Not measured
External Validity	High external validity Moderate external validity Low external validity
Methodologic Rigor	High methodologic rigor Moderate methodologic rigor Low methodologic rigor
Cost of Assessing one RWE study	$9,000

	$19,500 $28,000

Relative to Productivity, the rank order of the remaining attributes was: Clinical Outcomes (4.68 times as important as Productivity Outcomes), HRQoL Outcomes (2.78), Methodologic Rigor (2.09), Cost (1.83), Resources Utilization outcomes (1.71), and External Validity (1.56). The mWTP ranged from $49,502 (95%CI $30,356-$68,647) for a study with very informative Clinical Outcomes, to $10,744 (95%CI $1,909-$19,579) for very informative Productivity Outcomes. Only one latent class was found, indicating absence of systematic preferences heterogeneity among respondents.

Conclusions: This is the first study to examine payer preferences for RWE. Clinical and HRQoL outcomes are in the first and second place of payer's preferences for RWE studies' features; Productivity outcomes are last. Our results can effectively guide future research design, implementation, and funding, to bridge the gap between the information that Payers seek and the attributes that RWE studies prioritize.

Vaccine for COVID-19: What Are the Preferences of the General Public in Quebec

PRESENTER: **Gabin Morillon**, Ecole d'économie Université Clermont-Auvergne

AUTHOR: Thomas Poder

Introduction: Expectations toward a vaccine for Covid-19 are very high. However, the effectiveness of its adoption in many countries will highly depends on the acceptance of the population. To improve this acceptance, it is important to know the preferences of the public for the main characteristics of the vaccine. This study aimed to elicit preferences of the Quebec population about a COVID-19 vaccination program and to characterize individuals with respect to their vaccination behaviors.

Method: A discrete choice experiment has been conducted between October and November 2020 in the province of Quebec in Canada. Its design included seven attributes: vaccine origin, vaccine effectiveness, side effects, protection duration, priority population, waiting time to get vaccinated, and recommender of the vaccine. Utilities were estimated using a conditional logit with fixed-effect (CL), a mixed logit (MXL) and a latent class logit (LCL). Five groups were derived from the latter and descriptive analyses characterized them.

Results: Our sample included 1599 individuals. From this total, 119 always chose the opt-out option (7.4%). According to the MXL, the relative weights of attributes were as follow: effectiveness (28.48%), side-effects (23.68%), protection duration (17.41%), vaccine origin (12.75%), recommender (11.96%), waiting time to get vaccinated (3.62%), and priority population (2.11%). The first group (9.13%) of the LCL wanted to get vaccinated as fast as possible and was composed of uncertain and more vulnerable individuals. Group 5 (25.14%) was a mean group, mostly favoring vaccination. Groups 2 (7.69%) and 4 (15.82%) included "vaccine hesitant and demanding" individuals but were different in their sociodemographic profiles. Finally, "anti-vaccine" and other "vaccine hesitant" individuals were in group 3 (42.21%).

Conclusion: Vaccination hesitancy is not a dichotomic issue with "pro-vaccine" and "anti-vaccine". In the context of the COVID-19 pandemic, it is essential to understand the wholeness of behaviors to establish a clear vaccination campaign that can reach herd immunity.

Consumer Decision-Making When Shopping for Medical Services

PRESENTER: **Alex Chan**, Stanford University

This paper provides evidence that customer discrimination in the market for doctors can be largely accounted for by statistical discrimination. Using an experimental paradigm, called validated incentivized conjoint (VIC), I evaluate customer preferences in the field with an online platform where cash paying consumers can shop for and book a provider for medical procedures. Customers evaluate doctor options they know to be hypothetical in order to be matched with a customized menu of real doctors, preserving incentives. I found that a provider option is less likely to be chosen when the provider is not white. Willingness-to-pay is lower by 12.7% of the average price for black providers and lower by 8.7% of the average price for Asian providers. When quality information is provided for each provider option, the willingness-to-pay gap for non-white providers dropped significantly to about 1% for both minority groups - suggesting statistical discrimination. Actual booking behavior allows me to cross validate incentive compatibility of stated preference elicitation via VIC. (J71, I11, L15, L86, M31)

4:00 PM –5:00 PM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ORGANIZED SESSION: Expansions in Mental Healthcare and Social Protection and Socio-Economic Outcomes

SESSION CHAIR: **Naureen Karachiwalla**, International Food Policy Research Institute (IFPRI)

DISCUSSANT: **Mo Alloush**, Hamilton College; **Mallory Avery**, University of Pittsburgh; **Kate Orkin**, University of Oxford

The Mortality Effects of Community Mental Health Centers

PRESENTER: **Mallory Avery**, University of Pittsburgh

The Community Mental Health Act of 1963 established Community Mental Health Centers (CMHCs) across the country with the goal of providing continuous, comprehensive, community-oriented care to people suffering from mental illness. Despite this program being considered a failure by most contemporary accounts, the World Health Organization advocates for a transition from the institutionalization of the mentally ill to a system of community-centered care. In this paper, we construct a novel dataset documenting the rollout of CMHCs from 1971 to 1981 to identify the effect of establishing a CMHC on county level mortality rates, focusing on causes of death related to mental illness. Though we find little evidence that access to a CMHC impacted mortality rates in the white population, we find large and robust effects for the non-white population, with CMHCs reducing suicide and homicide rates by 8% and 14%, respectively. CMHCs also reduced deaths from alcohol in the female non-white population by 18%. These results suggest the historical narrative surrounding the failure of this program does not represent the non-white experience and that community care can be effective at reducing mental health related mortality in populations with the least access to alternative treatment options.

The Effects of a Large-Scale Mental Health Reform: Evidence from Brazil

PRESENTER: **Ms. Luiz Felipe Fontes**, FGV EESP

This paper studies the Brazilian psychiatric reform, which reorganized mental healthcare provision by the public system building a network of community-based services centered on the Psychosocial Care Centers (CAPSs). Our research design exploits the roll-out of CAPSs in a differences-in-differences framework. We show that these centers improved outpatient mental healthcare utilization and reduced hospital admissions due to mental and behavioral disorders. Those reductions were more pronounced for long-stay admissions and among patients with schizophrenia. Additionally, centers delivering substance abuse treatment reduced deaths caused by alcoholic liver disease. Finally, we also find that this shift away from inpatient care increased homicides.

The Effect of Mental Health Courts on Crime

PRESENTER: **Angelica Lucia Serrano**, ETHZ

Estimates of mental illness rates among convicted criminals in U.S. jails are as high as 64 percent. Specialized mental health courts have been introduced in recent decades with the goal of diverting mentally ill individuals into community-based treatments. Do these programs reduce recidivism? We provide causal evidence on this question using as a set of natural experiments the establishment of 339 mental health courts across U.S. counties over the years 1995-2016. Our staggered event study estimates of pre-trends support the parallel trends assumption. Using difference-in-difference regressions, we show that the introduction of mental health courts reduces crime.

The Impact of Cash Transfers on Anxiety and Investments: Experimental Evidence from Mali

PRESENTER: **Dr. Naureen Karachiwalla**, International Food Policy Research Institute (IFPRI)

Economic resilience requires targeted decisions aimed at generating income and building protections against shocks. However, poverty is highly correlated with poor mental health. Mental health conditions such as stress/anxiety can limit decision-making abilities by affecting cognition, self-esteem and confidence, and preferences such as time discounting. Poorer decision-making results in lower future income via reduced investments in physical and human capital, which perpetuates the cycle of poverty. In this paper, we estimate the impacts of Mali's national cash transfer program, Filets Sociaux (Jigisémèjiri), on measures of psychological well-being, cognition, and time preferences, as well as investments in physical and human capital. We find that receiving the program reduced household decision-makers' self-reported stress and worry. While cognitive function was not affected, recipients of the transfers experienced greater self-esteem and a modest increase in a measure of patience. Consistent with reduced stress, higher self-esteem, and increased patience, the program also increased investments in productive assets and more nutritious diets. Results suggest that, in addition to cash transfers providing the economic resources to support investments in the future, they may also build psychological resources for supporting these investments.

4:00 PM –5:00 PM WEDNESDAY [Supply Of Health Services]

Changes in Health Care Supply

MODERATOR: **Mikel Berdud**, The Office of Health Economics

Perioperative Magnetic Resonance Imaging in Breast Cancer Care: Variation in Adoption Trajectories Among Physician Peer Groups and Implications for Cost

PRESENTER: **Xiao Xu**, Yale University

AUTHORS: Pamela R Soulos, Jeph Herrin, Shiyi Wang, Craig Evan Pollack, Brigid K Killelea, Howard P Forman, Cary P Gross

Background: Perioperative magnetic resonance imaging (MRI) has been increasingly used in breast cancer care. Although it is perceived to help define the extent of disease and improve detection and removal of multifocal/contralateral diseases, empirical evidence shows that perioperative MRI increases patients' likelihood of undergoing more extensive surgery (e.g., mastectomy as opposed to breast conserving surgery) with no proven benefit in risk of re-operation, cancer recurrence, or mortality. Yet it is associated with high costs. Physician peer influence may play an important role in the rapid adoption of perioperative MRI. This study aimed to examine variation among physician patient-sharing peer groups in adopting perioperative MRI in breast cancer care and assess implications of the differential patterns of MRI adoption for costs of care.

Methods: Using the linked Surveillance, Epidemiology, and End Results-Medicare database, we applied the Girvan-Newman algorithm to identify physician patient-sharing peer groups based on billing relationships documented in claims data. Physician peer groups are clusters of physicians who frequently share patients with each other. For each peer group in 2004-2005, 2006-2007, and 2008-2009, respectively, we calculated its risk-adjusted rate of perioperative MRI use in breast cancer care after accounting for patient clinical risk factors. Based on these risk-adjusted rates, we used a growth mixture modeling technique to identify distinct trajectories of adopting perioperative MRI among physician peer groups and examined peer group characteristics that were associated with the distinct trajectories. We further compared monthly costs of breast cancer care for patients who underwent perioperative MRI versus those who did not (measured in inflation adjusted 2012 U.S. dollars), and constructed a simulation model to evaluate the impact of the different adoption trajectories on overall costs of breast cancer care for Medicare beneficiaries in 2008-2009.

Results: Among 12,771 women (from 86 physician peer groups) with stage I-III breast cancer receiving breast conserving surgery, use of perioperative MRI increased from 8.3% in 2004-2005 to 33.3% in 2008-2009. The 86 physician peer groups exhibited three distinct trajectories of adopting MRI: 1) low adoption (risk-adjusted rate of MRI use increased from 2.8% in 2004-2005 to 17.7% in 2008-2009), 2) medium adoption (9.6% to 49.8%), and 3) high adoption (38.8% to 75.8%). These trajectories accounted for 54.7%, 34.9% and 10.5% of the physician peer groups, respectively. Peer groups in these trajectories differed significantly in physician composition. For instance, compared to peer groups with "low adoption", those with "high adoption" had fewer primary care physicians (55.5% versus 47.7%, p=0.03) and more medical oncologists (6.6% versus 8.3%, p=0.04) and radiation oncologists (4.3% versus 7.3%, p=0.007). If all physician peer groups followed the practice pattern of the "low adoption" trajectory in 2008-2009, the Medicare program could save $52.9 million (95% confidence interval: $39.9 million-$69.2 million) in breast cancer care.

Conclusions/Implications: Physician peer groups varied in their path of adopting perioperative MRI. The differential patterns of MRI adoption had substantial financial implications. Leveraging the impact of physician peer influence may help reduce overuse of perioperative MRI.

Hospital Closure and Patient Outcomes: Evidence from Italy

PRESENTER: **Nirosha Elsem Varghese**

AUTHORS: Simone Ghislandi, Anna-Theresa Renner, Benedetta Scotti

Background: In Italy, there have been a substantial number of hospital closures in the past decade as a result of cost containment strategies enacted by the Ministry of Finance with the aim of restoring financial stability in regions that ran into severe deficits. The question on if we should prevent such hospital closures needs to be debated. Hospital closures have been said to be advantageous if the closed hospitals are inefficient or underutilized. Such closures may improve patient outcomes. On the other hand, closures could potentially harm population health through congestion in nearby hospitals and increased travel time in accessing care.

Objectives: To investigate the net impact of hospital closures on patient outcomes and to identify possible mechanisms such as increased travel time or congestion which might explain some of the consequences of hospital closures on patient outcomes.

Methodology

We use hospital discharge data from the Italian Ministry of Health with information on patients admitted for AMI during 2008-2015. We consider hospitals to be closed when either (a) AMI admissions in a hospital go down to zero (strict closure) and (b) when the admission reduces by 90% compared to previous year (relaxed closure) and stays constant. A total of 45 and 65 hospitals were identified to be closed respectively during 2008-2015 as per the strict and relaxed closure definitions.A home hospital is the modal hospital to which most of the residents of the municipality were admitted to that year. We consider a municipality to be treated if the municipality of residence experiences at least one home hospital closure. The same analysis is repeated at municipality level.

Given the variation in timing of hospital closures, we use a DID with multiple time periods. The difference-in-difference estimator indicates whether an admission is from an affected municipality and occurs in the post closure period. The outcome variables include in-hospital mortality, 30 day readmission and length of stay. Controls include age, gender, marital status, length of stay, education level, elixhauser comorbidities index and type of hospital (public/private). Municipality, regional and year fixed effects are used in all regressions.

Second, to bring in the evidence on travel time and congestion as a possible mechanism that is affected by closures and thereby affecting patient outcomes, we combine the above staggered diff-in-diff with IV approach. Specifically, we instrument travel time and bed utilization rate by the difference-in difference estimator in the first stage, and then estimate the impact of the hospital closure induced exogenous change on AMI outcomes in the second stage.

Results: At the individual level, we find that individuals belonging to municipalities that had a home hospital closure chad an increased likelihood of experiencing an in-hospital death, reduced 30-day readmission and increased length of stay. Similar and stronger effects are observed at the municipality level. Home hospital closures are associated with an increased travel time and congestion in remaining hospitals, which in turn worsens patient outcomes.

Author order: Simone Ghislandi, Anna Renner, Benedetta Scotti and Nirosha Elsem Varghese

Big, Bigger, Best? The Impact of Hospital Volume and Competition on Survival after Breast Cancer Surgery: A National Population-Based Study

PRESENTER: **Wouter van der Schors**, Erasmus University Rotterdam

Partly driven by studies on the volume-quality outcome relationships and the related introduction and further tightening of minimum volume standards, there is an international and increasing trend towards centralization and collaboration for high-complex low-volume hospital care. Yet, for low-complex oncological operations, such as breast cancer, empirical evidence does not demonstrate a consistent positive relationship between hospital volume and quality. Furthermore, both the increasing tendency towards multi-provider healthcare and emergence of clinical care networks imply an increased recognition for the potential trade-off between competition and concentration in setting where hospitals are expected to compete. However, the role of hospital competition on quality remains a contested issue for cancer surgery. In this paper we analyze the association between hospital volume, hospital competition and survival for patients who underwent invasive breast cancer (IBC) surgery. Also, we explore the relationship for patients who suffer from Triple Negative Breast Cancer (TNBC), widely regarded as a high-complex subtype.

Our primary data source is the Netherlands Cancer Registry (NCR). This registry is hosted by the Netherlands Comprehensive Cancer Organization (IKNL) and includes all newly diagnosed cancers in the Netherlands. Our study sample consists of 136,958 patients who underwent IBC surgery between in 2004 and 2014, of which 13,627 patients are diagnosed with TNBC. We use overall survival as explanatory variable. Hospital volume has been operationalized as the moving average over three years; i.e. the year of surgery (T0) and the two preceding years (T-1 and T-2) to smoothen potential volume spikes and dips. The number of hospitals within a fixed radius (*fascia count*) is used as a preliminary indicator for the potential impact of hospital competition. Various hospital, tumor, patient and treatment characteristics are included to allow for adequate case-mix correction. We perform Cox Proportional Hazard models to analyze whether higher hospital volume is associated with better outcomes in terms of survival for IBC. Restricted cubic splines are used for examining the effect of volume as a continuous variable.

We find that treatment in high volume centers (250 or more operations) is associated with increased survival when compared with centers performing 150 or less operations after correction for case-mix. These findings are robust to alternative categorization of the volume variable, as well as to using 90-day re-operation as an explanatory variable. We find that stronger hospital competition improves patient survival. This effect, however, is not robust. It differs across models with alternative categorizations of the fascia count and fixed radius. For the TNBC subsample, we find no indication for a volume and competition effect, both when we use overall breast cancer surgery volume and specific TNBC surgery volume.

Our findings suggest that concentrating breast cancer surgery in fewer hospitals may reduce patient mortality for certain thresholds. However, before actually introducing stricter volume standards further research is recommended to (i) include sophisticated measures for hospital competition, (ii) alternative outcome variables as quality of life and patient experiences and (iii) a qualitative approach to assess differences processes and structures to further unravel the chain of causation for IBC.

Age, Period, and Cohort Effects: Describing Changes in the Labour Supply of British Columbia's Primary Care Physicians from 1996-2017.

PRESENTER: **Margaret Jamieson**

Objectives: While the supply of physicians increased between 1996 and 2017, there is a perceived deficiency in the supply of clinical services at the primary care level. This research studies labour supply trends of primary care physicians (PCPs) in British Colombia, Canada (BC), looking at both the total labour force of PCPs, their aggregate service provision, and mental health and substance use (MHSU) service provision. **Data Sources:** Physician-level administrative billing data on primary care physicians in BC between 1996 and 2017 . **Study Design:** This research studies trends in primary MHSU service provision in different graduating cohorts of PCPs, PCPs with different levels of experience (as measured by years since graduation), and PCPs practicing during different time periods. Annual physician-level data was stratified by PCP sex, place of graduation, practice location, years since graduation, and graduating cohort. **Findings:** The findings show that average yearly MHSU patient contacts start at somewhat low levels for PCPs with very few years since graduation rise steadily until mid-career, then decrease steadily until physicians retire. Although the number of PCPs in the province has risen steadily since 1996, more recent cohorts of PCPs have fewer yearly MHSU patient contacts compared to earlier cohorts at the same stage of their career. These trends are similar, though not identical in male and female PCPs. **Conclusions:** More recent graduating cohorts of PCPs in BC are starting their practice at lower service volumes and peaking at lower levels of service provision than earlier cohorts. Given the changing demographics of BC's population, the changing healthcare needs of patients, and the contextual backdrop of the opioid overdose crises in the province, these findings point to potential future shortages in primary care services if subsequent graduating cohorts of physicians continue to provide lower levels of services. Age-period-cohort modelling has the capacity to enhance the way that we think about inter-generational patterns of labour supply, both within the context of health human resources and in other labour markets.

4:00 PM –5:00 PM WEDNESDAY [Health Care Financing And Expenditures]

ORGANIZED SESSION: Effects of Payment for Performance on Health Systems: Lessons from Complexity Science

SESSION CHAIR: **Josephine Borghi**,

DISCUSSANT: **Sophie Witter**, Queen Margaret University Edinburgh; **Peter Binyaruka**, Ifakara Health Institute; **Agnes Semwanga**, Makerere University

Analysing the Health System Response to Payment for Performance in Tanzania Using Systems Thinking Methodology

PRESENTER: **Rachel Cassidy**, London School of Hygiene & Tropical Medicine

AUTHORS: Andrada Tomoaia-Cotisel, Agnes Semwanga, Peter Binyaruka, Zaid Chalabi, Karl Blanchet, Dr. Neha S. Singh, John Maiba, Josephine Borghi

Introduction: Payment for performance (P4P) initiatives have been employed in low and middle-income (LMIC) countries as a means to improve the delivery and coverage of maternal and child health (MCH) services. Despite widespread implementation, there is still a lack of consensus on whether P4P is an effective initiative that leads to positive, sustained improvement in delivery of these services. There is a need to employ methods that can evaluate the pathways through which P4P alters health systems without diminishing the complex behaviour exhibited by health systems in the evaluation. We intend to use causal loop diagrams (CLDs) and system dynamics models (SDMs) to model the impact of P4P on delivery and uptake of MCH services in Tanzania, where stakeholders are keen to optimise the current design and develop further evidence-based theory on the system-wide effects of P4P on the health system.

Method: This work comprises of two core stages (i) the development of a CLD which provides a blueprint for a (ii) later developed SDM. The CLD represents relationships between variables that are important when we consider how the health system responds and transforms under P4P. The CLD was developed using qualitative data from a process evaluation of a P4P programme in Tanzania and validated through stakeholder consultation. The CLD was then used to build a stock flow diagram for a SDM, using secondary data from an impact evaluation of the P4P programme. The SDM is used to explore a number of 'what if" scenarios, to explore how variations in the design of the programme would affect service delivery and utilisation outcomes.

Results: The CLD pinpoints the key mechanisms underpinning provider achievement of P4P targets, reporting of health information by providers, and care seeking by the population, and identifies those mechanisms affected by P4P. For example, the availability of drugs and medical commodities was critical not only to provider achievement of P4P targets (supply of MCH services) but also to demand of services and was impacted by P4P through the availability of additional facility resources and the incentivisation of district health managers to reduce drug

stock outs. The CLD also highlights the importance of adequate staffing levels for service delivery and reporting, but the lack of P4P influence on this. The results of the SDM will also be discussed, showing which mechanisms have the largest effect on programme outcomes, and how P4P affects these, and how variations in programme design are likely to affect outcomes.

Discussion: Recommendations for programme design must consider the impact on the holistic system, to avoid suboptimal programme impact or unintended, negative consequences. Our study shows how secondary data from an impact and process evaluation can be used to model the health system and its response to P4P, to improve out understanding of programme mechanisms and inform the design of more effective future P4P programmes. This work will not only be relevant for P4P in Tanzania but also generate policy relevant recommendations for LMICs.

Improving Health Systems Performance in Low- and Middle-Income Countries: A System Dynamics Model of the Pay-for-Performance Initiative in Afghanistan

PRESENTER: **Olakunle Alonge**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Sen Lin, Takeru Igusa, David H Peters

Background: Pay-for-performance (P4P) schemes are complex interventions. Traditional deterministic models may be limited in evaluating the dynamic and non-linear relationships involved in implementing P4P schemes within health systems – thus limiting our understanding of the impact pathways and learnings on how P4P may (or may not) strengthen health systems and save lives. A P4P scheme was implemented in Afghanistan between September 2010 and December 2012 to improve coverage and quality of key maternal and child health (MCH) services. Findings from a cluster randomized trial evaluating the scheme suggested that there was no significant improvement in the coverage and overall quality of MCH services. The trial cited poor implementation as a potential explanation for this lack of effectiveness but was limited in demonstrating how the various implementation issues under the P4P scheme may have impacted the health system performance in Afghanistan. System dynamics methods were used to explore effective implementation pathways for improving health systems performance through pay-for-performance (P4P) schemes.

Method: A causal loop diagram was developed to delineate primary causal relationships for service delivery within primary health facilities. A quantitative stock-and-flow model was developed next. The stock-and-flow model was then used to simulate the impact of various P4P implementation scenarios on quality and volume of services. Data from the Afghanistan national facility survey in 2012 was used to calibrate the model.

Results: The models show that P4P bonuses could increase health workers' motivation leading to higher levels of quality and volume of services. Gaming could reduce or even reverse this desired effect, leading to levels of quality and volume of services that are below baseline levels. Implementation issues, such as delays in the disbursement of P4P bonuses and low levels of P4P bonuses, also reduce the desired effect of P4P on quality and volume, but they do not cause the outputs to fall below baseline levels. Optimal effect of P4P on quality and volume of services is obtained when P4P bonuses are distributed per the health workers' contributions to the services that triggered the payments. Other distribution algorithms such as equal allocation or allocations proportionate to salaries resulted in quality and volume levels that were substantially lower, sometimes below baseline.

Conclusion: The system dynamics models served to inform, with quantitative results, the theory of change underlying P4P intervention. Specific implementation strategies, such as prompt disbursement of adequate levels of performance bonus distributed per health workers' contribution to service, increase the likelihood of P4P success. Poorly designed P4P schemes, such as those without an optimal algorithm for distributing performance bonuses and adequate safeguards for gaming, can have a negative overall impact on health service delivery systems.

Using System Dynamics Modelling Principles and Tools for Intervention Design in Georgia

PRESENTER: **Karin Diaconu**, Queen Margaret University Edinburgh

AUTHORS: Lela Sulaberidze, Ivdity Chikovani, Maia Uchaneishvili, Natia Shengelia, Akaki Zoidze, Ariadna Nebot, Ibukun-Oluwa Omolade Abejirinde, Sophie Witter, Anna Vassall, Bruno Marchal

Introduction: Tuberculosis (TB) is one of the greatest global health challenges of our time. Addressing this disease burden requires novel systems-based approaches. As part of the Results4TB project in Georgia, we have brought together researchers, policy-makers and healthcare professionals to co-design a performance-based financing intervention intended to strengthen TB related integrated care management.

Methods: We used participatory workshops and causal loop diagrams (CLDs) to explore current challenges within the system and drawing on system dynamics principles and participant views, identified key health system constraints and dynamics any TB focused intervention should address. We further used CLDs to identify the intended theory of change of the intervention, define its action mechanisms and identify suitable data collection methods for intervention evaluation.

Results: This presentation discusses how SDM principles and tools can be utilized to study problems, co-design interventions and further explore the potential for these methods to guide evaluation designs (in this case, we combine realist, health economic and trial-based evaluations). We also offer reflections on how best to implement such methods, considering for example how to enable constructive dialogue between different stakeholders and how to best use such methods throughout the intervention implementation and project cycle.

Conclusion: System dynamics approaches and tools are increasingly used health research for intervention evaluation, however this project explicitly discusses their utility for intervention design.

Using Agent-Based Modelling As an Ex-Post Evaluation Tool to Better Understand the Impact Mechanisms of a Financial Incentives Scheme for Healthcare Providers

PRESENTER: **Anna Foss**, LSHTM (London School of Hygiene and Tropical Medicine)

AUTHORS: Nicholaus Mziray, Peter Binyaruka, Zaid Chalabi, Rachel Cassidy, Christa Searle, Josephine Borghi

Background

Payment for performance (P4P), or financial rewards to healthcare workers contingent on their achievement of pre-defined performance targets, is gaining popularity as a mechanism to improve health service delivery. The underlying assumption is that health workers will respond to incentives by increasing effort, as the offer of additional funds increases their motivation to perform. There has been substantial research into the effects of P4P schemes on service delivery outcomes. However, there has been less research on how these schemes affect health worker behaviour which then impacts on the behaviour and care seeking of patients. In this presentation, we describe the steps taken to build an ABM for a P4P scheme in Tanzania, and highlight the contributions that ABM can make to understanding the behaviour and response of providers and patients to P4P.

Methods

Firstly, we defined the agent classes to be included in the ABM: patients and providers. Managers are modelled simply as system influences. We considered a single behaviour for patients: delivery at a facility or not; and a series of behaviours for providers: charging user fees; prescribing drugs; being kind. These behaviours were selected as they were significantly improved by P4P within an impact evaluation study. We describe the steps taken to build an ABM to examine the effect of P4P on these behaviours.

Results

We found three visualisations helpful in the pursuit of our aim. The first conceptual map connected variables that were found to be significantly affected by P4P and related to our outcomes of interest through statistical analysis of data from an impact evaluation of P4P. To identify other

attributes that are relevant to decision making, we reviewed the empirical literature and ran regressions using baseline data from the impact evaluation to determine which patient/provider characteristics were associated with the behaviours of interest. These associations were then incorporated into the first conceptual map. The second conceptual map captured a broader set of connections than the data suggested, to allow for other intuitive links to be explored in the modelling, which is important when considering emergent behaviours and the generalisability of the model to other contexts. Thirdly, we drew decision trees to illustrate the different choices individual patients and providers have when making behavioural decisions affecting the rate of institutional deliveries. The ABM allows for heterogeneity in decision-making in that patients and providers are modelled to have specific characteristics and behaviors based on the data, whilst also allowing for the fact that not all patients will behave the same in response to the same provider in the same health facility.

Conclusions

We have described the steps used to build an ABM to explore how and why some facilities succeeded to increase the rate of institutional deliveries through P4P while others did not, including seeking lessons learned to highlight any early warning indicators of expected success or unintended negative effects. Our framework has generalisable methodological steps for others seeking to use ABM to better understand how P4P affects the behaviour of providers and patients.

4:00 PM –5:00 PM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ECONOMICS OF OBESITY SIG SESSION: Fetal, Environmental and Industrial Determinants of Malnutrition, Obesity and Mortality

MODERATOR: **Olufunke Alaba**, University of Cape Town

Association between Income Inequality and Racial Disparities on Obesity in US Men and Women: 1999-2016

PRESENTER: **Hossein Zare**, JHU

AUTHORS: Mojgan Azadi, Danielle Gilmore, Darrell Gaskin, Roland J. Thorpe Jr.

Background:

America experiences sharp increases in income inequality in recent decades the Gini coefficient (GC)—a well-known index to measure income inequality—has increased almost every year, from 0.394 in 1974 to 0.462 in 2000, and 0.489 in 2017. Evidence shows that economic inequality is associated with health outcomes and unequal distribution of income may add an additional hazard to the health of people living in unequally distributed income communities, it increases the importance of understanding the relationship between income distribution and specific health conditions.

Obesity is a major public health problem, between 1999 and 2018, the age-adjusted prevalence of obesity increased from 30.5% to 42.4%, the prevalence of obesity fluctuates by income and socioeconomic status, however there is a little evidence to determine the association between income inequality and obesity and how obesity may be moderated by race and income inequality.

Objectives:

To examine the association between income inequality and obesity in adults ages 20 years and older and to test how this relationship changes by race/ethnicity.

Methods:

Data for this study came from the 1999-2016 National Health and Nutrition Examination Survey (NHANES). Obesity was defined by using Body Mass Index $\geq$ 30 kg/m^2; The Gini Coefficient (GC) was calculated to measure income inequality by using the Poverty Income Ratio (PIR). We categorized GC in five quintiles to examine the relationship between income inequality and obesity. For the first set of analysis, a Modified Poisson regression was used in a sample of 36,665 (17,303 White Non-Hispanic (WNH), 7,475 Black NH (BNH) and 6,281 Mexican American (MA). We dropped pregnant women (1,667) and missing observations for PIR from the analysis. We stratified the analyses by race and ran sets of adjusted and non-adjusted models. Models included age, marital status, education, health behaviors (smoking and drinking status and physical activities), health insurance coverage and self-reported health.

Results:

On average 35% of the population were obese, in comparison BNH with 45.5% has higher obesity rate than MA (40%) and WNH (35%). When it came to income inequality MA communities have experienced higher income inequality than WNH and BNH. GC has changed from 0.410 in obese MA to 0.395 in non-obese, and from 0.301 in obese to 0.269 in non-obese BNH, and from 0.247 in obese to 0.254 in non-obese WNH. The results of regression models showed that WNH in the highest income quintile had a higher prevalence of obesity than those in the lowest income quartile (PR:1.26, CI: 1.07-1.47), the same patterns with BNH (PR:1.37, CI: 1.17-1.67), but we have not find any significant associations between obesity and income inequality in MA.

Conclusions:

BNH and MA obese communities experienced higher income-inequality than WNH. We have found a positive association between income inequality and obesity for WNH and BNH, but there was no association between income inequality and obesity in MA. Policy makers may be prioritizing people of color and minority population for treating obesity and income-inequality.

Keywords: Income inequality, Obesity, Gini Coefficient, Race/Ethnicity

Accumulation and Transmission of Inequality of Opportunity and the Double Burden of Malnutrition: The Case of Mexico

PRESENTER: **Andrea Salas Ortiz**, University of York. Department of Economics and Related Studies. York, England

Roemer's inequality of opportunity (IOp) theory states that individual outcomes are the result of circumstances (exogenous situations in which people do not have any control and, therefore cannot be held responsible) and efforts (acts that embrace individual responsibility), under this approach equality of opportunity is achieved if outcomes are orthogonal to circumstances. Based on this framework and using a life course perspective, this paper analyses the evolution of IOp in malnutrition in the light of the socioeconomic changes and the evolution of circumstances and efforts experienced in people born between 1983 and 1988 in Mexico. For the one side, even though malnutrition is the coexistence of under and over nutrition, these issues have been independently analysed. For the other, the lack of panel data has hindered the possibility to perform life span health analysis in low and middle-income countries, where malnutrition has been a recurrent public health issue. This paper also proposes an innovative way to deal with the lack of panel data by combining matching and re-weighting methods to construct a pseudo birth-cohort. Using data from six different cross-sectional National Health and Nutrition surveys (1988; 1999; 2006; 2012; 2016 and 2018) the effect of circumstances and efforts on IOp is disentangled and measured in different nutrition-related health outcomes: z-scores for height-for-age (HAZ); weight-for-height (WHZ), weight-for-age (WAZ) and BMI-for-age (BMI-A), as well as haemoglobin (Hb), body mass index (BMI) and waist circumference (WC). The circumstances and efforts variables included in the model are selected building upon normative as well as the LASSO-based (Least Absolute Shrinkage and Selection Operator) method. Results indicate that for the birth cohort studied, inequalities in malnutrition have been a persistent issue across the life course of individuals. As people age, inequalities related to circumstances in Hb accumulates whereas for BMI and WC inequalities decrease as people get older. There is also evidence that IOp in nutrition-related health outcomes have been

transmitted from parents to children, conditioning a healthy life start. Overall, IOp in malnutrition has not decreased over a life span of 30 years. When disentangling the contribution of circumstances and efforts to inequality, the results indicate that people's circumstances explain 65% of inequality in malnutrition, whereas efforts account for only 35%. While circumstances are the main driver of inequality in undernutrition, efforts are the main driver of over nutrition when people are in their early-adulthood, but as people get older the effect of efforts diminishes and circumstances become the main driver of inequalities. These findings suggest the relevance to further evaluate the long-term effects of social programmes in the light of the double burden of malnutrition. The empirical results of this analysis are also relevant for reconsidering the "*economics of obesity*" framework.

The International Diffusion of Food Innovations and the Nutrition Transition

PRESENTER: **Fabrice Etile**, Ecole d'Economie de Paris

AUTHORS: Anne-Célia Disdier, Lorenzo Rotunno

Motivation: High- and middle-income countries have experienced a profound shift in their population diet over the past decades. While food security has improved, the supply of animal protein free fat and free sugar has also significantly increased, both in absolute term and in relative share of total calorie intake. This nutrition transition is associated to rising rates of obesity and incidence of diabetes and cardio-vascular diseases in many countries (Popkin, 2004, 2017). While globalization is usually seen as a key driver of the nutrition transition (Hawkes, 2006), there is little systematic evidence on the economic and cultural mechanisms linking globalization to changes in food supply and demand (Etilé and Oberlander, 2019). We here examine one such mechanism: the diffusion of food innovations across countries and over time.
Objective: We construct measures of food innovations by country and year, document their distributions across countries and over time since 1946, and identify the causal impact of changes in food production techniques on country-level nutritional and health outcomes.
Method: We leverage an exhaustive dataset of food patents filed throughout the world since the 60s. Using patents as indicators of innovative activities and patent nomenclature as indicator of their utilization in the production process, we construct various country-year-level measures of the extent to which food innovations may contribute to the production of ultra-processed food products. We match these variables with other data sources in order to estimate the impact of food innovations on nutritional and health outcomes over the period 1960-2017.
Results: Our preliminary OLS-Fixed Effects results show that rising food innovations is positively associated with the increase in average BMI, and sugar and animal protein intakes, but not free fat. The effects are larger in upper-middle income countries than in high- and low-middle income countries. The results are robust to controlling for trends in economic growth, trade openness, social globalization, female labour force participation and urbanization.
Discussion: Most existing studies of the impact of the role of globalization and trade in the nutrition transition are based on case studies of specific aspects of food systems in specific countries. We here propose a more systematic analysis of a specific channel: food innovations. Our work is still in progress. First, we are refining our indicators of food innovation to better account for their idiosyncratic health impact. Second, we will implement grouped-fixed effect techniques to better account for between-country heterogeneity in trends in unobserved variables (see Oberlander et al., 2017).

Fetal Origins of COVID-19 Mortality. Evidence from Peru

PRESENTER: **Dr. Patricia Ritter**, University of Connecticut

AUTHOR: Ricardo Sanchez

Covid-19 has already generated more than 1 million deaths worldwide. While there is an important and fast-growing literature about the consequences of the pandemic, the literature addressing the determinants of Covid-19 mortality is surprisingly small. In this study, we aim to contribute to this literature by investigating whether early-life circumstances play a role in Covid-19 mortality and other long-term outcomes. We exploit the Cholera Epidemic afflicting Peru in the early 1990s as a quasi-natural experiment for variation in such circumstances.

We find that working-age women exposed to Cholera during the first trimester in-utero are more likely to die from Covid-19. As potential mechanisms, we find that women exposed to Cholera during their first trimester in-utero also have higher BMI, are more likely to be obese and to suffer from high-blood pressure as adults. Additionally, we find that women exposed to Cholera while in their first trimester in-utero are also more likely to be self-employed. Approximately 60% of workers in Peru are self-employed. For them, a day without working is a day without earnings. Self-employed workers have been the less likely to comply with the lockdown and, therefore, the sector of the population with the largest infection rate of Covid-19 in Peru. Event studies show no evidence of pre-existing trends in none of the outcomes.
With this study we aim to contribute in several ways.
First, we aim to contribute to the understanding of the determinants of Covid-19 mortality. This study provides evidence that early-life circumstances can have a powerful impact on Covid-19 mortality. Covid-19, and similar epidemics, will be most likely part of the future [WBPandemics], and we still know very little about their main determinants. In this study, we cannot identify the exact mechanism(s) but we show evidence of potential mediators: obesity and self-employment. Future studies should provide more evidence about the effect of early life shocks on Covid-19 mortality in order to increase our knowledge about mechanisms, and well as parental investments and other behaviors that can compensate or reinforce the original shock.
Second, this study aims to contribute to the literature about the long-term consequences of epidemics, and, more precisely, Cholera epidemics. Cholera epidemics have been the second most common type of epidemic in the world in the last two decades [smith2014global]. The long-term consequences of obesity, self-employment and Covid-19 should inform policy makers about the additional very large costs of this type of epidemics and the urgent need to prevent them.
Finally, this study adds more generally to the literature concerned with the long-term effects of early-life shocks. Although the literature presenting evidence of long-term effects on human capital variables is quite large, there is little evidence of long-term effects on mortality, especially on the mortality of working-age individuals. This is especially important in less developed countries, where life insurance, labor benefits and institutional protection to widows is so meager that the death of a working-age member can throw a family into a poverty trap.

4:00 PM –5:00 PM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Policy Evaluation in Primary Care

MODERATOR: **Sean Sylvia**, University of North Carolina at Chapel Hill

Understanding Variations in Antibiotic Prescribing in Primary Care: Insights from the Tuscany Region, Italy.

PRESENTER: **Claire Willmington**, Scuola Superiore Sant'Anna

AUTHORS: Milena Vainieri, Dr. Chiara Seghieri

Background:
Practice variation is a well-known phenomenon that affects all aspects of healthcare delivery and leads to suboptimal health outcomes as well as poor resource allocation. Given the global rise of antimicrobial resistance (AMR), practice variation is of particular concern when it comes to the prescription of antibiotics. A growing number of health systems are tackling this issue at all levels of healthcare governance.
Aims and objectives:
This study aims to (1) measure the variation of antibiotic prescribing in Tuscany's primary care; (2) measure the observed leeway that different levels of governance have for managing this variation ; (3) measure the potential cost savings that harmonization of antibiotic prescribing could generate at different levels of governance.
Methods:
To study the antibiotic prescribing patterns, we analyzed the performance and variation for seven indicators related to the prescription of antibiotics at three levels of healthcare governance: i) the individual level, 2619 GPs; ii) the peer-group level, all 116 GP partnerships and iii) the institutional level, all 26 health districts. For the statistical analysis, we built three-level mixed effects models that were fitted with 2619 GPs, 116 PCUs and 26 health districts. An expenditure analysis was also conducted to estimate the potential cost-savings that lower antibiotic use and costs could generate.
Results:
The results from the multi-level models suggested that the grand majority of the variation was located at the GP level (75% to 98%). However, the percentage of variation associated with GP partnerships and health districts ranged from 2% to 25%, depending on the type of indicator

analyzed. Our expenditure analysis suggested that reducing antibiotic use and costs could generate large cost-savings at the regional level, ranging from 7.3 to 8.2 million euros.
Conclusion:
While the variation was found to be in large part due to differences between GPs themselves, the influence exerted by peer groups and institutional mechanisms does have a significant impact as well. Further research needs to be conducted regarding the institutional and contextual factors that prompt GPs to harmonize their clinical behavior in line with best practices and lead to not only improved patient outcomes but also large cost-savings.

Impact of Primary Health Care Coverage on Individual Health: Evidence from Blood-Based Biomarkers in Brazil

PRESENTER: **Fernando Postali**, University of Sao Paulo
AUTHORS: Maria Dolores Montoya Diaz, Adriano Teixeira, Natalia Ferreira-Batista, Rodrigo Moreno-Serra

Context: The Brazilian Institute for Geography and Statistics (IBGE) carries out each five or six years the so-called National Health Survey (PNS). In 2013's edition, a subsample of about 8900 individuals was submitted to clinical laboratory tests (blood and urine) with the purpose of collecting information about their general health state. These laboratory tests were performed in partnership with Osvaldo Cruz Foundation (Fiocruz), and the microdata with their results were just fully released (October 2019).

The Family Health Strategy (ESF) is the largest Brazilian health primary care program. Several studies evaluate the impact of the program, finding evidence that it succeeded in reducing the mortality rates of some diseases (e.g.: Soares and Rocha, 2010 for infant mortality) and the hospitalizations of others. However, there is a gap in this literature because the channels whereby ESF actions affect the individual health have never received the deserved attention. The laboratory tests dataset represents an odd opportunity to contribute to fill this gap.

Objectives: The purpose of this paper is to evaluate whether the ESF coverage affects the individual health, measured by the individual blood-based markers of the laboratory results and by the blood pressure taken during the survey.

Methods: The cross-sectional dataset is composed of the conjunction of PNS 2013 survey with the laboratory tests results. The PNS sample design allows to identify the Metropolitan Area the tested individual belong to, resulting in a subsample of 3840 individual tests distributed in 21 Metropolitan Areas. The measure of local ESF coverage is composed of the interaction among the following measures: i) the number of ESF teams per 10 thousands inhabitants within the Metropolitan Area; ii) whether the household is registered at the ESF program or not; iii) the number of times a ESF team visited the household in the previous 12 months. The empirical strategy estimates the effect of these coverage measures on the likelihood of abnormal results in the laboratory test (probit), controlled for individual and household characteristics, as well as for the local supply of health facilities (hospital beds per capita in the Metropolitan Area).

Results: The results suggest that ESF coverage is related to the decrease in the likelihood of abnormal results of blood-based markers for Anemia (serum hemoglobin), Kidney failure (serum creatinine) and Leukocytosis (blood leukocytes). The likelihood of arterial hypertension also decreases as the household is registered at ESF. Blood markers for both Cholesterol (LDL) and Diabetes (glycated hemoglobin) did not respond significantly to ESF coverage. On the other hand, the blood marker for the presence of Dengue's antibodies (IgC) seems to be negatively correlated with the number of ESF visits, but not with the Metropolitan ESF coverage.

Discussion: Such evidence suggests that ESF should reassess its strategy toward addressing non-communicable metabolic diseases (like Diabetes), whose prevalence will likely increase in the coming years as consequence of the Brazilian population-ageing.

The Impacts of Enrolment Policies on Patient Affiliation with Primary Care Physicians in Quebec, Canada

PRESENTER: **Dr. Erin Strumpf**, McGill University

Background: Affiliation, defined as the concentration of care with a primary care physician, can influence patients' care experience, continuity of care and health outcomes. Many Canadian provinces have implemented primary care enrollment policies, with the motivation that they would increase affiliation and thereby improve downstream patient outcomes. However, there is little evidence regarding the impacts of such policies on patient-physician affiliation. We evaluated the effectiveness of two different primary care enrolment policies in Quebec. The 2003 policy targeted the enrolment of elderly and/or chronically ill patients, whereas the entire population was eligible to enroll under the 2009 policy.

Data and Methods: Several Quebec health administrative databases were linked using unique anonymous identifiers and include all patients registered for provincial health insurance programs. Our data cover 16 years of service use (1997-2013) and include physician claims, hospitalizations, emergency department visits, basic demographics and dissemination area level socioeconomic characteristics. We used a difference-in-differences (DD) study design to evaluate the impact of the 2003 policy on three measures of patient-physician affiliation; dichotomous usual provider of care (UPC), continuous UPC and the Reporting a Regular Medical Doctor (RRMD) index. We evaluated the effect of the 2009 policy on the same measures of affiliation using an interrupted time series (ITS) study design. We estimated the impacts of both policies in the Quebec population aged 40+ and in a cohort restricted to persons who used health services regularly.

Results: The DD estimates for the 2003 policy range from -0.250 to -0.952 percentage point changes among the regular users and -0.164 to -0.306 in the full cohort. These are very small changes on baseline rates ranging from 58% -74%. The event study did not reveal any evidence of dynamic effects. The ITS slope change estimates for the 2009 policy range from -0.490 to 0.215 for the different outcomes. Level shifts range from -0.312 to 0.691 percentage points compared with the counterfactual. As with the DD analysis, these estimated effects are very small relative to the baseline rates for the outcomes (60% -75%). Our effect estimates for both policies were stable under several robustness checks specific to each methodology.

Conclusion: Our results suggest that the recent Quebec enrolment policies did not impact patient-physician affiliation. A recent study of Ontario enrolment policies found a 3% reduction in emergency department visits among enrolled patients; however, this improvement could not be directly attributed to enrolment as the policy included additional services such as after-hours access and weekend care. Our results suggest that this reduction in emergency department visits was likely independent of enrolment and attributable to the other components of the Ontario policy. Our findings suggest that enrolment alone is not sufficient to produce improvements in affiliation, continuity of care, or efficient use of health services. More research is needed to better understand the factors that influence both affiliation and downstream patient outcomes.

Can Primary Care End Preventable Deaths in Children? Quasi-Experimental Study from *Programa Saúde Da Família*

PRESENTER: **Adriano Teixeira**, Insper - Institute of Education and Research
AUTHOR: Maria Dolores Montoya Diaz

The under-five mortality rate, the probability of a child dying before reaching the age of five, is known as a crucial indicator of child well-being and general health status of a population. Previous evidence has shown a negative association between primary care availability and infant mortality rates in developing countries. The consolidation of the *Programa Saúde da Família* (PSF) in Brazil was the main strategy for the development of a primary care model based on community health workers, replacing a techno-health care model focused on hospital care. As a primary care initiative with an emphasis on improving child health, PSF is expected to have a true and lasting impact on the lives of children preventing many of them to die from avoidable causes. In this paper, we conducted a quasi-experimental study following municipalities that takes into account that PSF was implemented at different times in each municipality. Our empirical strategy enables heterogeneous response to the length of exposure to the program and controls for unobserved time-invariant municipality-level, and municipality-specific time trends were used to capture differential trends in mortality specific to each municipality. The data covered all the 5570 Brazilian municipalities over a two-decades period (1998–2018). Our findings highlight that program implementation do have a remarkable effect on reducing infant preventable mortality, but the effect takes a couple of years to manifest itself. As the time of exposure to PSF increases, the predicted avoidable mortality rate (per 10,000 inhabitants) reduces from 3.1 to 2.5 after 5 years of exposure, then to 1.8 after 10 years, and reaches 0.4 after 20 years into the

program. These results were achieved primarily through improvements related to adequate care during childbirth and adequate attention to the newborn. The estimations are robust to the possibility of pre-existing trends in mortality, suggesting that there is a causal negative relationship between PSF implementation and under-five avoidable mortality.

4:00 PM –5:00 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: 'Nudge to Test' or 'Test As a Nudge': Behavioural Economics and HIV Self Testing in East and Southern Africa

SESSION CHAIRS: **Fern Terris-Prestholt**, London School of Hygiene & Tropical Medicine; **Jason J Ong**, Monash University

DISCUSSANT: **Sandra G. Sosa-Rubi**, National Institute of Public Health; **Matthew Quaife**, London School of Hygiene & Tropical Medicine

Investigating Costs Associated with HIV Treatment Initiation Using HIV Self-Testing and Financial Incentives in a Cluster Randomised Trial in Malawi

PRESENTER: **Linda Sande**, Malawi-Liverpool-Wellcome Trust

AUTHORS: Augustine T. Choko, Cheryl Johnson, Karin Hatzold, Elizabeth L. Corbett, Hendramoorthy Maheswaran, Melissa Neuman, Fern Terris-Prestholt

Background

HIV self-testing (HIVST) is the self-sampling and interpretation of HIV status in private. Secondary distribution of HIVST involves receiving an HIVST kit for another's use. We investigated the incremental costs of secondary distribution of HIVST to partners of pregnant women attending antenatal care (ANC) and newly identified HIV positive individuals (index) in Malawi.

Methods

HIVST distribution of trial-purchased kits was done as part of a 3-armed cluster randomised trial within 27 public health facilities using unincentivized health workers. Standard of care (SoC) gave the ANC and index clients invitation letters for their partners to come to the clinic for an HIV test. The intervention (HIVST_only and incentive) arms were SoC+HIVST with the partners self-testing at home. The HIVST_only arm encouraged partners to present at the clinic only if they screened positive. The incentive arm encouraged partners to come to the clinic regardless of their HIVST result and were given a $10 incentive for coming. The incentives served a dual purpose: they provided compensation for the partners' involvement in a study assessing accuracy in interpretation of HIVST results and also encouraged linkage to care after a positive HIVST result. We present results of the SoC and incentive arms only.

Costing of the trial was incremental to conventional HIV testing and from a provider's perspective. We combined bottom-up and top-down costing approaches, categorised costs as capital and recurrent and removed all research costs. Capital costs were assumed a lifespan of 2 years and annualised at a 3% discount rate. Costing was done between 2018/19 and costs are reported in 2019 US$.

Results

A total of 1,600 and 1,903 were recruited in the SoC and incentive arms, respectively. A larger proportion of partners came to the clinic in the incentive arm than SoC: 59% vs 36%. The incentive arm was also associated with a higher positivity rate i.e 3% vs 1% in SoC. The cost per partner tested was $14.94 in the incentive arm and $12.37 in SoC. This cost excludes the financial incentives because we assumed the incentives influenced the decision to come to the clinic but not kit use. The cost of identifying a person-living-with-HIV (PLWH) (includes financial incentives) was also higher in the incentive arm. i.e. $692.97 vs $652.11. The additional cost of identifying an PLWH over and above SoC was $99.82.

Discussion

People respond to nudges. Incentives applied in self-sampling technologies have the potential of encouraging linkage to follow-on care. The financial incentives applied in this study had an additional advantage of compensating for the cost of seeking care for individuals with high opportunity costs. As expected, such an intervention costed more than SoC but was associated with better outcomes.

Conclusion

Reaching populations left behind by conventional HIV testing approaches will require innovative delivery of testing services. Bundling HIVST with financial incentives for linking to care has the potential to improve testing uptake and linkage to care and had a lower unit cost that providing HIVST alone.

Relative Efficiency of Demand Creation Strategies to Increase Voluntary Medical Male Circumcision Uptake in Zimbabwe

PRESENTER: **Collin Mangenah**, CeSHHAR Zimbabwe (Centre for Sexual Health, HIV & AIDS Research)

AUTHORS: Webster Mavhu, Diego Cerecero, Chiedza P GAvi, Polite Mleya, Progress Chiwawa, Sandra Chidawanyika, Getrude Ncube, Sinokuthemba Xaba, Ministry of Health and Child Care Zimbabwe Xaba, Owen Mugurungi, Noah Taruberekera, Ngonidzashe Madidi, Katherine Fielding, Cheryl Johnson, Karin Hatzold, Fern Terris-Prestholt, Frances Cowan, Prof. Sergio Bautista-Arredondo

Background

Supply and demand-side factors continue to undermine VMMC uptake. Human centred design methods (HCD) are a design and management framework that develops solutions to problems by involving the human perspective in all steps of the problem-solving process. Relative economic costs of VMMC demand creation/service delivery modalities were assessed following PSI Zimbabwe's redesign of their interpersonal communication demand creation approaches drawing on market research and HCD methods.

Methods

A RCT compared arms with and without two interventions implemented by trained and incentivised interpersonal communications mobilisers: i) standard demand creation augmented by HCD-informed approach; ii) standard demand creation plus offer of HIVST across five rural Zimbabwe districts. Full annual economic costs of VMMC demand creation/service delivery were analysed based on actual programme financial expenditures supplemented by health facility data collection to capture all resources used for service provision. Sites represented three models of service-delivery: static (offering VMMC continuously); integrated (recently capacitated facilities, offering VMMC intermittently) and; Mobile/outreach (for more remote sites). Average costs per client reached and circumcised were derived by dividing full total program costs by number of clients reached and circumcised. The relationship between unit cost and scale was assessed together with characteristics such as type of facility, urbanicity, ownership, and facility throughput. All costs were analysed in 2018 US dollars.

Results

There was no evidence that the HCD-informed intervention increased VMMC uptake versus no HCD-informed intervention (IRR 0.87, 95%CI 0.38-2.02; p=0.75) nor did offering men a HIVST kit (IRR 0.65, 95%CI 0.28-1.50; p=0.31). Challenges with trial implementation saw <50% of IPC agents converting any men to VMMC, undermining the effect of demand creation and possibly reflecting acceptability and feasibility of the interventions. Total annual programme cost was $752,585 across demand creation approaches. Average costs per client reached with demand creation plus cost per circumcision were $58 and $174, respectively. Highest costs per client reached were in the HCD arm – $68 and lowest in standard mobilisation ($52) and HIVST ($55) arms, respectively. Highest cost per client circumcised was observed where HIVST and

HCD were combined ($226) and lowest in HCD alone ($160). Demand creation and communication costs constituted 66% of costs compared to 34% for VMMC service-delivery. Vehicle running costs were the highest cost contributor (39%) ahead of staff costs (23%). VMMC unit costs were lowest in rural high-volume church clinics within the HIVST model ($86) and highest in rural low-volume public-sector clinics within the standard mobilisation arm ($288).

Discussion

There was high variability in unit costs across arms and sites suggesting opportunities for cost reductions. Highest costs per client reached and circumcised were observed in the HCD+HIVST arm when combined with an integrated service-delivery setting where circumcision numbers were lower. Despite incurring similarly high demand creation activity-related costs, standard mobilisation and HCD arms had lower unit costs as they had a higher proportion of clients reached and circumcised. Mobilisation programmes that intensively target higher conversion rates as exhibited in the standard mobilisation and HCD arms provide greater scope for efficiency by spreading costs.

Cost and Cost-Effectiveness of Community-Led Delivery of HIV Self-Testing in Malawi: A Pragmatic Economic Evaluation

PRESENTER: **Pitchaya Indravudh**, London Schol of Hygiene & Tropical Medicine

AUTHORS: Katherine Fielding, Linda Sande, Hendramoorthy Maheswaran, Saviour Mphande, Moses Kumwenda, Richard Chilongosi, Rose Nyirenda, Cheryl Johnson, Karin Hatzold, Elizabeth L. Corbett, Fern Terris-Prestholt

Background

Community-based strategies can extend coverage of HIV testing and diagnose HIV at earlier stages of infection but can be costly to implement. Community-led approaches involve engaging underserved communities in disease prevention and management. Community participation in health programmes has been shown to improve health outcomes at low costs, as facilitated through improvements in collective awareness, self-efficacy and agency, and social cohesion. We evaluated the costs and effects of community-led delivery of HIV self-testing (HIVST) in Mangochi district, Malawi.

Methods

This economic evaluation was based within a pragmatic cluster-randomised trial of 30 group village heads and their catchment areas comparing the community-led HIVST intervention in addition to the standard of care (SOC) versus the SOC alone. The intervention involved mobilising community health groups to lead seven-day HIVST campaigns including distribution of HIVST kits. The SOC included facility-based HIV testing services. Primary costings estimated economic costs of the intervention and SOC from the provider perspective, with costs annualised and measured in 2018 US$. A post-intervention survey captured individual-level data on HIV testing events, which were combined with unit costs from primary costings, and outcomes. The incremental cost per person tested HIV-positive and associated uncertainty were estimated.

Results

Overall, the community-led HIVST intervention costed $138,624 or $5.70 per HIVST kit distributed, with test kits and personnel the main contributing costs. The SOC costed $263,400 or $4.57 per person tested. Individual-level provider costs were higher in the community-led HIVST arm than the SOC arm (adjusted mean difference $3.77, 95% CI $2.44-5.10; $p<0.001$), while the intervention effect on HIV positivity varied based on adjustment for previous diagnosis. The incremental cost per person tested HIV-positive was $324 but increased to $1312 and $985 when adjusting for previously diagnosed self-testers or self-testers on treatment, respectively. Community-led HIVST demonstrated low probability of being cost-effective against plausible willingness-to-pay values, with HIV positivity a key determinant.

Conclusion

Community-led HIVST can provide HIV testing at a low additional unit cost. However, adding community-led HIVST to the SOC was not likely to be cost-effective, especially in contexts with low prevalence of undiagnosed HIV.

Behavior Change with a New HIV Testing Technology: A Randomized Trial of HIV Self-Tests to Promote Partner Testing and HIV Risk Reduction in Kenya

PRESENTER: **Harsha Thirumurthy**, University of Pennsylvania

AUTHORS: Ruchi Mahadeshwar, Nicholas Wilson

Nearly half of HIV-infected individuals in sub-Saharan Africa are unaware of their serostatus, and HIV incidence in the region remain high. HIV self-testing is a disruptive technology that has potential to promote partner testing, identify HIV-infected persons, and facilitate improved sexual decision-making. We report results from a randomized trial of an HIV self-testing intervention in which high-risk women in Kenya receive multiple self-tests for testing themselves and their partners over an 18-month period.

Between June 2017 - August 2018, 2,087 high-risk women were enrolled from 66 community clusters in the Nyanza region of Kenya. Women in intervention clusters received multiple self-tests and were encouraged to offer tests to sexual partners with whom they did not anticipate using a condom. Over an 18 month follow-up period, we examined effects on women's knowledge of their partner's HIV status and women's sexual decision making.

Results show that the HIV self-testing intervention increasing knowledge of partner testing and that in turn led to decreased use of condoms with HIV-negative partners and higher income from transactional sex. Women offered an average of 8 self-tests to their sexual partners over 18 months. Women in the intervention group reported 35% higher primary partner testing than the control group ($p<0.001$). And in data obtained on the 3 most recent transactional sex encounters (over 11,000 encounters), we again found significantly higher rates of partner and couples testing among women's transactional sex partners. We similarly found a significant increase in partner testing. Finally, the intervention group identified 1.8 times ($p<0.01$) more HIV-positive sexual partners per participant and importantly, there was no increase in intimate partner violence due to the intervention. In addition, we find that HIV self-tests help women make decisions about whether to accept higher payments in exchange for condomless sex without accepting the higher HIV risk that is typically associated with condomless sex.

4:00 PM –5:00 PM WEDNESDAY [Demand And Utilization Of Health Services]

Effects of Medicaid Expansion in the United States

MODERATOR: **Marcia Weaver**, University of Washington

Expanding Medicaid Eligibility Is Associated with Greater Insulin Use and Improvements in Diabetes-Related Mortality

PRESENTER: **Samuel Crawford**, University of Southern California

AUTHORS: John Romley, Rebecca Myerson

Introduction: Improving access to care and health outcomes among Americans with chronic disease was a goal of the Patient Protection and Affordable Care Act (ACA). One mechanism to achieve this goal, was through federally subsidized, state-specific Medicaid eligibility expansions. Eligibility expansions changed the income requirements for Medicaid coverage to 138% of the federal poverty level, significantly improving health coverage access of millions of low-income Americans. In the case of diabetes, health coverage has been associated with greater access to medications and clinical management for glycemic control. Over the last decade, the list price and out of pocket price of insulin have increased dramatically in the United States (U.S.); gaps in access to this important medication among patients with insulin-dependent diabetes can lead to acute health complications.

Objective: Our objective was to assess changes in healthcare access, affordability and outcomes among non-elderly, low-income adults with diabetes associated with Medicaid eligibility expansions, overall and by rural vs. urban areas of residence.

Research Design: Models assessing healthcare access and affordability utilized multivariable difference-in-difference linear probability regression models and controlled for age as well as demographic and socio-economic variables. To assess the robustness of findings related to changes in insulin use, we analyzed prior trends and used logit models. Models assessing diabetes-related mortality used negative binomial regression models and analyzed prior trends using an event study model. Access and affordability measures were further stratified by urban and rural status.

Measures: Key outcomes of this study were related to healthcare access and affordability among low-income American adults reporting diagnosed diabetes, and age-adjusted diabetes-related mortality per 100,000 American adults aged 25-64.

Participants: We used two sources of U.S. nationally representative data. Insulin use analysis included 78,970 adults with diabetes participating in the Behavioral Risk Factor Surveillance System, over 2011-2018. Diabetes-related mortality was analyzed using vital statistics data from the Centers of Disease Control and Prevention WONDER database, over 2010-2018.

Results: Medicaid eligibility expansion was associated with a reduction in cost-related barriers of prescription use among low-income respondents. Furthermore, eligibility expansions were associated with differing impacts depending on resident urban or rural status. Furthermore, Medicaid eligibility expansion was associated with a significant decline in diabetes-related mortality. However, that result does not hold when controlling for state-specific fixed effects. Supplemental models suggested the robustness of findings and evidence of parallel trends in both outcomes prior to Medicaid eligibility expansions.

Conclusions: Medicaid eligibility expansion was associated with improvements in healthcare access among people with diabetes and increases in use of healthcare among people with diabetes who live in rural areas. Differing areas of improvement, related to access and healthcare use by urban and rural status, highlight the importance of geographically-specific policy interventions to improve diabetes care among low-income respondents. By providing evidence on changes in health care use and health outcomes associated with Medicaid expansion policy, our findings may inform ongoing policy discussions about state-level adoption of the policy.

Medicaid Expansion and the Mechanics of Increased Access to Organ Transplant

PRESENTER: **Sara R Machado**, London School of Economics and Political Science

AUTHOR: Ms. Francisca Vargas Lopes

Medicaid expansion's effect on coverage and access are well documented in many health care domains. The extent to which coverage leads to access depends on system, patient, and disease and treatment-specific factors. In this paper, we explore several dimensions of Medicaid expansion on the unique ecosystem surrounding organ transplantation. Patients with organ failure face a challenging pathway towards transplantation, the first step being wait-listing. Given the scarcity of organs available for transplantation, patient screening for listing is extremely thorough. While clinical status is essential, the ability to cover all transplant-related medical expenses, as well as patients' sociodemographic and behavioral characteristics, are all part of the vetting process. Each of these is a potential barrier that may hinder the ability of coverage expansion to increase access to transplants and, ultimately, improve patient outcomes.

We use a difference-in-differences design, harnessing within-state variation over time to measure the effect of coverage expansion on a set of access measurements that disentangle different mechanisms through which increased coverage impacted access. We compute the outcomes by dividing the number of Medicaid transplant candidates added to the waiting list (1) by the population in each state, to measure the impact of increased ability to afford care, (2) by the total of Medicaid enrollees in the state, to measure the impact of increased disease detection and (3) by all payers waiting-list additions, measuring crowding out of other forms of health insurance.

Using data on the universe of organ donors and transplant candidates, from the Organ Procurement and Transplantation Network, we quantify the effect of Medicaid expansion, for each of the outcomes above, using state-level data for patients added to kidney, liver, heart, and lungs waiting lists, between 2008 and 2018, overall and by organ. We repeat the same analysis for transplant recipients. We include time-varying controls for sociodemographic characteristics (from the American Community Survey) and organ-specific disease prevalence (Global Burden of Disease Estimates).

We find Medicaid expansion to result in 10.6% increase of Medicaid waiting list additions per 100,000 habitants across all organs. Organ-specific estimates indicate potentially larger effects among in kidney transplantation (20.6% on average). The proportion of Medicaid enrollees added to the waiting list increased by 36.1%. and the proportion of Medicaid transplant candidates among all payers increased by 51.6%, relative to non-expansion states.. Effects of Medicaid expansion in actual transplants are similar to those in wait-listing, except for the first outcome (5%, on average). This suggests that increased access to the waiting lists does not necessarily translate into access to transplantation. When each organ is studied separately we find the results to vary, with conclusions above holding for liver and kidney, but less for heart and lung.

Our findings suggest that increased coverage through Medicaid expansion resulted in better access to transplants´ waiting list, as well as to transplantation itself, albeit on smaller magnitude for the latter. The effect of coverage on access appears to operate through three different mechanisms – increased ability to afford care, disease detection and crowding out of other insurance forms.

The Effect of Medicare Prevention Benefit Expansion on Cancer Detection and Mortality

PRESENTER: **Mika Hamer**, University of Colorado Anschutz Medical Campus

AUTHORS: Rebecca Myerson, Cathy Bradley, Richard Lindrooth, Marcelo Coca Perraillon

Background: Breast and colorectal cancers are leading causes of death among older adults in the United States. Early detection greatly improves survival. Yet, in 2010, more than half of adults over age 65 were not up to date on recommended preventive services, including cancer screening. To address underutilization of these services, Medicare expanded prevention benefits through the Affordable Care Act (ACA) beginning in 2011. Specifically, Medicare: (1) eliminated cost sharing for prevention services rated "A" or "B" by the US Preventive Services Task Force (USPSTF); (2) introduced a new annual check-up, the Annual Wellness Visit; and (3) provided bonus payments to primary care providers in health care shortage areas. The causal effect of these policy changes on cancer detection and mortality is unknown.

Methods: We use a difference-in-differences (DID) design to estimate breast and colorectal cancer detection and mortality before and after 2011 for a Medicare-eligible population over age 65. Our comparison group is the near elderly (age 59-64) who were not affected by the policy changes, but who are similar on health and lifestyle factors associated with the outcomes. The validity of this design relies, in part, on the arbitrariness of age 65 as the threshold for Medicare eligibility, following a regression discontinuity design (RDD). By combining DID with RDD, we estimate the incremental effect of the benefit expansion over and above the effect of gaining Medicare alone in the pre-ACA period. We model outcomes using negative binomial regression with population exposure, and control for time trends, effect of aging, and county-level factors (e.g., health care supply). Analyses are limited to the immediate post-ACA period (2011-2013) because many of the ACA's main provisions affecting people under 65 began in 2014. We vary the bandwidth around the Medicare age-eligibility threshold in sensitivity analyses. Cancer diagnoses came from Surveillance, Epidemiology, and End Results data. Cancer mortality came from CDC vital statistics databases. County covariates came from Area Health Resources Files.

Results: Our sample included 291,666 tumors and 442,974 cancer deaths in people aged 59-70 from 2008-2013. Medicare's prevention benefit expansion was associated with an increase in total breast cancer detection (11.25/100k population, $p=0.002$) driven by early-stage cancers (11.09/100k population, $p<0.001$). There was no change in late-stage cancers or breast cancer mortality. There was no change in colorectal cancer detection, total or by stage. There was a small, but significant decrease in colorectal cancer deaths (-1.49/100k population, $p=0.026$). As a placebo test, we use lung cancer, which had no routine screening recommendation from USPSTF until 2014. We found no effect on lung cancer

outcomes, supporting the robustness of the main findings. Parallel trends assumptions were satisfied in all models. Findings were robust to changing bandwidths.

Conclusion: By encouraging and improving access to preventive services for older adults, the 2011 Medicare prevention benefit expansion increased detection of early-stage breast cancers and modestly decreased colorectal cancer mortality. This work provides empirical evidence of the effect of these policies, accounting for patient- and provider-selection factors omitted in prior work using methods for selection on observables.

4:00 PM –5:00 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Costs and Consequences of Vaccine Delivery Strategies in Low- and Middle-Income Countries

SESSION CHAIR: **Stephen C Resch**, Harvard T.H. Chan School of Public Health

ORGANIZER: **Allison Portnoy**, Harvard T.H. Chan School of Public Health

DISCUSSANT: **Praveena Gunaratnam**, CHAI

Labor Resource for Immunization and Administrative Activities in the Context of Primary Health Care Facilities in Six Countries

PRESENTER: **Joseph Americo Carreiro**, Management Sciences for Health

AUTHORS: Colin Gilmartin, Hector Castro, Dr. Logan Brenzel, Dr. Allison Portnoy, Christian Suharlim

Introduction:

Vaccinations save lives. Planning vaccination programs requires a full understanding of resource requirements beyond vaccine costs. Different studies have shown that labor is a primary driver of immunization delivery costs. The Expanded Program on Immunization Costing and Financing (EPIC) project published detailed data on routine immunization costs for 317 primary healthcare (PHC) facilities in Benin, Uganda, Ghana, Moldova, Honduras, and Zambia in 2015. Previous studies (Menzies et al., Geng et al.) have shown that labor represents an important proportion of total immunization costs (14–69%) and inversely correlated with increasing delivery volume. Our evaluation extended this prior study and explored the variability of labor input for immunization, and the types of activity performed, such as program management and vaccine delivery, in the context of immunization program delivery and its functioning within PHC facilities. By better-understanding labor input with contextual factors, such as administrative zones, delivery volume, and urbanity, we can offer insight into how LMIC countries can effectively plan and budget for routine immunization programs

Methods:

We quantified labor input by FTEs to improve cross-country comparability. We evaluated the share of PHC FTE towards immunization and its variation across contextual variables (catchment population, service volume, urbanity, facility ownership, administrative zones). We quantified the Immunization Admin FTE- consisting of labor input dedicated towards program management, surveillance, social mobilization, advocacy, and record-keeping for immunization- and its variation across contextual variables. Facilities with missing values are omitted from the analysis.

Results:

We evaluated 2333 labor data points representing 317 facilities in six countries. On average, across all observations in our dataset, PHC facilities devote 19.2% (95%CI 16.7-21.3%) of their labor input towards immunization. This is highest in Ghana at 22.4% (95%CI 16.9, 27.9%) and lowest in Benin at 12.6% (95%CI 10.6, 14.7%). Facilities serving larger catchment populations devote less FTE share towards immunization. This relationship holds across various other contextual variables explored. Compared to NGO/Private-owned facilities of similar volume, government-owned facilities spent 10.5%, 12.9%, and 19.6% less FTE towards immunization in low, medium, and high- volume facilities, respectively. Administrative activities require, on average, 41.42% (95%CI 39.2-43.5%) of all labor input towards immunization. High volume facilities require 190.5% more immunization FTE and 82.6% more immunization admin FTE than low-volume facilities. Holding volume constant, no relationship is observed between administrative FTE and urbanity, ownership, and the number of administrative zones.

Conclusion:

A large share of PHC labor input is devoted to immunization. There are contextual factors that may explain variability of labor across settings. The large share of labor devoted to administrative tasks may be improved by introducing effective management technologies, data systems, and economies of scale and scope. This will allow healthcare workers to spend more time providing direct services to their population.

The Cost of Integrated Immunization Campaigns: Findings from Sierra Leone and Nigeria

PRESENTER: **Laura Boonstoppel**, ThinkWell

AUTHORS: Christina Banks, Flavia Moi, Kyle Borces, Obinna Onwujekwe, Florence Sibeudu, Divine Obodoechi, Dr. Logan Brenzel

The COVID-19 pandemic has increased the need for integrated delivery of essential health services, including immunization, to ensure effective and efficient service delivery. Many countries have suffered from disruptions in immunization services, reductions in coverage, and have had to delay or cancel immunization campaigns, rendering populations vulnerable to outbreaks of vaccine preventable diseases. As part of catch-up vaccination strategies and while resources are particularly constrained, countries have been encouraged to explore the option of conducting multi-antigen campaigns or integrating immunization campaigns with other health services. Despite this recommendation, there is little evidence on the cost and efficiency gains of co-delivery during immunization campaigns.

This study estimated the full financial and economic costs of two immunization campaigns during which other vaccines or health services were delivered in all or part of the country. In Sierra Leone, oral polio vaccine, vitamin A and albendazole delivery were administered during a measles-rubella catch-up campaign in 2019. In Nigeria, meningitis A was integrated with the yellow fever campaign in Anambra state in 2020. In both countries, a sample of 30-50 facilities was selected, and data were collected retrospectively from facility, national level and all administrative levels in between.

Findings show cost savings in major fiscal cost drivers, such as per diems, transport and training costs. The study also compares the delivery cost per dose between areas that did and those that did not deliver multiple antigens, compares cost composition in light of delivery strategy differences (such as types of delivery sites and challenges faced during implementation), and assesses differences in cost drivers and profiles. The results of the study will help global and country level decision makers in planning and budgeting for multi-antigen and co-delivery campaigns.

Impact of Campaign-Style Delivery of Routine Vaccines on Other Routine Health Services: A Quasi-Experimental Evaluation Using Routine Health Services Data from India

PRESENTER: **Emma C Clarke**, Harvard University

AUTHORS: Mary Caroline Regan, Christian Suharlim, Susmita Chatterjee, Dr. Allison Portnoy, Dr. Logan Brenzel, Arindam Ray, Jessica Cohen, Margaret McConnell, Mr. Stephen C Resch, Nicolas A Menzies

Introduction:

Improving routine immunization coverage and equity are strategic priorities of the World Health Organization's (WHO) Immunization Agenda 2030. One WHO-recommended strategy for addressing these goals is Periodic Intensification of Routine Immunization (PIRI), which adapts

approaches from mass campaigns to deliver routine vaccines.

There is little evidence on the effects of PIRI interventions on health systems. It is possible that PIRI interventions could divert health worker time and other resources away from the delivery of routine services, a concern that exists for mass campaigns. However, such negative effects could potentially be avoided with sufficient planning and integrated delivery of services during PIRI sessions. In this study, we evaluated the impact of Intensified Mission Indradhanush (IMI), a large-scale PIRI intervention implemented in India during 2017-2018, on the delivery of non-vaccine routine health services.

Methods:

We conducted a health worker survey, and a quasi-experimental evaluation assessing the impact of IMI on the delivery of selected maternal and child health services. The survey sample included 289 health workers across 40 districts. Surveys asked about the services that health workers normally would have provided if they were not participating in IMI, whether a substitute provided services in their place, and whether they delivered any non-vaccine health services during IMI sessions.

Informed by the survey data, we conducted a controlled interrupted time-series analysis using routinely-collected data on health service delivery volume. We compared trends in service delivery volume in districts participating and not participating in IMI, and estimated the impact of IMI as a percent change in service delivery volume during the 4-month implementation period.

Results:

In the health worker survey, 44% of respondents reported that, on the days when they conducted IMI sessions, they normally would have delivered non-vaccine routine health services including antenatal care and health clinics, while 28% reported that they would have conducted routine immunization and 24% would have been on holiday or in meetings. Only 7% of health workers reported that a substitute conducted their missed work during IMI. There was some service delivery integration during IMI sessions: 37% of respondents reported conducting health education and 25% reported conducting antenatal care. Other activities conducted during IMI sessions included distribution of oral contraceptive pills, iron and folic acid supplements, condoms, and oral rehydration solution; outpatient care; and child growth monitoring.

Using interrupted time-series analysis, we found that IMI had a negative but not statistically significant effect on the number of women completing four antenatal care visits, the number of iron folic acid pill packs distributed to pregnant women, and the number of oral contraceptive pills packs distributed; and a positive but not statistically significant effect on the number of deliveries taking place in health facilities.

Conclusions:

Our findings suggest it may be feasible to conduct PIRI interventions without disrupting routine health services. However, routine data may not be precise enough to capture all disruptions. Policymakers and researchers should continue to measure and evaluate the effects of PIRI interventions on routine health services to inform decision-making.

Restricting the Scope of Costing Studies to Improve the Efficiency of Data Collection: An Example from Routine Immunization

PRESENTER: **Dr. Allison Portnoy**, Harvard T.H. Chan School of Public Health

AUTHORS: Emma C Clarke, Christian Suharlim, Mr. Stephen C Resch, Nicolas A Menzies

Background:

Cost data are critical inputs for health program planning in low- and middle- income countries (LMICs), but costing studies are expensive and time-consuming. Improving the efficiency of cost estimation methods can lower the costs and increase the information content of these studies. Traditionally, concerns about efficient study design in costing analyses have focused on selecting the appropriate sample size to answer study questions, and optimizing the trade-offs between number of sampled units, clusters, and sample stratification. However, decisions must also be made about the cost components collected in a survey, which reflects another trade-off between accuracy and resources needed for data collection. This study investigated efficient data collection approaches for estimating immunization program costs, focusing on the choice of data to be collected in costing studies.

Methods:

We conducted a simulation study to test the performance of different data collection approaches. Our simulation used data from an existing study of national facility-level costs in six countries, with data from 319 primary health care facilities, as well as routinely available data. The data collection designs included: (1) salaries only; (2) doses and total immunization staff; (3) include salaries, doses, and total immunization staff; and (4) salaries and vaccine costs. For each modeling approach, the total facility-level cost output from the original study sites were predicted with a linear regression model according to the specified covariates (i.e., costing components). We compared the accuracy of the cost estimates from each approach to the true value in order to estimate bias, variance, and root mean squared error (RMSE) and conducted cross-validation.

Results:

When the only primary data collected was for salaries (Model 1), estimates ranged from -0.6% to 1.5% away from the true value. Collecting data on doses and total immunization staff (Model 2) yielded results that were -1% to 2% away from the true value. Collecting more information yielded better results: estimates from Model 3 were between -0.9% and 0.8% away from the true value, and estimates from Model 4 were between -1.1% and to less than 0.1% different. A cross-validation of these prediction models found that predicted facility-level costs for one country relying on a model of the remaining five country sites aligned most closely with the original facility-level costs using Model 4.

Conclusions:

Developing less resource-intensive approaches to collect cost data will allow more routine use of costing studies. Our findings suggest that, for immunization program costing, it may be sufficient to collect data on salaries and vaccine costs only, depending on the desired precision of the estimates. By identifying data collection strategies that collect a narrower range of cost categories without large loss of precision for cost estimation, we can both improve the efficiency of future costing studies and also the routine data collection of vaccination programs at the country level. Additionally, identifying the most valuable components for budgetary accuracy and cost estimation can provide indicators for measuring program efficiency and opportunities for health system intervention.

5:15 PM–6:30 PM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Social Determinants of Health and Family Economics Poster Session 2

MODERATOR: **Beverley Essue**, Institute of Health Policy, Management and Evaluation, University of Toronto

Are Minority Groups Represented at the Decision Table in Matters Concerning Them? Findings from a Gender and Equity Analysis of the Basic Health Care Provision Fund Intervention in Nigeria.

PRESENTER: **Frances Ilika**, Palladium -Health Policy Plus

AUTHOR: Sara Pappa

Introduction

The basic Health Care provision (BHCPF) is a priority health intervention designed to improve equity in health access and quality of care at the primary health care (PHC) level; with a high focus on maternal and child health. This intervention is implemented through government agencies at the National and State levels. The BHCPF Operations Manual endorses at least 40 percent female membership, with women in 'effective roles' in implementation structures. The extent to which key beneficiaries are involved in the design and implementation of the program is not clear.

Methods

A gender and equity analysis was conducted in 3 Nigerian states (Abia, Osun, Ebonyi) and the Federal Capital Territory (FCT) representing the 3 major ethnic groups. We examined specific gender and equity considerations and potential challenges, while identifying areas of improvement in ensuring BHCPF efforts are successful. We applied the Interagency Gender Working Group (IGWG) gender analysis framework to elucidate the state-by-state gender and equity context, across key domains, situating the impact between women, men, boys and girls with a focus on: (1) practices, roles, and participation; (2) knowledge, beliefs, perceptions; (3) power and decision making. Data was collected through desk reviews of key policy documents and key Informant Interviews.

Results

Overall, the level of gender and equity awareness largely stopped at understanding there is a need, but not recognizing gender and equity requirements. Most noted barriers related to lack of information and awareness of services and health risks, especially among women, transportation barriers, and low financial access for services. Some respondents demonstrated a subtle denial of the existence of gender and equity disparity in the delivery of, and access to, health services at all levels—especially PHCs. The leadership structures largely follow traditional gendered patterns; with an entirely male board in FCT, only one female in Ebonyi, while Abia showed a good representation of 40%. There is a complete male leadership cadre in the board across all states—these are responsible for decision making. Men often see PHCs as a women's domain and not tailored to their health needs; leading to neglect in funding PHCs towards adequate service delivery.

Conclusion

To fulfil the goals of health interventions, targeting vulnerable groups; pinpointing the relative gender and equity barriers to seeking care is a critical step. Both men and women need to be appropriately engaged, informed and represented in decision making cadres for achievement of critical objectives and goals.

Child Mental Health and Income Gradient from Early Childhood to Adolescence: Evidence from the UK

PRESENTER: **Murong Yang**, University of Oxford

AUTHORS: Cathy Creswell, Claire Carson, Mara Violato

Background

Mental health problems are increasingly prevalent among children and adolescents. Children from low income families are likely to have worse mental health than their wealthier peers. Understanding the association between economic deprivation and poor child mental health, how it varies across ages from early childhood to teen years, and the mechanisms underlying the association is of paramount importance to tackle this increasing public health problem which has been further exacerbated by the COVID-19 pandemic.

Objective

This study aims to investigate the relationship between family income and child mental health problems from childhood to adolescence in the UK, its potential variation with age, and the potential mechanisms that may explain the relationship.

Methods

Data were drawn from the UK Millennium Cohort Study, a nationally representative longitudinal study of 18,818 children born in the UK in 2000-2002. The main outcome was parent-reported child mental health problems, measured by the Total Difficulties Score (TDS) derived from the Strengths and Difficulties Questionnaire (SDQ) at ages 3, 5, 7, 11, 14 and 17 years. Internalising and externalising subscales of the SDQ were also used as outcomes to investigate different aspects of child mental health problems. The exposure was family income, which was measured using permanent family income and frequency of poverty over time, with robustness check using lagged transitory income. Within the theoretical framework of the Grossman health production function, multivariable logistic regression was conducted to investigate the cross-sectional association between family income and child mental health problems, and to explore the mechanisms underlying the effect, in each age group, using insights from the 'parental investment' and 'parental stress' models.

Results

Preliminary results indicated significant protective effects of higher permanent family income on the likelihood of the child suffering from mental health problems (TDS) across all ages. Although the relationship weakened after adjusting for various confounding and mediating factors, the marginal effects of permanent income equalled to -0.025($p=0.012$), -0.010($p=0.018$) and -0.044($p<0.001$) at age 3, 5, and 11 years, respectively (age 17 analysis ongoing). Results were confirmed in model specifications using frequency of poverty as the main exposure. In addition, poor maternal mental health and low mother-to-infant attachment, which were constructed based on the 'parental stress' theories, were identified as significant mediating factors of the negative impact of low family income on child mental health. The effect of poor maternal mental health on children's mental health became greater as children grow older.

Conclusions

This study shows that while family income is strongly associated with a child's mental health, much of this effect is mediated via known risk factors such as maternal depression and the direct effects are relatively small. This suggests that policies that target income redistribution would not only address the increasing child mental health inequalities, but also have wider beneficial effects within the family, reducing the prevalence of other factors that we observe as mediators. The identification of cost-effective interventions to reduce income-related child mental health inequalities is increasingly important as the ongoing COVID-19 pandemic pushes more families into poverty.

Health Inequity in Bangladesh: Trend and Decomposition

PRESENTER: **Dr. Sadequl Islam**, Laurentian University

Sustainable development depends on reductions in various types of inequity, including health inequity between subgroups of a population. Research on health inequity helps identify and monitor health differences between subgroups and provides feedback to strengthen equity-oriented policies and practices.

During the last three decades, the per capita income level in Bangladesh has increased significantly, and poverty has declined substantially. However, the degree of inequality of income has increased. The question remains whether health inequity has decreased or not. The literature on health inequity in Bangladesh is scanty because of data limitations.

The main objectives of this paper are to a) compute various measures of health inequity for Bangladesh; b) examine trends in various measures of health inequity; c) and carry out a decomposition analysis of health inequity in Bangladesh.

The paper computes several inequity measures such as absolute and relative inequity, the slope index inequity, the concentration index (based on the *Handbook on Health Inequality Monitoring: With a Special Focus on Low-and Middle-Income countries*, World Health Organization,

2013). For empirical analyses, the paper uses the Health Equity Assessment Toolkit (HEAT) and HEAT-Plus software developed by the World Health Organization. The software allows the evaluation of inequalities within a country using over 30 reproductive, maternal, newborn, and child health indicators and five equity stratifiers such as economic status, education, place of residence, subnational region, and child's gender.

The paper carries out decomposition analyses of health inequity in Bangladesh for rural and urban areas and eight administrative regions (called divisions) of Bangladesh based on the Theil index. The Theil index is the appropriate method for computing relative inequity between subgroups in cases where there is no natural ordering among population subgroups.

For Bangladesh, the paper relies on two types of surveys: the Demographic and Health Survey (DHS) and the UNICEF's Multiple -Indicator Survey (MICS). The paper computes health inequities based on DHS (Standard version) microdata from 1993-94 to 2018. It also computes health inequity for the DHS Service provision assessment(SPA) surveys of 2014 and 2017. The DHS (SPA) version is a health facility survey which provides a comprehensive overview of a country's health service delivery. Six surveys of the MICS microdata are available for the 1993-2019 period.

The paper uses the HEAT software and its built-in database for Bangladesh for the 1993-2014 period. The HEAT-PLUS software permits uploading the user's database. The paper uses the HEAT-PLUS software for the DHS(SPA), survey, 2017 and DHS (standard) survey,2017-18 and MICS 2019 survey to measure health inequities for these years.

Some preliminary findings from the Demographic and Health Survey of Bangladesh 2017-18 show that health inequity in Bangladesh is substantial. For example, for the lowest quintile (poorest), only 25.1% of mothers received four or more antenatal care services from a skilled provider, compared to 70.9% for the highest quintile (richest). Furthermore, the relevant figures for rural and urban areas are 39% and 56.6%, respectively.

Social Inequalities Related to Antimicrobial Resistance in N. Gonorrhoeae in Colombia

PRESENTER: **Sandra Marcela Sánchez**, Profamilia

Antimicrobial resistance (AMR) occurs when microorganisms survive exposure to antibiotics that would normally kill them. Neisseria gonorrhoeae is a threat to public health worldwide due to the increasing number of antibiotic resistant strains.

1. gonorrhoeae AMR has multiple determinants: indiscriminate and irrational drug use associated with a lack of information, lack of rapid diagnostic tests, and some gender stereotyping of adult men not seeking health services.

The hypothesis of this study is that there are determinants of N. gonorrhoeae that may be contributing to AMR in Colombia. This hypothesis was answered by three specific objectives: to analyze the antimicrobial sensitivity of N. gonorrhoeae isolates, to measure inequalities, and to define evidence-based policy recommendations to support the implementation of the national response plan to ADR, with emphasis on N. gonorrhoeae.

An ecological study was conducted using a multi-panel of disaggregated data at the departmental level during the period 2009-2018. The target population was the 33 departments of Colombia (including Bogotá D.C.) that reported people served and antimicrobial sensitivity of N. gonorrhoeae isolates.

First, a univariate descriptive analysis of the variables was conducted. Secondly, the maximums and minimums of the variables were calculated. Thirdly, the antimicrobial sensitivity percentages of N. gonorrhoeae isolates by antibiotic were analyzed. Fourth, inequality rates were calculated and fifth, the population was classified into quintiles to identify the epicenter of inequality. This research did not require ethical approval because the authors did not collect new data and the study was based on publicly available secondary data.

Between 2009 and 2018, 29,030 people were diagnosed with N. gonorrhoeae. The findings indicate antimicrobial resistance of N. gonorrhoeae isolates to penicillin (50.7%) and tetracycline (67.3%). The greatest inequalities were in the cases of the presence of barriers to access to health services, not having received information on prevention of STIs, UBN and illiteracy. A pro-poor inequality was found in knowledge of HIV/AIDS and STI prevention in medical consultations. With respect to structural determinants, 30% of N. gonorrhoeae isolates are concentrated in 70% of the departments with the greatest barriers to health services.

Regarding intermediate determinants, 80% of N. gonorrhoeae isolates are concentrated in the half of the departments where people receive the least information on STI prevention. Finally, social exclusion was identified as explained by illiteracy, barriers to accessing health services, not receiving medical information on STI prevention, and not using contraceptive methods.

Some recommendations emerge from this study: increase awareness about safe sexual and reproductive health; rethink how to deliver key messages with an equity approach; improve information, prescription, and drug chain systems; create coalitions to improve response and share objectives with the private sector; improve data availability and disaggregation; and support research on inequities in ADR.

The Effect of Household Relocation on Healthcare Access and Utilization Among Children

PRESENTER: **Julie Hudson**, AHRQ

AUTHOR: Terceira Berdahl

Topic

Prior research finds that negative life events such as death, divorce, job loss and housing instability are associated with worse health for individuals, but few studies examine how life transitions impact access to care and utilization patterns. This paper addresses this gap in the literature and focuses on the impact of household relocation on healthcare access and utilization for children. We hypothesize that moving residences could result in delays for access and utilization. Causes include competing time factors associated with a household move, change in insurance, and the need to seek new medical providers. Moves may also be the result of unstable life and financial circumstances, such as those observed during the current pandemic.

Methods

We use the Medical Expenditure Panel Survey Household Component (2001-2018) to identify a sample of children ages 0-18. The panel nature of MEPS allows us to follow children for five rounds over a two year period. Round specific geo-code information is available to track changes in residential location at the block-, tract-, county-, and state-level (for example, a move from one tract to another tract, or from one state to another state). In addition, longitude-latitude coordinates can be used to both identify whether a move occurred and to calculate distance moved.

Our outcome measures for children include having a usual source of care at rounds 2 and 4, having a well-child visit during the year, and having a well dental visit during the year. We also observe compliance with recommended well child visits and well dental visits during the year. Yearly measures include years 1 and 2 of the panel. We use regression analyses to account for whether the child's residence changed during the panel (any move) and to account for distance moved during the panel. To take advantage of outcome variables measured over time, we include specifications where residential moves are observed between specific rounds. For example, the impact on usual source of care in round 4 for residential moves that occurred between rounds 3 and 4. All regressions control for demographic characteristics, including race, age, gender, family structure, income, parental education, insurance status, region, and urban/rural location.

Findings

Preliminary findings using sample means suggest strong evidence that children are less likely to have a usual source of care and had lower healthcare utilization if their family moved during the MEPS reference period (over two consecutive calendar years). For usual source of care, magnitudes increase with greater distances moved in miles. Moving across states has a greater impact than moving across counties and both

were larger than block or tract moves. Children who moved between rounds 1 and 2 have significantly lower incidence of usual source of care in round 2, but experience some improvement by round 4 (while remaining significantly lower than children with no move). For moves between rounds 3 and 4, we observe no significant difference in usual source of care in round 2 (before the move), but large significant differences in round 4 (after the move).

Does the Impact of Providing Health Information Vary by Socioeconomic Status? A Regression Discontinuity Study of Community-Based Hypertension Screening in Two Major Indian Cities

PRESENTER: **Ms. Sneha Mani**

AUTHOR: Nikkil Sudharsanan

Hypertension is the leading risk for mortality in India yet the majority of individuals with hypertension are not aware of their condition. Community-based screening and information provision is a widely proposed strategy for connecting individuals with undiagnosed hypertension to the health system and improving blood pressure (BP) management at the population level. The main theory behind community-based screening and information provision is that the lack of awareness about the necessity and importance of BP control is the primary reason that individuals with hypertension are not taking action to control their BP. By providing individuals with information about their health status and of the importance of controlling BP, they will take actions-such as seeking care, making lifestyle changes, and taking and adhering to medicines, to control their BP. The community-level approach also captures individuals who are unlikely to visit a health facility for preventive care or seek care for minor ailments, which is a common issue in low- and middle-income countries like India. However, community-based screening efforts will not lead to BP control if people who are identified as potentially hypertensive do not seek care to confirm their diagnosis or, after seeking care, do not initiate and adhere to treatment and lifestyle changes. This consideration is especially important for equity, as disadvantaged individuals may be less likely or able to respond to health information and take active efforts to control their BP. Using a regression discontinuity design with panel data from two of India's largest cities, we will provide some of the first causal evidence on the effect of providing hypertension information on whether an individual seeks diagnosis and initiates and adheres to treatment and how these effects vary based on multiple measures of socioeconomic status (SES).

Our study takes advantage of the fact that the activities of the fieldwork team administering the survey instrument can be compared to community-based screeners. Specifically, at the baseline wave, the fieldworkers' collected two BP readings at an individual's home and if an individual's systolic BP was $\geq$ 140 mmHg or their diastolic BP $\geq$ 90 mmHg, the fieldworkers provided information to the individual that they may be hypertensive and that they should seek further care for hypertension. Since this information was provided based on a strict BP cutoff, we will use the RDD to estimate the effect of the intervention by comparing the hypertension diagnosis and treatment status in subsequent waves of data among people whose systolic BP was just above the 140/90 mmHg cutoff in the baseline wave (who form the intervention group) to those whose BP was just below those cutoffs (who form the comparison group). We will also investigate whether new health information acts as an equalizer and reduces baseline SES inequalities or further exacerbates them. In addition to more common measures of SES, such as income and education, we will also take advantage of the geocoded data to determine how geographic inequality and access to health facilities mediates the relationship between new health information and behavior change over time.

The Value of Health Information and Learning about Family Risk

PRESENTER: **Mr. Alex Hoagland**, Boston University Department of Economics

Consumers making health care choices fall short of standard utility-maximizing benchmarks, errors that are typically attributed to a lack of sufficient information. However, even as access to reliable health information is increasing, individuals may continue to misinterpret that information. In particular, information disclosed in the form of a health shock may lead households to move from under-weighting to over-weighting their own health risks, generating new distortions in choices, including perpetuating the use of low-value care. This tradeoff between inattention and salience in individual risk assessment has not been well-studied. I use household experiences of major medical events as health risk signals that generate informational spillovers within the family. I show that these events generate strong spending responses consistent with a household's reevaluation of health risks; however, these responses include increased investment in both high- and low-return services, leaving welfare effects ambiguous. I therefore estimate a structural model of health choices in which individuals learn about their health risks over time. The model suggests limited welfare gains from risk information, primarily driven by individuals' overly high degree of responsiveness to information. Bounding the extent to which consumers update their beliefs following health events improves welfare.

Determinants of Physical Activity in Albania: Evidence from Demographic and Health Surveys

PRESENTER: **Dr. Harminder Guliani**, University of Regina

AUTHOR: Monika Çule

Objective: Physical Activity (PA) is known to reduce the risk of all-cause mortality, morbidity, and several non-communicable diseases. Despite increasing evidence of physical and mental health benefits from being physically active, globally, 23% of adults and 81% of school-going adolescents have a sedentary lifestyle. New WHO (2020) guidelines recommend at least 150 to 300 minutes of moderate aerobic activity per week (or the equivalent of vigorous-intensity) for adults and 60 minutes per day for children and youth. The share of the global population achieving these recommended minimums is low. In Albania, only 46 percent of adults (18-59 years of age) meet the recommended PA level; 48 percent of men and 44 percent of women. To date, the determinants of physical activity among Albanians are under-researched, and this study aims to examine the facilitators and barriers to engaging in PA using national-level data. Specifically, our objective is to assess any differences in factors that influence the decision to participate in PA and the amount of time spent on PA among Albanian adults, how similar or different these factors are across genders, and to what extent Albanians meet the WHO recommended level of PA.

Methods: Using the 2017-2018 Albania Demographic and Health Survey data and a double-hurdle model, we simultaneously assess the influence of demographic, socioeconomic and behavioural factors on the likelihood of engaging in some PA and the amount of time spent on PA among Albanians. A separate probit model analyzes the factors affecting the probability of meeting the WHO recommended level of PA, given participation. The outcome variable, PA, is a self-reported measure based on respondents' participation in some form of aerobic exercises that increases breathing and heart rate such as walking, bicycling, jogging, etc. and/or commuting to work by biking or walking.

Results: The results suggest significant variations in the likelihood of engaging in some PA, the amount of time spent, and meeting the recommended level by household economic status, administrative regions, occupation, and education. Compared to Tirana residents, males and females residing in other Albanian prefectures were less likely to participate and spend fewer minutes per week, though the magnitude varied by region and across two genders. The results on household economic status differ on the extensive and intensive margins. While affluent Albanian males and females were more likely to participate than poor and very poor Albanians, conditional on participation, Albanian rich males and females exercised fewer minutes per week than their poor counterparts. Compared to unemployed Albanian men and women, employed adults were more likely to participate in any PA, though the magnitude of results varied by occupation status. However, employed females who participated spent on average fewer minutes per week than unemployed females who participated. The patterns of these results were similar in meeting the recommended level of PA.

Conclusions: Given the lack of a national PA policy in Albania, our results provide important insights for policymakers to most effectively increase the level of PA among various socio-demographic groups

The Effect of a Universal Preschool Programme on Long-Term Health Outcomes: Evidence from Spain

PRESENTER: **Laia Bosque Mercader**, University of York

Motivation. Early life experiences are considered to be key cornerstones of the brain architecture accountable for determining long-term cognitive and non-cognitive skills, and physical and mental health (Duncan & Magnuson, 2013; Knudsen et al., 2006; Sapolsky, 2004), and have been found to have persistent effects on later-life child human capital development such as education, labour market, and health outcomes (Almond & Currie, 2011). Evidence has shown that some early life interventions can enhance child conditions in the first years of life as well as throughout the life course (Almond et al., 2018). In particular, early childhood education programmes are deemed to influence child outcomes in

many domains ranging from education, income, and employment to health (Almond et al., 2018) both in the short and long run (Ruhm & Waldfogel, 2012).

Objective. This study evaluates the effects of a Spanish universal preschool programme on long-term health and healthcare outcomes. The Spanish universal preschool programme comprised a large-scale expansion of full-time high-quality public preschool for three-year-olds in 1991/92 school year, which crowded out family care through increases in public enrolment rates of almost 20 percentage points (p.p.) from about 10% in 1990/91 to 30% in 1993/94.

Methods. Despite being nationally enacted, the implementation of the programme was the responsibility of the Spanish regions allowing to exploit the fact that the initial intensity of public preschool uptake varied across regions. To investigate the effect of the policy on long-term health outcomes, I employ a difference-in-differences strategy exploiting the timing and geographical variation of the implementation of the reform. To be more precise, I compare long-term health outcomes of cohorts aged three before to those aged three after the start of the programme, across individuals residing/born in regions with varying initial intensity of three-year-old public preschool implementation.

Data. The study uses data on three-year-old enrolment rates for 1987/88-2002/03 from the *Statistics of Non-university Education*. Long-term health outcomes at the individual level are derived from the *Spanish National Health Survey* (2003 and 2006) and at the regional level from the *Hospital Morbidity Survey* (1999-2018) and the *Death Registries* (1999-2018).

Results. The results show that a greater initial intensity in public preschool decreases the likelihood of being diagnosed with asthma and rises hospitalisations rates for children aged three after the policy. To be more explicit, the probability of being diagnosed with asthma decreases by 20.6% and hospitalisation rates rise by 1.3% for individuals aged three post-policy when intensifying the initial expansion of public enrolment rates by 10p.p. In addition, I find a positive impact on hospitalisation rates for pregnancy-related diagnosis and musculoskeletal system and connective tissue diseases, and a negative effect on hospitalisation rates due to infectious and parasitic diseases, endocrine, nutritional and metabolic diseases, and immunity disorders. Children with parents that have medium-educational levels benefit the most in terms of lower likelihood of consuming medicines and visiting the doctor. No effects are found on self-reported health status, chronic allergy, mental disorders, hospital and emergency service visits, and deaths per 10,000 individuals.

Examining the Relationship between Life Satisfaction, Parenthood and Employment. Evidence from the European Social Survey 2016

PRESENTER: **Aileen Murphy**, University College Cork

AUTHOR: Edel Walsh

Objectives: As society changes and adapts it is important to consider the impact of social roles, such as parenthood, on life satisfaction. Existing international evidence on the relationship between parenthood on life satisfaction is mixed. We examine the impact of parenthood on life satisfaction among working parents across Europe using recent data (2016) from 23 countries. Given the pressures on parents to balance family and work commitments we examine the factors affecting the life satisfaction of different groups of parents; mothers and fathers, those working and those out of the labour force, those in partnerships and those not.

Methods: Using data from the 2016 European Social Survey (N= 44,387), we conduct multilevel regression analyses to investigate the factors affecting parents' life satisfaction in Europe. Multilevel regression analysis controls for heterogeneity in the data and tends to perform better than other common estimators when using a pooled dataset with many different countries. Analysis weights are applied to take into account the different survey designs in different nations. We include controls for socio-demographic and economic characteristics. Importantly we control for age and number of children in the household.

Results: Preliminary results reveal a complex relationship between life satisfaction and parenthood and the interaction with employment status. For example, mothers with children up to 4 years of age have significantly higher life satisfaction than parents of older age groups. However, the life satisfaction of working mothers with children up to 4 years of age is statistically significantly lower ($p < .001$) than other parents. The life satisfaction of single parents (never married) is positively affected by having children up to 4 years of age; except, however, if they are working where we find the coefficient is negative and significant ($p < .001$). For couples the results are mixed. Where both parents are working the effect of having children on life satisfaction appears to be positive. Where the parent respondent is economically inactive, but their partner is working, life satisfaction of the respondent is significantly higher ($p < .05$).

Discussion: Family policies and supports, while vulnerable to macroeconomic conditions, can shape the effects of parenthood on individual life satisfaction. Such policies need to be purposeful for working parents of younger children and consistent with economic strategy and labour market goals.

Maize Price Shock, Agriculture Production and Children Nutrition Outcomes in Tanzania

PRESENTER: **Mkupete Jaah Mkupete Sr**, University of Stellenbosch

AUTHORS: Dieter Von Fintel Sr., Ronelle Burger

This study used the three waves of the Tanzania National Panel Survey to analyze how a maize price shock affects the nutrition outcomes of children under five. We distinguished be-tween households who produce food and that do not. The results show that maize prices negatively significantly affected the linear growth of children from food nonproducers households. The effect is positive for children from food producers households. We find that girls suffer more than boys when maize prices increase. Moreover, we find that infants aged 25-36 months who stop breastfeeding and begin to eat on the same plate with older household members to be more vulnerable to shock than other age groups. We also find that the impact of maize price on children nutrition works through differential effects on diet diversity. The results imply that food production has a protective effect in the presence of a price shock at least in events when the increase in price is not caused by climate change. Investment in climate smart agriculture for sustainable food production can offer an alternative to ensure that these gains persist in a changing climate.

5:15 PM –6:30 PM WEDNESDAY [Evaluation Of Policy, Programs And Health System Performance]

Evaluation of Policy, Programs and Health System Performance Poster Session

MODERATOR: **Randall Ellis**, Boston University

Impact of PEPFAR on Governance in Recipient Low- and Middle-Income Countries

PRESENTER: **Dhwani Hariharan**

AUTHORS: Dr. Gary Gaumer, Dr. William Crown

Objective: The President's Emergency Plan for AIDS Relief (PEPFAR) was initiated in 2003-2004 to address the global HIV/AIDS epidemic. Since its initiation, PEPFAR has provided about $100 billion to 94 low- and middle-income countries (LMICs), supporting programs such as HIV prevention, testing and care services. Large vertical programs such as PEPFAR could impact a country's governance quality either positively by reducing corruption and increasing accountability and community participation (Daischel and Frist, 2018), or negatively, through unintended strain on a weak health system or potential strengthening of authoritarianism (Dijkstra, 2018; Biesma et al., 2009). This study aims to assess the impact of PEPFAR presence in LMICs on six key governance quality indicators - government effectiveness, control of corruption, political stability and absence of violence, rule of law, regulatory quality, and voice and accountability.

Methods: The study uses a panel dataset with data for 2000-2018 from the World Bank, World Health Organization (WHO), PEPFAR dashboard, U.S. Foreign Aid Explorer, and Organization for Economic Co-operation and Development (OECD). Based on approaches to policy planning, program initiation and funding, the 94 recipient countries are categorized into 3 groups - COP (32 countries that have submitted annual Country Operational Plans [COP]), ROP (18 countries that have submitted Regional Plans [ROP]) and other LMICs (44 countries that

received greater than $1 million or $0.05 per capita HIV/AIDS funding since 2004.) Impact of PEPFAR presence in all countries or segments are estimated using difference-in-differences (DD) econometric models. The models control for baseline (2004) covariates such as HIV prevalence, life expectancy, urban population, domestic non-donor spending per capita, WHO health systems ranking (2000), and receipt of US aid prior to PEPFAR initiation, along with country-year specific other donor spending for HIV/AIDS per capita.

Results: Preliminary results in the COP group indicate that government effectiveness, political stability and absence of violence, rule of law, and voice and accountability show statistically significant improvements associated with PEPFAR whereas control of corruption and regulatory quality have positive impacts which are not statistically significant. The largest positive impact of PEPFAR presence is on political stability and absence of violence (6.3-point increase in percentile rank, p-value <0.01), followed by rule of law (5.5 points, p-value <0.001), voice and accountability (4.3 points, p-value <0.05) and government effectiveness (3.9 points, p-value <0.05).

Conclusion: The preliminary results among the COP countries mainly show positive changes in percentile ranks across most governance indicators, with most estimates being statistically significant. Further planned analyses include studying the impact of PEPFAR over different time periods. These analyses may reveal different trends in governance quality over time.

Malaria Burden on Households: Evidence from Benefit Incidence Analysis of Donor Supported Malaria Programme in Enugu, Southeast Nigeria

PRESENTER: **Eric Obikeze**, University of Nigeria, Enugu Campus

Background: Malaria ranks high amongst diseases of sub-Saharan Africa. It is a major cause of care-seeking in Nigeria accounting for more than 40% of outpatient consultations and 30% of hospitalizations. Donor partners in Nigeria support the fight against malaria scourge through provision of diagnostics, treatment and prevention strategies. Although it is envisaged, but very little evidence exist in the extent of their support as most people pay for malaria services out of pocket. This study examines the burden of malaria to households with interest on the benefit incidence of donor support malaria services in the country.

Methods: The study used interviewer-administered questionnaires to elicit information from households in three different locations of urban, semi-urban and rural groups in Enugu State. The rural group was Nkanu west which was purposively selected because it has the adequate presence of donor partners. Concentration index was used to determine the level of equity in spending for malaria diagnosis, treatment and prevention across the socio-economic quintiles.

Findings: Most of the respondents (93.5%) were women and married. More than half had secondary education. Cost of malaria diagnosis and medical costs for first episode of malaria were high amongst respondents at N1025.6 and N1249.1 ($2.9 and $3.5) respectively. Diagnosis and treatment of children less than 5 years and pregnant women in the households were high with out of pocket (OOP) payment of N1726.1 ($4.8) and N1787.6 ($5.0) respectively. Net benefit incidence for malaria was only recorded when the study examined the benefit on bed net N123,500 ($343.1), the rest recorded financial incidence for malaria. Concentration index showed that the burden of malaria existed across the socioeconomic quintiles that were examined.

Conclusion: Donor assistance for malaria services in Nigeria is not evident except in the free distribution of bed nets. OOP for malaria diagnosis and treatment is a burden on households that go for malaria diagnosis and treatment services.

Coverage and Income-Related Inequality in Breast and Cervical Cancer Screening in 30 European Countries: Analysis of Different Time Frames and Target Group Versus Whole Female Population

PRESENTER: **Ms. Micaela Antunes**, University of Coimbra, FEUC, CeBER

AUTHOR: Carlota Quintal

Objectives: Screening for breast and cervical cancers is highly effective to reduce cancer mortality. Previous studies have found evidence of socioeconomic inequalities in the use of mammography and Pap smear test. The objectives of this work are to update this evidence, while extending the literature in several ways, with emphasis on the comparison of screening across different time frames and between the target group and whole female population.

Methods: Data come from the European Health Interview Survey (2nd wave: 2013-2015) and includes 30 European countries. We jointly analyse coverage and inequality, computing prevalence rates and standard and generalised concentration indices (using the *conindex* STATA command). Sample weights provided in the database are used. Net monthly equivalised income of the household (quintile) is used as the ranking variable.

Results: For mammography (screening every two years – women aged 50−69 years), the average coverage is 65.3%, ranging from 6.6% to 86.9%. There are only four countries with nonsignificant concentration indices (CIs). In the remainder countries, CIs are positive/significant. Regarding screening within last 12 months, in many countries, CIs are positive and of greater magnitude compared to recommended interval. For women (within target age) never screened, the highest percentage is 79%; the lowest is 0.8%. CIs are negative basically in all countries. Concerning screening every two years in whole sample, all CIs are positive and generally statistically significant.

For Pap smear test (screening every 3 years, women aged 20-69 years), the average coverage is 69.86% (ranging from 26.99 to 87.21%). Only two countries have screening coverage below 50% and most present values above 60%. CIs are positive and statistically significant, except for Ireland. CIs range from -0.001 to 0.1869. For screening within last 12 months (target group), most CIs are positive (and statistically significant). In the case of absence of screening (target group), the highest percentage is 62.21% and the lowest is 3.92%. In the case of screening in whole population (every three years), concentration among the richest women is stronger for total population than for target population.

Discussion: Our results show that relevant pro-rich inequalities persist though there are quite different realities in terms of prevalence and relative inequality among the 30 European countries analysed.

For both screening tests, Bulgaria and, particularly Romania, emerge with strong relative inequality. But these countries have quite low coverage; efforts should concentrate on screening expansion. Some Baltic and Mediterranean countries also show less favourable figures.

There are signals of overutilisation related to frequency of screening due to positive CIs of greater magnitude in shortest than recommended interval as well as related to screening beyond recommended ages due to positive CIs of greater magnitude in whole population. Although screening outside guidelines for average risk might be justified on medical grounds, it is unlikely that needs for screening in these cases are concentrated among richest women.

In the case of never screening, women's informed preferences for not screening should be respected; however, it seems unlikely that preferences for not screening are concentrated among the poorest women.

Inequalities in Colorectal Cancer Screening in 30 European Countries: Investigating the Role of Education for Different Groups and Time Frames

PRESENTER: **Carlota Quintal**, University of Coimbra, FEUC, CeBER

AUTHOR: Ms. Micaela Antunes

Background/Objectives: Colorectal cancer (CRC) was among the three most commonly diagnosed cancers and the second leading cause of cancer mortality worldwide in 2018. There is evidence that screening for persons at average risk is effective to prevent cancer-related deaths. There is also evidence of socioeconomic inequalities in uptake of screening. For education, results have been mixed – some studies found inequalities favouring individuals with higher levels of education; others found no association. Although screening is effective to reduce CRC mortality, it is increasingly being recognised that screening programs should adopt an informed decision making approach. WHO discourages enthusiastic persuasion and "nudging". There are few studies about educational inequalities in CRC screening for European countries and none with recent data. Our objectives are to analyse and quantify education-related inequalities in CRC screening, not only updating the existing evidence but

also extending it in various ways by including more countries than previous works and by investigating patterns of utilisation beyond the recommended group and time interval.

Methods: Data come from the European Health Interview Survey (2nd wave: 2013-2015) and include 30 European countries. We analyse both coverage and inequality, computing prevalence rates and concentration indices (CI) (using the conindex STATA command). Sample weights provided in the database are used. The highest level of education completed (primary, secondary, tertiary) is used as the ranking variable.

Results: For the target group (individuals aged 50-74) with at least one exam in the recommended interval (FOBT/FIT within last two years or colonoscopy within last 10 years), the average coverage is 37.69%, ranging from 6.25% to 70.9%. The average CI is 0.0118 but CIs are not significant in 14 countries. In the remainder, most CIs are positive with highest value observed for Spain (0.0711). On average, 51% of the individuals in the target group never underwent screening. The highest percentage of never screened exists in Romania. The average CI is -0.0105; in 17 countries CIs are not significant. In the other cases, most are negative though in Ireland it is 0.0408. Considering the recommended intervals but for whole population (individuals over 24 years), only in two countries CIs are not significant and in the remainder CIs are all negative.

Discussion: Despite the remarkable progress in CRC screening in Europe there are different realities. Regarding the target group, in 20 countries the level of coverage falls short of the minimum threshold recommended by EU (45%). A positive result is that the hypothesis of equal utilisation across different levels of education cannot be disregarded in about half of the countries (though in some cases there are inequalities in favour of more educated). No major differences were found between men and women. The category 'never screened' within target age also seems equally distributed in many countries. A surprising finding is the concentration of use in whole population (thus including ages beyond the recommended range) among less educated. Bearing in mind the positive association between education and health literacy, this raises the question on whether screening decisions have been properly informed.

Impact of Brazilian Family Health Strategy on Self-Assessment Health Indicators - Metropolitan Areas

PRESENTER: **Natalia Ferreira-Batista**, FIPE/USP

AUTHORS: Maria Dolores Montoya Diaz, Fernando Postali, Adriano Teixeira, Rodrigo Moreno-Serra

Previous studies have found that the expansion of primary healthcare in Brazil under the country-wide family health strategy (ESF), one of the largest primary care programs in the world, has improved health outcomes. However, these studies have relied either on aggregate data or limited individual data, with no finegrained information about household participation in the ESF or local supply of ESF services - which represent crucial aspects for analytical and policy purposes. This study analyzes the relationship between the ESF and health outcomes for the adult population in Brazilian metropolitan areas.

We investigate this relationship through two linked dimensions of the ESF - the program's local supply of health teams and ESF household registration - using fixed-effects models. By contrast with previous studies that focus on comparisons between some definition of "treated" versus "nontreated" populations, our results indicate that the local density of health teams is
important for the observed effects of the ESF on adult health. We also find evidence that is consistent with the presence of positive primary healthcare spillovers to people not registered with the ESF. However, current ESF coverage levels in metropolitan areas seem inadequate to address prevailing health inequalities.

Our analysis suggests that the local intensity of ESF coverage should be a key consideration for evaluations and policy efforts related to future ESF expansions.

Urgent Care Centers, Hospital Performance and Population Health

PRESENTER: **Ms. Leticia Nunes**, IEPS - Institute for Health Policy Studies

AUTHORS: Rudi Rocha, Sonia Bhalotra

Hospitals are under increasing pressure as they bear a growing burden of chronic disease while also dealing with emergency cases that do not all require hospital care. Many countries have responded by introducing alternative facilities that provide 24/7 care for basic and medium-complexity cases. Using administrative data, we investigate impacts of the opening of these intermediate facilities (UPA) in the state of Rio de Janeiro in Brazil. We find that an UPA opening in the catchment area of a hospital reduces hospital outpatient procedures and admissions and that this is associated with improved hospital performance, indicated by a decline in inpatient mortality. This does not appear to derive from a change in the risk profile of cases going to hospital but rather from hospital resources being re-focused. In a significant departure from related research, we investigate population-level outcomes. We find that a large share of the decline in hospital mortality is offset by deaths in UPAs but that there remains a net decline in deaths from cardiovascular conditions that are typically amenable to primary care.

Should the Federal Trade Commission Deny Mergers with Future Rivals?

PRESENTER: **Dr. Maysam Rabbani -**, University of South Florida

In 2010, the Federal Trade Commission (FTC) stated that mergers between incumbents and future rivals can harm consumers by delaying price reductions or boosting current prices. This statement has been left empirically unverified, and lacking evidence, the FTC has never used it in litigation. I provide the first empirical evidence for this statement using a pharmaceutical merger case. I find overwhelming evidence that mergers with future rivals create an antitrust loophole that boosts prices and market concentration and hurts competition in the short and long run. A variation of the loophole explains how dominant firms in the software industry perpetuate their market dominance by taking over fringe firms. This study also finds that merger effects spill over from the merging firm to the close rivals, and spill over from the market in which the merger takes places to the other markets in which the merging firms are present. This indicates that the existing market delineations in merger analysis are too narrow to capture the full extent of the effects. Last, I paint a full picture of the pharmaceutical supply chain and measure how largely and quickly a drug manufacturer merger affects retail pharmacies, insurers, and patients.

Defining a Quality-Adjusted and Multidimensional Measure of Efficiency in Primary Care in England

PRESENTER: **Margherita Neri**, The Office of Health Economics

AUTHORS: Patricia Cubi-Molla, Graham Cookson

NHS England's *General Practice Forward View* committed to a significant investment in primary care (PC), including the recruitment of additional medical workforce by 2020/21. However, continual improvement in PC efficiency is necessary to prevent a growing population and increasingly complex and multi-morbid patients eroding this investment.

This project aims to deliver evidence-based recommendations for improving performance in PC and identify the determinants of PC labour productivity. This oral session will focus on the results of the first project stage, where we defined a new measure of PC efficiency that can account for both quality and multiple dimensions of output. This measure will be used in the later project stages to examine the variability and determinants of efficiency in PC in England (e.g. skill mix, technology, patient mix).

We conducted a systematic literature review of the available definitions of PC efficiency in the economic literature, to identify the existing approaches and evaluate the limitations that our project should address and try to overcome. Searches were performed in Ovid and EconLit following the PRISMA guidelines for systematic reviews.

A total of 2,590 non-duplicate records were retrieved. After screening, 42 papers met the inclusion criteria and 38 papers were finally included in the analysis. The literature review showed that no satisfactory measure of PC efficiency that is suitable to England exists. The main limitations of the literature were associated with the output definition, which tends to be expressed in terms of the volume of activities performed (71% of the studies). The quality of PC output is typically controlled for using indicators of PC quality standards (e.g. access, patient satisfaction, continuity) (29% of the studies), or performance against activity targets (e.g. screening, management of chronic conditions) (26% of the studies). Reference to the health outcomes achieved was limited (13% of the studies). Further, the output dimensions seemed insufficient to represent comprehensively the multiplicity of services offered by PC in England.

To address the limitations on PC output, we examined the literature on PC effectiveness and performance. We identified three eligible studies proposing multi-dimensional frameworks of PC effectiveness and performance. These frameworks include a broad range of dimensions and indicators to measure PC performance in terms of the quality of structure and processes, in addition to the health outcomes achieved. This strand of the literature may be seen as a reaction to traditional ways of measuring health care performance, which focussed on the volume of health care delivered and neglected quality.

The objective of the next stages of the research will be to synthesise a framework of PC output and related indicators which reconcile the approaches of the economic literature on efficiency, and the health service literature on performance measurement. Our aim is to develop a definition of PC output that is grounded on the objectives of PC from the perspective of the health care decision-maker (i.e. measures as closely as possible the achievement of health outcomes) and encompasses the multiplicity of services offered by PC in England, while also being feasible to measure.

Bridging the Perceived Disconnect between Health Technology Assessment and Delivery Systems

PRESENTER: **Eleanor Grieve**, Glasgow University

AUTHORS: Hannah Hesselgreaves, Olivia Wu, Andrew Briggs

There has often been a perceived disconnect between the delivery system and Health Technology Assessment (HTA), with the uneven implementation of recommendations. Even in well-resourced health systems, cost-effective interventions do not always (rarely) get implemented optimally with recurrent themes around organisational processes, clinician engagement and financing being key barriers. Whilst high-income countries (HIC) may have led the way, lower- and middle- income countries (LMIC) are increasingly beginning to develop HTA processes to assist in their healthcare decision-making. Optimisation of health technology utilisation is health technology - and system-specific, and HTA may be made more impactful by greater consideration of organisational and contextual issues. Providing evidence about the expected impact of a technology on health system structure, processes and resources might be valuable to inform the construct and recommendations of an HTA or develop an implementation plan. Yet, this aspect of HTA is often found to be lacking.

We undertook a realist synthesis to produce tested and data-driven theory that considers individual, interpersonal, institutional and systems-level components and their interactions on the mechanisms by which HTA can be optimised. Drawing on our programme theory, we consider practical implications to achieve greater interconnectedness between HTA and health systems, in LMIC in particular.

Firstly, rather than maintaining an emphasis on user-focused HTA ie where a synthesis of clinical evidence and economic evaluation of available technologies are the mainstay, we consider the application of developer-focused HTA where system constraints are addressed whilst the technology is still under development. Secondly, although health products have been its more significant focus to-date, HTA could develop to increase its focus on technologies applied to healthcare ie regulatory and policy measures for managing and organising healthcare systems - as well as extending its application to non-healthcare sectors. We consider such a refocus towards meso/macro HTA given the interdependency of HTA and health systems - and wider sectors - for optimising its impact on health outcomes.

The global expansion of HTA, its variable implementation, the lack of quantified evidence on health outcomes, along with an increasing investment in these processes at the systems level in LMIC has generated greater interest from policy makers about the value and impact of HTA. HTA should seek to harness mechanisms to improve implementation of findings - as it is only when decisions result in practice change, can better health be achieved. In HICs, there has been perhaps an element of taking for granted that a fully functioning system will adapt accordingly to ensure implementation of recommendations. In an era of investment and expansion, in particular, for LMICs, we hope this research offers a forward-looking model as a reference for their own implementation of HTA.

Did the Implementation of Activity-Based Funding in Irish Public Hospitals Impact on Outcomes for Hip and Knee Replacements?

PRESENTER: **Gintare Valentelyte**, Royal College of Surgeons in Ireland

AUTHORS: Conor Keegan, Prof. Jan Sorensen

Introduction

Activity-based funding (ABF), is a financial model that incentivises hospitals to deliver care more efficiently. Under ABF, hospitals receive prospectively set payments based on the number, and type of patients treated. In theory, this provides hospitals with incentives to provide more efficient healthcare and to be more transparent in their allocation of resources and finances. Most hospital care in Ireland is delivered in public hospitals and this care is mostly government-financed, although about one-fifth of care delivered in public hospitals is privately financed. In 2016, a major financing reform took place, and funding of public patients in most public hospitals moved to ABF, while financing of private care remained unchanged. A recently published scoping review has identified the key analytical methods used to evaluate the impacts of ABF. The aim of this study is to compare some of these analytical methods in terms of estimating the impact of ABF on hospital length of stay (LOS) for public patients who underwent elective hip replacement surgery in public acute hospitals in Ireland.

Methods

Using national Hospital In-Patient Enquiry administrative activity data from 2013 to 2019, we assessed the impact of ABF on patient LOS. We compared average LOS pre-ABF (2013 - 2015) and post-ABF (2016 - 2019) introduction between public hospital episodes affected (treatment group) and private hospital episodes not affected (comparator group) by the funding change. We compared the following analytical methods: Interrupted time series (ITS) analysis, Differences-in-Differences (DiD) analysis and Synthetic control (SC) analysis, and highlighted their relative strengths and weaknesses. We controlled for key patient characteristics: age, number of diagnoses and additional procedures, DRG complexity and interactions between these patient characteristics.

Results

19,565 hospital episodes across 19 public Irish hospitals providing orthopaedic services were included in our analysis. Over the study period, the overall average LOS for this sample was 5.2 days (SD: 3.3 days; IQR: 3 days). The ITS analysis suggested ABF had a negative impact on average LOS ($p<0.05$) while the DiD and SC methods, incorporating control groups, suggested no statistically significant effect.

Conclusion

In health economic research it is not always feasible to conduct experimental analysis and we therefore often rely on observational analysis to identify the impact of policy interventions. We demonstrated that ITS analysis produces results different in interpretation relative to control-treatment approaches such as DiD and SC. Our comparative method analysis therefore suggests that choice of analytical method matters and researchers should strive to employ more appropriate designs incorporating control/treatment groups. More robust methods provide a stronger basis for evidence-based policy-making.

ACA Welcome Mat Effects on Medicaid for Always Eligible Parents and Their Children

PRESENTER: **Julie Hudson**, AHRQ

AUTHOR: Asako Moriya

Topic

Insurance coverage in low income families increased significantly under the Affordable Care Act (ACA). The percent of parents who were uninsured decreased significantly between 2013 and 2017, in large part due to the ACA Medicaid expansion to low income adults. Public coverage also increased among low-income children who were already eligible for Medicaid and CHIP before the ACA. These “welcome mat” effects were experienced by eligible children nationwide, but were larger for children living in expansion states, and largest among children whose parents gained eligibility for Medicaid under the ACA. However, less is known about “welcome mat” effects among parents who were pre-ACA Medicaid-eligible. Our paper addresses this gap in the literature by measuring welcome mat effects of the ACA for “always eligible”

parents and by comparing the size of these effects to those of their children. We also address unique complications associated with measuring welcome mat effects among parents, for whom, the potential for bias from income mismeasurement and simulation error is higher than for children.

Methods

We use the American Community Survey 2013-2018 to identify samples of non-disabled, citizens who are not covered by Medicare. Our adult sample contains parents ages 26-64 with a minor child (0-18) in the family. We further restrict our sample to parents who are simulated to be eligible for Medicaid in their state of residence in all years of the study, both before and after the implementation of the ACA ("always eligible"). Our child sample contains Medicaid-eligible children ages 0-18 in families with always eligible parents. We use difference-in-differences methods to compare public coverage before and after the ACA, and by state ACA Medicaid expansion policy. Analyses are run for parents of all incomes, below 138% FPL, below 100% FPL, and below 75% FPL. Our primary analyses exclude states that changed Medicaid-expansion policy after 2014; we also test using 2015 as a cutoff. To address simulation and income measurement issues for parents, we consider a wide variety of adjustments to income eligibility thresholds within states and the inclusion/exclusion of states in our sample.

Findings

We find evidence of welcome mat effects for always eligible parents and their children. The magnitudes for parents were typically two times larger than those for children. Always eligible parents and their children experienced increases in public coverage in both expansion and non-expansion states, but among parents, gains in coverage were significantly larger in expansion states starting in 2015. Welcome mat results for parents were robust across all test specifications in both significance and in magnitude. By 2018, the (marginal) welcome mat effect was 11 percentage points (pp) among always eligible parents (9-14pp across models) and 5pp among their children. When taking expansion status into account, by 2018, the marginal effects for parents and children were 7pp and 2pp respectively in non-expansion states and 13pp and 6pp respectively in expansion states.

5:15 PM –6:30 PM WEDNESDAY [Supply Of Health Services]

Supply of Health Services Poster Session 2

MODERATOR: **Catherine Goodman**, LSHTM (London School of Hygiene and Tropical Medicine)

Face-to-Face Priority-Setting in Primary Care: A Qualitative Analysis Using 'One in a Million'

PRESENTER: **Dr. Yuri Hamashima**, University of Bristol

AUTHORS: Amanda Owen-Smith, Tim Jones, Joanna Coast

Background

General practitioners (GPs) are key decision-makers in managing healthcare demands and allocating limited healthcare resources fairly and efficiently. However, face-to-face priority-setting tends to be implicit because of physicians' desire to respond to individual needs and maintain their relationships with patients. Furthermore, previous literature has suggested that GPs also react to information about the societal cost of treatment and national guidelines when they make a decision. It remains, however, that little is known about how GPs manage patients' healthcare demands in face-to-face consultations while balancing their roles as agents for both patients and society.

Objectives

The main aim of this research is to investigate how GPs manage patients' healthcare demands in face-to-face consultations in primary care practice. We also intend to understand the context in which rationing issues emerge in conversations between patients and doctors.

Methods

This study is a qualitative analysis using the One in a million: Primary care consultation archive. This database stores 327 video and audio-only recordings of medical interviews with adult patients which were collected at 12 different General Practices across Bristol in the UK from July 2014 to April 2015. Index consultations were sampled from the archives based on two patient surveys indicating the patient's expectation of a receiving a referral to secondary care before the consultations. We applied a thematic analysis to the selected transcripts, then conducted a line-by-line coding of the data, and used constant comparative analysis to generate a theoretical elaboration and understanding.

Results

In total, 60 consultations were selected for analysis. Among them, 39 patients were female, and 21 patients were male. The patients' age ranged from 20 to 87 (mean: 51 years). The most common reason for consultation was musculoskeletal conditions. Following the consultation, only 11 of the 60 cases received a referral for specialist care. A further 3 patients were referred to a physiotherapist.

From the consultation data, we observed different types of rationing occurring in the primary care setting, including rationing by exclusion and by deflection. Doctors' statements also indicate that they see their role in part as being a gatekeeper who conducts "groundwork" before seeing a specialist. Within the data, there was evidence of GPs acting at different points as agents both for the healthcare system and for the patient. There was also some suggestion that they sometimes tried to combine elements of these roles. Examples included (i) acting as a 'gatekeeper' and thus as an agent for society but also seeing their role as conducting the 'groundwork' on behalf of the patient, before that patient see a specialist (ii) declining the patient's request for referral, but seeking their preferences for treatment or diagnostic processes. Thus, GPs frequently showed their ability to move between these two roles, and balance how they played out within the consultation.

Discussion

This qualitative analysis using primary care consultation data contributes to exploring how physicians deal in practice with the dilemma of simultaneously holding different agency roles in health care.

The Postcode Lottery in GP Services in England

PRESENTER: **Prof. Paul Allanson**, University of Dundee

AUTHOR: Richard Cookson

The geographical variation in the provision and quality of GP services in England is commonly described as a postcode lottery in which where patients live determines the standard of service they can expect to receive. Such variation is widely seen to be inequitable, doubly so to the extent that those patients adversely affected are more likely to live in deprived areas of the country or suffer from other disadvantages, and can also have a direct impact on secondary care services such as hospital accident emergency departments when patients struggle to access GP services.

This paper proposes a "postcode lottery" index to provide an intuitive measure of the potential significance to patients of the variation in quality across GP practices. Consider a lottery in which a patient has an equal chance of being assigned to one of two practices with quality determined by a random draw from the quality profile for each practice as given by the distribution of patients by quality level. The index is defined as the average absolute difference in the probabilities of being a 'winner' rather than a 'loser' over all pairs of practices, where the patient 'wins' or 'loses' depending on whether they are assigned to the practice with the higher or lower randomly chosen quality level and is otherwise indifferent to the lottery outcome. Alternatively, the index is equal to twice the mean increase in the probability that the quality of service received by a patient will be better than it would otherwise have been as a result of having the right to choose the practice with the better quality profile of any pair of practices rather than being randomly assigned to one of them.

Importantly, the index can be calculated directly from ordinal measures of GP practice quality without the need to either dichotomize polytomous categorical variables or convert them to an interval scale. Our main empirical analysis is based on the 2019 English GP Patient Survey of more than 2 million people who were asked to describe their overall experience on a 5-category scale from very poor through to very good. Practice-level results are reported for nearly 7000 practices, which were organized into 191 Clinical Commissioning Groups (CCGs) responsible for the planning and commissioning of health care services for their local area. Our findings provide evidence of significant variation in GP quality both between practices within individual CCGs and between CCGs, with an average 17.0pp absolute difference in the chances that GP quality was better rather than worse as a result of being registered with one practice rather than another within the same CCG. Indirect standardization techniques are used to show that this variation is only partially accounted for by heterogeneity in the health and demographic composition of practice patient lists. We conclude that elimination of the postcode lottery would provide a measurable, policy-relevant objective to the extent that discrimination between patients on the basis of where they live is due to factors within the control of the health service.

Cost of Delivering Health Services in Public Sector Primary Health Facilities in Liberia: Evidence from the Health Systems Strengthening Accelerator

PRESENTER: **Oluwabambi Tinuoye**

AUTHORS: Chukwuemeka Azubuike, Yewande Ogundeji, Zel Maikori, Roland Kesselly, Nuaker Kwenah, Ernest Gonyon, Kelechi Ohiri

Background

Globally, Primary health care (PHC) has been identified as an important vehicle for achieving universal health coverage. Since 2010, the government of Liberia has been implementing the Essential Package of Health Services (EPHS) as a strategy to expand PHC services to all Liberians. To support this strategy, credible and comparable cost estimates are needed to optimize health services delivery, project resource requirements, and achieve effective management of the Liberian health system. This study aims to present a detailed approach to estimating the average costs of providing primary health services in Liberia for the year 2018.

Methods

The modeling study utilized primary and secondary data from PHCs in 15 counties in Liberia. The primary healthcare services costed in this study aligned with the Liberian Essential Package of Health Services (EPHS). Actual service estimates for January to December 2018 were retrieved directly from facility ledgers from a representative sample of health facilities selected via a stratified purposive approach. Estimates of drugs and medical supplies cost, infrastructure, equipment, personnel, and management costs were derived from secondary data from both government and non-government sources. Estimates of staff time were derived from a patient flow analysis across 8 PHCs. The costing analysis was conducted on Microsoft Excel, and split costs into fixed, variable and management components. Fixed costs were also disaggregated into direct and indirect costs using the proportion of staff time spent on actual service delivery.

Results

The annual per facility costs of providing health services in PHC I, PHC II, and Health Centers were $190,795; $233,769, and $529,468, respectively. When scaled across the 713 PHCs in the state, this derives an estimated $165m per year to operate public primary health facilities in Liberia. Across all facility types, drugs, health personnel and management costs were the main drivers of cost. Of every dollar spent in a health facility, about 37-42% was attributed to drugs, while 13-18% was for salaries of health personnel. The average unit costs of providing ANC, labor and delivery services, postpartum and newborn care across the 3 facility types was $49.65, $28.23, $13.29, and $14.88, respectively.

Conclusion

The estimated the annual national cost of providing the EPHS in all primary health facilities represents about 52.6% of the total health spending in Liberia for 2016, and almost four times the general government spending on health for 2016. This has implications on the ability of the GOL to afford the EPHS realistically, which highlights the need strengthen domestic resource mobilization to increase the fiscal space for health in Liberia. The findings show that that the average costs of services in a public PHC in Liberia is about 4 times that in a facility in Nigeria and Rwanda, and about 10 times the value in a facility in Ghana. These findings may also be indicative of opportunities to design and implement cost containment strategies including efficiency gains especially within Liberia's context of limited fiscal space.

Costs for Diabetes and Hypertension Management in Primary Care Facilities in Nigeria

PRESENTER: **Chinwe Weli**, Health Strategy and Delivery Foundation

AUTHORS: Yewande Ogundeji, Tamilore Areola, Kelechi Ohiri

Abstract

Introduction

Nigeria is experiencing demographic and disease transitions, which have results in a rise in non-communicable diseases (NCDs) such as diabetes mellitus (DM), hypertension (HTN), cancer and injuries. There are no recent granular costs of providing these services at the primary healthcare level, which are needed to inform policy makers and financial planning. To help address these complex set of challenges, we conducted a costing study to explore the preparedness of Nigeria to finance the changing health and resource needs associated with these health transitions.

Methods

Primary data were collected from 24 health facilities in four states in Nigeria (Kaduna, Lagos, FCT and Imo). A combined costing approach which involved both top-down (allocation) and bottom-up (ingredients-based) methods was used to determine the unit costs associated with the service delivery of HTN, DM and injury interventions.

Key Findings

Overall, the estimated total unit cost for facilities to provide hypertension and diabetes mellitus treatment services to a single patient is 51,805 NGN (US $144) and 154,636 NGN (US $430) respectively. Further, the estimated total unit cost for facilities to provide injury services is 280,654 NGN (US $780). Drug costs are the major variable cost drivers for hypertension, diabetes mellitus, and injuries at 11,655 NGN (US $32), 36,784 NGN (US $102) and 122,976 NGN (US $342) respectively.

Conclusion

NCDs, injuries and accidents services incur high service costs which can lead to high out-of-pocket expenses. The study estimates can be used for necessary planning and policy solutions to effectively and sustainably offer a wider scope of essential benefit package of services to the Nigerian population.

The Association between Supply of Primary Care Professionals and Rural-Urban Disparities in Prevalence of Dementia

PRESENTER: **Nasim B. Ferdows**, University of Oklahoma Health Sciences Center

AUTHOR: Jaehong Kim

Objective: Rising life expectancy has led to increasing prevalence of age-related diseases, such as Alzheimer's disease and related dementia (ADRD). The more rapid increase of the rural older population may lead into higher rates of dementia in these communities. However, growing

evidence suggests that rural residents face disparities in availability, accessibility and affordability of healthcare services compared to their urban counterparts, which can make diagnosis more challenging, leading to underestimation of ADRD prevalence in these communities. The objective of this study is to examine the effect of availability of physicians on ADRD prevalence, comparing rural and urban communities.

Design: 20-percent random sample of Medicare beneficiaries older than 65 (2002-2014) was used to create county-level dataset that contains ADRD prevalence, gender, racial/ethnic composition, and average number of non-ADRD beneficiaries in a given county-year. This county-level dataset was then merged with Area Health Resource File (AHRF), which contains county-level data on availability of healthcare services.

The main explanatory variable was physician per 1,000 population in a given county-year. We used county fixed-effect two stage linear regression model to estimate the effect of physician supply on ADRD prevalence. The number of non-ADRD beneficiaries was used as an instrument variable to account for endogeneity in the model. Counties were categorized into urban, rural adjacent to an urban, and rural not adjacent to an urban county. We controlled for per-capita income, unemployment rate and the ratios of females, Blacks, and Hispanics in a given county-year.

Results: Our sample included 10,590,016 individuals in 3,041 counties, including 57.08% females, 8.18% Blacks, and 1.86% Hispanics in 1,127 urban counties, 1,000 rural-adjacent, and 914 rural-nonadjacent counties. After peaking in 2008, ADRD prevalence declined with higher rates in urban counties (10.28% in urban vs. 9.57% and 9.26% in rural-adjacent and rural-nonadjacent in 2002; 12.27% in urban vs. 11.35% and 11.15% in rural-adjacent and rural-nonadjacent in 2008; 11.05% in urban vs. 10.21% and 10.08% in rural-adjacent and rural nonadjacent in 2014). There were fewer per-capita physicians in rural areas with a sharp growth in urban areas (from 2.78 in 2002 to 3.03 physicians per 1,000 population in 2014) whereas a persistent decline in rural areas following a peak in 2003 (from 1.07 and 1.32 in 2002 to 0.99 and 1.33 in rural-adjacent and nonadjacent in 2014).

Our results indicate that 1% increase (above the mean) in per-capita physicians decreases ADRD prevalence by 0.0055%p ($P<0.01$) in urban, increases by 0.0010%p ($P=0.26$) in rural-adjacent, and decreases by 0.0003%p ($P=0.749$) in rural nonadjacent. Our 2SLS results indicate that 1% increase in per-capita physicians decreases ADRD prevalence by 0.56%p ($P=0.037$) in urban, whereas increases by 0.77%p ($P=0.019$) and 0.99%p ($P=0.045$) in rural-adjacent and rural-nonadjacent.

Conclusion: Since the response of ADRD prevalence was higher in rural-adjacent and rural-nonadjacent counties compared to urban counties, the hypothesis that the available effect was stronger in rural areas than urban is confirmed. Also, since ADRD prevalence increased by additional per-capita physician supply in rural-adjacent and rural-nonadjacent counties, more physicians in rural areas may increase the number of elderlies diagnosed with ADRD.

Faster Diagnosis and Treatment for Cancer: Redesigning Patient Pathways Using the UK National Cancer Registry Data

PRESENTER: **Júlia González Esquerré**, NHS England and NHS Improvement

AUTHOR: Steven Paling

Objectives

Timely treatment is crucial for cancer patients, affecting both their experience and outcomes. In this paper, we present evidence on how cancer pathways can be redesigned to deliver faster diagnosis and treatment, making practical recommendations based on their potential effects on the length of the cancer pathways for the average patient.

Methods

This research uses national, patient-level data available through the English National Cancer Registration Dataset maintained by the UK National Cancer Registration and Analysis Service (NCRAS) linked to a combination of datasets for additional information on socioeconomic and patient characteristics. We construct pathways for diagnosed cancer patients from first access to healthcare, through diagnostics to first definitive treatment. A total of 236,205 cancers were included in our sample, all cancers were diagnosed between 2015 and 2016 and patients had to be resident in England at the time of diagnosis.

We use ordinary least-squared regression to assess how hospital management-related factors are associated with waiting times for treatment. We examine how system factors such as the organisation of diagnostic tests, multi-disciplinary team (MDT) meetings, cancellations and attendances to multiple healthcare providers affect time to first definite treatment, controlling for severity, via stage of cancer, comorbidities and route to diagnosis, as well as other patient characteristics such as deprivation, ethnicity and age.

We run this analysis for the four biggest tumour sites in terms of incidence in England: breast, lung, lower-gastrointestinal (LGI) and prostate cancers.

Results

For the average patient, having a diagnostic test on the first appointment, having all diagnostic tests on the same day and having a single MDT meeting are all associated with reduced pathway length.

Having cancelled appointments or attending multiple providers are associated with patients waiting longer for treatment and being less likely to receive treatment within 62 days.

These findings are consistent across the different tumour sites under study.

Discussion

This research presents one of the largest, national reviews of factors associated with cancer pathways. This findings highlight specific areas where redesigning cancer pathways, where clinically appropriate, and redesigning inter-hospital transfers of patients could lead to shorter waiting times for cancer treatment. In addition, our findings suggest that policies aimed at reducing hospital and patient cancellations have the potential to improve cancer waiting times significantly.

Leapfrogging and the Market Effects of Hyper-Specialization: Evidence from Heart Surgeries

PRESENTER: **Mr. Alex Hoagland**, Boston University Department of Economics

Medical innovations alter patient exposure to potential treatments by changing both the risk threshold associated with treatment and the degree of specialization required of the providers. In particular, shifts in the supply of medical services arising from innovation may increase access to new treatments while crowding out appropriate use of lower-technology treatments, including preventive maintenance. I exploit a recent market-expanding innovation in heart surgeries used to treat aortic stenosis: transcatheter aortic valve replacement (TAVR) surgeries. I show that this innovation moved the locus of treatment from surgical centers to cardiologist offices, and show theoretically that this implies a crowding out of preventive care. I then leverage geographic variation in local Medicare patient populations and market structures to estimate the extent of this overtreatment.

Impact of Reimbursement and Volume Changes on Conservative Treatment Usage

PRESENTER: **Yu Liu**

Physicians may change their usage of treatment methods because of the changes of reimbursement and patients' volume. For example, reducing fees may curtail certain overuse of expensive treatments; when the patients' volume declined, physicians may increase the amount of expensive treatments to recoup losses. Conservative treatments have become popular for some diseases in order to reduce overtreatment, e.g., active surveillance for localized prostate cancer. During the same period, Centers for Medicare and Medicaid Services reduced reimbursement for intensity modulated radiation therapy (IMRT) in 2012 based on concerns about overuse; the number of patients with localized prostate cancer

also declined because of the changes of prostate cancer screening recommendations by the United States Preventive Services Task Force (USPSTF). We study the impact the changes of both reimbursement and patients' volume on urologists' use of active surveillance on localized prostate cancer patients, using SEER-Medicare Linked Database. Because urologists may reduce their patients' volume from personal preference (e.g., retirement), we used an expected patients' volume change as an instrument for the actual urologists' patient volume changes.

Preliminary results showed that the more expected loss per patient because of reimbursement change, the less likely this urologist will use conservative treatment. During the period when overall patients' volume went up (2006-2007), urologists' usage of conservative treatment was not associated with their expected patients' volume change. During the period when the overall patients' volume went down (2012-2013), urologists' usage of conservative treatment decreased when their expected patients' volume decreased.

We further divided urologists into two groups (IMRT Urologists and Surgery Urologists) based on their most popular treatment methods. IMRT Urologists were less likely to use active surveillance than Surgery Urologists. During the period when overall reimbursement went down (2012-2013), the more expected reimbursement loss per patients or the more expected patients' volume loss, the larger the differences of active surveillance usage between IMRT and Surgery Urologists. For example, if expected loss per patient was 2.9k (0.5 standard deviation more than the mean expected loss per patient), IMRT Urologists were less likely to use active surveillance by 7.56 percentage points compared to Surgery Urologists. If expected loss per patient was 4.6k (1 standard deviation more than the mean expected loss per patient), IMRT Urologists were less likely to use active surveillance by 8.68 percentage points compared to Surgery Urologists. If the expected patients' volume loss was 7.11 (0.5 standard deviation more than the mean expected volume loss), IMRT Urologists were less likely to use active surveillance by 6.86 percentage points compared to Surgery Urologists. If the expected patients' volume loss was 9.59 (1 standard deviation more than the mean expected volume loss), IMRT Urologists were less likely to use active surveillance by 7.26 percentage points compared to Surgery Urologists.

When patients' volume declined because of external reasons or when expected reimbursement per patient reduced, urologists may decrease their usage of conservative treatment to recoup their potential losses. Such effect is more obvious for urologists who used expensive radiation therapy.

Catch Me If You Can: Questionable Modelling Assumptions and Parameter Choices and Their Impact on Drug Reimbursement Decisions

PRESENTER: **Dr. Shehzad Ali**, Western University

AUTHOR: Lina Ghattas

Pharmacoeconomic submissions for drug reimbursement typically include long-term decision models. These models use assumptions and parameters that may favour one intervention over the other. Reimbursement agencies have an important role to identify and test robustness of these assumptions, data sources and modelling decisions to allow fair comparison of health technologies. In this study, we reviewed the drug submissions received by the Canadian Agency for Drugs and Technologies in Health (CADTH) during the year 2020, with the aim to identify and critically review key methodological issues related to the model structure, disease process, choice of parameters and modelling assumptions. We focus on the limitations that were considered questionable by the CADTH appraisal committee and were subsequently altered in the reanalysis or were raised as significant limitations of the model. We identified methodological issues that had the highest impact on the incremental cost-effectiveness ratio (ICER) and the reimbursement decision. The findings of our study will help improve the quality of future drug submissions and assist reimbursement agencies in identifying important gaps that can influence decision making.

Pricing, Consumption and Competition in Pharmaceutical Drugs: Evidence from Changing Drugs' Co-Payments in Portugal

PRESENTER: **Carolina Borges da Cunha Santos**

AUTHOR: Eduardo Costa

Reference price regimes for prescription drugs are usually implemented with the aim of curbing public expenditure with pharmaceuticals, induce drug substitution from branded to generics drugs and enhance competition. In these systems, patients co-pay the difference between the drug's pharmacy retail price and the reimbursement level. Relying on a detailed product-level panel dataset of prescription drugs sold in Portuguese retail pharmacies, from 2016 to 2019, we evaluate pharmaceutical firms pricing decisions for branded and generic drugs, as well as consumers' reaction to price changes. In particular, we exploit the variation induced by a policy change, which decreased reference prices for 36% of the equivalent-drug groups in our sample.

Results of a difference-in-differences analysis show that, despite the reference price decrease, affected firms increased their prices - particularly for off-patent branded products. Such reaction from firms results in an increase in the price paid by patients. Such price effects resulted on a 16% decline on branded drugs consumption, with significant heterogeneity across regions and therapeutics.

Estimates suggest that NHS co-payments savings were achieved through higher out-of-pocket payments paid by patients, with a pass-through above 100%. Additionally, pharmaceutical firms' reaction to the reference price decrease was contrary to what was expected, suggesting underlying competitive dynamics which should be considered prior to policy changes.

Product Development Partnerships (PDPs) and Pharmaceutical Innovation

PRESENTER: **Dimitrios Kourouklis**, Office of Health Economics

AUTHORS: Mikel Berdud, Mireia Jofre-Bonet, Adrian Towse

Public and private investments can be mutually beneficial and influence each other positively in the discovery and development of pharmaceutical innovation. Yet, the available literature has not explored in depth the role of specific collaborations aimed at new drug development such as Product Development Partnerships (PDPs). In the last decades there has been an increased trend in the number of PDPs seeking to produce new vaccines and new medicines for global health challenges of infectious diseases. The pipeline of PDPs shows multiple products in development in partnership with private firms, academic institutions, governments, NGOs and/or philanthropic donors and charities.

To better understand the economic rationale and contribution of PDPs firstly on pharmaceutical innovation and secondly in improving health and health-related economic value delivered to patients globally, there are several relevant research questions that require attention: i) what different types of PDP exist, what objectives do they pursue and what incentives do they create? ii) are PDP and private pharmaceutical funding of research and development (R&D) complements or substitutes? and; iii) does the role of the PDPs in pharmaceutical innovation – complementary or substitutive – vary across different therapeutic areas, phases of drug development, and/or archetypes of health technologies (i.e. vaccines, new chemical entities, biologics, diagnostics)?

The economic rationale of PDPs rests on the lack of economic incentives for private pharmaceutical R&D in areas of low expected revenues but high unmet need (e.g., neglected tropical diseases, orphan drugs, advanced therapy medicinal products, and antimicrobial resistance (AMR)). In such circumstances, private investment in R&D might be insufficient due to the lack of commercial incentives. Thus, PDPs arise as a potential solution by creating partnerships that mix public and/or non-for-profit scientific institutions, including private investors. The combination allows the rate of return needed to attract private investment to be lower because the risk of failure is shared between partners, some of them being funded by public money or philanthropic funds.

In this paper, we examine the role of PDPs on the quantity and type of innovation and better understand whether different types of PDPs fund distinct types of innovation. We also answer the question of whether PDPs are complements or substitutes of pure private investment. Our discussion aims to shed light on the general question about the balance (relative efficiency) between creating a market (pull strategy) or using PDPs (push strategy).

Our findings can inform policy makers on: (i) how to optimally regulate PDPs to solve the market failures that characterise pharmaceutical innovation, and ii) how to optimally balance the use of PDPs (push) with pull strategies to tackle global health challenges, chronic or unexpected, and improve patients' health and society's welfare by incentivizing innovation in areas of highly unmet need.

The Economics of Medical Procedure Innovation

PRESENTER: **Bingxiao Wu**, Rutgers University

AUTHORS: David Dranove, Craig Garthwaite, Christopher Heard

This paper explores the economic incentives of medical procedure innovation. Using a novel, proprietary dataset on billing code applications of emerging medical procedures, we highlight two mechanisms that could hinder innovation. First, the administrative hurdle of securing permanent, reimbursable billing codes substantially delays innovation diffusion. We find that Medicare utilization of innovative procedures increases nine-fold after the billing codes are promoted to permanent (reimbursable) from provisional (non-reimbursable). However, only 29 percent of the provisional codes are promoted after the five-year probation period. When accounting for the time between the approval of device and the granting of new procedure billing codes, the development time of new medical procedures are on a par with, or even longer than, that of new drugs. Second, medical procedures lack intellectual property rights, especially those involving no patented devices. When appropriability is limited, specialty medical societies act to solve the commons problem by leading the applications of billing codes. Our work indicates that the *ad hoc* process that oversees procedure innovations creates uncertainty over both the development process and the allocation and enforceability of property rights; this stands in stark contrast to the more deliberate process of regulatory oversight for pharmaceutical innovations.

Using Insurance Claims Data in the Medical Price Indexes

PRESENTER: **Daniel Wang**, BLS

AUTHORS: John Bieler, Caleb Sungwoo Cho, Brett Matsumoto, Daniel Wang

In this project, we construct physician and hospital price indexes using claims data from a medical claims database. Using the database, we are able to create a nationwide sample of physician and hospital services. We define a unique service based on the provider, insurer, and procedure code (and place of service for physician services). The national level claims data appears to be more representative than the CPI sample as certain physician specialties and types of procedures are underrepresented in the CPI sample.

Overall, we find that supplementing CPI data with claims data from a national claims database could yield more accurate price measures by improving representativeness. However, there remain issues with using the claims data in the official price indexes that need to be addressed. First, the CPI aims to be a real time price measure and the national claims databases are only updated with a lag. Also, the source of data feeding into the claims databases is not stable over time, and the coverage can shrink over time. The production of the official indexes requires not only timely but also a reliable source of data. Finally, we will need to determine if the claims databases contain data from a broad enough sample of insurers to fully replace manual data collection for services covered by private insurance.

The use of insurance claims data in the construction of the official medical price indexes presents many opportunities and challenges for the Bureau of Labor Statistics. Currently, the BLS collects price data directly from providers in a manual collection process. However, there are growing challenges for the existing methods. Respondent cooperation among medical providers has declined and the response rates for the household surveys used to select providers have fallen. Providers are also increasingly refusing to provide prices for services covered by private insurance leading to an overrepresentation of prices for the uninsured and non-covered services.

The current data collection process has some important advantages for the purposes of constructing price indexes. Characteristics of the service are held fixed in the repricing, the data are timely, and the sample frame includes the universe of medical goods and services consumed by households. These features are generally not found in claims data. Claims databases only represent a subset of private insurance claims, are only available after a lag, and may not be able to control for as many characteristics. Since claims data are not fully representative of the market, it cannot serve as a full replacement for manual collection. This mitigates any potential cost savings from switching to the use of claims data. One area where claims data has a clear advantage is the vastly larger sample size.

5:15 PM–6:30 PM WEDNESDAY [Health Care Financing And Expenditures]

Health Care Financing and Expenditures Poster Session 2

MODERATOR: **Ama Fenny**, Institute of Statistical, Social and Economic Research

Short and Longer-Term Impact of Voluntary Health Insurance on Catastrophic Health Expenditure in Central Nigeria

PRESENTER: **Adeyemi Okunogbe**, World Health Organization

AUTHORS: Wendy Janssens, Joel Hahnle, Tanimola Akande, Bosede Rotimi

Out-of-pocket health expenditures (OOPs) constitute a significant proportion of total health expenditures in many low-and-middle income countries (LMICs) leading to an increased likelihood of exposure to financial catastrophe in the event of illness. Health insurance has the potential to reduce catastrophic health expenditures (CHE), but rigorous evidence of its sustained impact is limited, especially in LMICs.

This study is based on a quasi-experimental panel dataset consisting of 3 waves of household surveys conducted in 2009 (baseline), 2011 and 2013 in central Nigeria, in a treatment and a control area. The balanced data consists of 1,039 households and 3,450 individuals. We examined the short- and longer-term effects of a health insurance program on CHE, measured either as OOPs exceeding 10% of annual non-medical consumption or OOPs exceeding 40% of household capacity-to-pay (CTP). We employed a difference-in-differences (DiD) regression approach, first estimating effects using an intent-to-treat analysis and then computing average treatment effects on the treated by combining DiD with propensity score weighting.

We found that having health insurance is significantly associated with a 3.7 percentage point decrease in CHE in the short-term ($p<0.1$) but not in the longer-term, when using the 10% threshold. Heterogeneity analyses show a reduction in the risk of CHE of 5.0% ($p=0.1$) and 6.9% ($p<0.01$) in both the short-term and longer-term, respectively, for the poorest tercile. No significant effects were found for the middle and richest terciles. Households with a chronically ill member experienced reductions in the risk of CHE of 10.6% ($p<0.05$) and 8.9% ($p.<0.05$) in the short- and longer-term, respectively. Impact estimates using the 40% of CTP threshold were mostly not significant.

Our findings highlight the critical role of health insurance in providing financial risk protection, especially for vulnerable populations such as the poor and the chronically ill, and by extension in achieving universal health coverage via improving access to health care and reducing poverty risk from catastrophic health payments. Further research is needed to understand why the effects of health insurance partially fade out over time.

Health Shocks, Health Insurance, Household Welfare & Informal Coping Mechanisms: Evidence from Nigeria

PRESENTER: **Adeyemi Okunogbe**, World Health Organization

AUTHORS: Berber Kramer, Menno Pradhan, Wendy Janssens

Health shocks are a source of financial risk especially in low and middle-income countries. This paper examines the effects of health insurance on household welfare during health shocks and the informal strategies used to cope with these health shocks. We employed a fixed-effect regression modelling approach which exploits household variation in illness occurrence and health insurance status over 55 weeks in a panel dataset sourced from weekly financial diaries of 121 households in central Nigeria.

Health shocks are associated with increased out-of-pocket health expenditures, but this increase is 42 percent lower when insured during a health shock compared to not being insured. Somewhat surprisingly, we find that household consumption increases in the week of a health shock regardless of whether these health shocks are covered by health insurance.

The effect of health shocks on household consumption may be influenced by how well households are able to deploy informal coping strategies in response to health shocks. We find that net loans *increase* by 31 percent for households with uninsured health shocks and *fall* by 26 percent

for households with insured health shocks compared to households with no health shocks. Net savings also *reduce* by 42 percent for households with uninsured severe health shocks compared to households with no health shocks.

Health insurance therefore seems to play an important role in helping protect insured households' financial risk during a health shock, while uninsured households appear to rely on potentially costly informal coping strategies in order to smooth consumption.

Fairness and Transparency of the COVID-19 Healthcare Provider Relief Fund Allocations

PRESENTER: **Junying (June) Zhao**, University of Oklahoma Health Sciences Center

AUTHORS: Prof. Dale Bratzler, Prof. James George

BACKGROUND

The COVID-19 Provider Relief Fund started in March 2020, distributing $175 billion to healthcare providers. The fairness and transparency of the allocations have not been studied.

METHODS

Using the most recent financial data from the U.S. government and 50 publicly-traded healthcare entities, including 11,857 branch hospitals and facilities, we traced the allocated funds. We measured and compared the amounts of funds expected based on governmental allocation rules, the amounts actually received and reported in corporation financial statements, and the amounts reported in public records.

RESULTS

Allocations were based on the size and sales of healthcare entities using gross receipts and net operating revenue, rather than actual COVID-19-related needs. Gross receipts included non-operating capital income (rent, interest, investments) which were irrelevant to COVID-19 services and irrelevant for tax revenue and public debt financing the Fund. Individual providers and entities without 2018 operating revenue or 2019 Medicare reimbursements were ineligible for some phases of the allocation. The amounts of allocations to healthcare corporations that were publicly recorded were significantly less than the amounts actually received and reported in corporation financial statements. Overfunded entities may return excess funds after 1-2 years which may then be reallocated to underfunded entities. No accounting standards were specified, making the evaluation of allocations difficult.

CONCLUSIONS

The allocation procedure lacked fairness and transparency in needs assessment, eligibility verification, allocation amounts, utilization report and needs reevaluation, return and reallocation, and in accounting and auditing. We provide evidence documenting these limitations and discrepancies and suggest an implementation framework for future analysis of COVID-19 financing policies.

Measuring the Option Value of Capacity to Tackle Future Crises: Evidence from the COVID-19 Pandemic

PRESENTER: **Laurence Roope**, University of Oxford

AUTHORS: Paolo Candio, Vasiliki Kiparoglou, Helen McShane, Raymond Duch, Philip Clarke

The COVID-19 pandemic has shone a spotlight on healthcare system resilience and ability to cope with unexpected crises, highlighting the perils of over focusing on short-term allocative efficiency at the price of capacity to deal with uncertain future challenges as they arise. Having access to a public good or service has 'option value', even if there is uncertainty as to whether it will ever be used. Many countries have struggled with shortages of personal protective equipment, health professionals, intensive care unit beds, mechanical ventilators and COVID-19 testing capacity. In normal times, it is efficient for healthcare systems to match capacity with demand, but this leaves systems highly constrained when dealing with unexpected, but ultimately inevitable, shocks. Using biomedical research infrastructure as a case study, this paper explores estimation of option value. Researchers working on both the Oxford Vaccine and the RECOVERY trial have been supported by infrastructure funding such as the NIHR Oxford Biomedical Research Centre (Oxford BRC). Such funding can facilitate researchers to respond quickly and effectively to uncertain major health issues as they arise, without waiting for dedicated funding. When COVID-19 struck, the flexibility of research infrastructure funding enabled researchers to divert resources from existing projects to the emerging crisis. Valuing the option value of research infrastructure is challenging. We discuss two approaches, one ex-ante and one ex-post. Ex-post we can investigate the degree to which research infrastructure accelerated the development of studies with tangible economic value. For example, BRC infrastructure has made a substantial contribution to the Oxford Vaccine study. Drawing on global economic forecasts, if Oxford BRC funding ultimately proves to speed up development of an effective vaccine by even one day, this could be worth up to $15bn to the global economy. Ex-ante, option value could be estimated based on the public's willingness-to-pay. We will present evidence from a 12-country survey (N=15,000), due to be conducted in October, which elicits the general public's willingness-to-pay additional taxes ring-fenced to prevent a future pandemic spreading. Better accounting for 'option value' could help protect valuable healthcare and research budgets and leave us better prepared to address future threats.

The Promises and Pitfalls of Forty-Two-Year Trends of Public Health Spending: Canadian Evidence

PRESENTER: **Ms. Emmanuelle Arpin**, University of Toronto

AUTHORS: Mehdi Ammi, Sara Allin

Introduction: In the wake of the COVID-19 pandemic, concerns around public health (including prevention, promotion and surveillance) investments have been raised. Globally, public health (PH) has consistently received one of the smallest shares of national total health expenditures (1.6%-5.8%; OECD Health Statistics, 2020). There is however little investigation of the relative evolution of PH spending compared to other health expenditures. Data quality concerns complicate such exercises. Evidence from the US indicate official PH estimates may be overestimated (Leider et al., 2020), while an examination of European data showed discrepancies between three international agencies (WHO, Eurostat, OECD) for nine European countries (Rechel, 2019). Such issues are likely in Canada, particularly as PH is largely defined, funded and delivered at the sub-national level (provinces, territories).

Objectives: First, to examine forty-two years of PH spending trends in Canadian provinces and territories. We focus on real growth compared to other sectors of the health system, as to better situate concerns over insufficient PH investments. Second, to evaluate potential reporting discrepancies of PH spending between Canada's primary national health reporting agency (Canadian Institute for Health Information; CIHI) and sub-national government budgetary expenditures in PH. Doing so allows to assess the reliability of the trends.

Methods: For our first objective, we created spending indices, akin to the Consumer Price Index, with a base value of 100 in the year 1975 and computed annual per capita spending estimates in constant 1975 CAD$ from 1975 to 2017 (latest year of validated data). The primary index was for PH spending; for comparative purposes, we also created indices for overall health sector spending without public health, and the three largest spending sectors in Canada: hospitals, physicians, and pharmaceuticals. For our second objective, we compared national expenditure estimates with publicly available sub-national government estimates, combined with budgets from government affiliated sub-national PH organizations on the recommendation of knowledge users. We focused this analysis for four of the most populous provinces (Ontario, Quebec, British Columbia and Alberta) over six years (2012-17).

Results: We observe real growth in PH spending particularly after the late 1990s and multiplied by five since 1975 (2017 index average: 510). Exceptions are Nova Scotia (153) and Quebec (138) where growth in per capita spending remained relatively low over time. Besides spending in pharmaceuticals (1472), trends in PH spending saw greater increases compared to physicians (334) and hospitals (211). There are, however, discrepancies between official national spending estimates and sub-national governments, with the national reports being significantly larger. The Quebec government estimates only account for about half of the CIHI estimates, and this is the province with the smallest discrepancy. While only examined over a six-year period, this discrepancy is nevertheless largely time invariant.

Conclusions: Long-term real trends indicate that PH spending grew more quickly than some other parts of the health system in Canada, but not all. These increases could be linked with the evolution of health outcomes. The trends in public health spending need further investigation to address the data discrepancies, even though those appear relatively time-invariant.

Leveraging the Cost Data You Have: A New Methodological Approach Using PrEP Primary Cost Data

PRESENTER: **Lori Bollinger**, Avenir Health

Background: Accurate, timely and locally relevant cost data are critical for program planning and budgeting. However, large-scale, primary source cost data gathering exercises are expensive, time-consuming, and often technologies have changed by the time the data become available. Here we present a new methodological approach to leveraging existing primary cost data, using cost data on Pre-Exposure Prophylaxis (PrEP) for HIV as an example.

Methods: A review of the published literature and recent presentations identified relevant PrEP costing literature, and primary source data were obtained from the authors. Analyses were performed to estimate average minutes spent per cadre per PrEP service delivery strategy, as well as average percentages spent on items such as overhead and capital costs. These analyses were then combined with default cost data, including for wages and key commodities, to calculate PrEP costs in PrEP-it, a PEPFAR-funded multi-module PrEP implementation and planning tool.

Results: The analyses showed that the percentages devoted to overhead and capital costs were 10.7% and 0.4% of overall service delivery visit costs respectively. These percentages are used in the "Costs Lite" module, along with the calculated minutes combined with wage data. In the "Detailed Costs" module, overhead costs were further disaggregated into laboratory test-related costs, using a linear regression with number of laboratory tests as the dependent variable, and other recurrent costs, which became 6.8% of total service delivery costs. In addition, minutes spent by cadre by service delivery strategy are displayed in editable format, allowing for task-shifting analyses. These components are combined with user-specified ARV and laboratory costs, visit and laboratory schedules, lump sum costs and editable country-specific default wage rates to calculate unit costs (per person taking PrEP for one full year and per person initiating PrEP, taking discontinuation rates into account), annual total costs, monthly costs, and costs per HIV infection averted by different priority populations.

Conclusions: Leveraging existing primary source data is a cost-effective strategy to calculate accurate, timely and locally relevant costs. Designing tools for policy makers with this approach can result in maximizing the utility of large-scale, expensive cost data gathering exercises, limiting any further necessary cost data gathering to filling in any key data gaps.

Estimating Spending on Immunization By Source, Activity and Component in Low- and Middle-Income Countries, 2000-2017

PRESENTER: **Dr. Joseph Dieleman**, University of Washington

AUTHORS: Dr. Angela Esi Micah, Gloria Ikilezi, Steven Bachmeier, Ian Cogswell, Emilie Maddison, Hayley Stutzman, Ms. Golsum Tsakalos, Dr. Logan Brenzel

Background

Childhood immunization is one of the most cost-effective health interventions available. Nonetheless, access to key vaccines remains far from complete. The Global Vaccine Action Plan (GVAP) 2011-2020 and the Immunization Agenda 2030 (IA2030) have intended to catalyze progress towards universal coverage for key vaccines. Despite these goals, comprehensive estimates of domestic spending on immunization do not exist, and there is very limited data on domestic private spending on immunization. This research aims to fill this gap.

Methods

We estimated annual spending on immunizations for 135 low- and middle-income countries from 2000 through 2017, with a focus on government, donor, and out-of-pocket spending, and disaggregated spending for vaccines, delivery costs, routine immunization schedules and supplementary campaigns. To generate these estimates, we extracted data from National Health Accounts, Joint Reporting Forms, comprehensive Multi Year Plans, Gavi databases and the Institute for Health Metrics and Evaluation's 2019 development assistance for health database. We estimated total spending on immunization by aggregating the government, donor, pre-paid private and household spending estimates.

Findings

Between 2000 and 2017, funding for immunization totaled $107·6 billion (104·0-113·1). Government spending consistently remained the largest source throughout providing between 58·0% (55·4-59·6) and 79·2% (73·5-81·3) of total immunization spending each year. Across income groups, per surviving infant immunization spending is comparable in low-income and lower middle-income countries, with spending at an average of $40 (38-42) and $40 (37-44) respectively. However, in low-income countries, development assistance makes up the largest share of total immunization spending (69·4% (64·7-71·9)). Overall, we observe higher vaccine coverage associated with increased government spending on immunization although there were countries for which the inverse applied.

Interpretation

While these estimates highlight the immense progress that have been made in the last two decades in increasing spending on immunization and coverage levels, many challenges still remain and require dedication and commitment to ensure that the progress made in the previous decade is sustained and advanced.

Public Health Spending in Nigeria: Shifting Discretionary Funding Towards Budget Earmarks to Achieve Sustainable Universal Health Coverage (UHC)

PRESENTER: **Olufunke Falade**, Palladium- USAID IHP

AUTHOR: Dr. Carlos Avila

Background: Public health finance in Nigeria is a shared responsibility among the federal government, 36 states, Federal Capital Territory (FCT) and 774 local government authorities (LGAs). Discretionary budgets are appropriated annually through state bills and can easily be diverted to other sectors. In contrast, budget earmarks are set up as mandatory spending and directed by statutory law. Health sector planning is weak, and budget execution is affected by delayed release of funds and discretionary allocation. The Nigeria USAID-Integrated Health Program (IHP) is supporting improvements in budgeting performance as a critical step to end preventable deaths of mothers and children in Bauchi, Ebonyi, Kebbi and Sokoto States.

Methods: We analyzed the magnitude, scope, outputs and potential/achieved impact of discretionary and earmarked health budgets in the IHP supported states in 2019 and 2020. Total health expenditure was disaggregated into PHC and hospital services to reflect spending priorities and probable outcomes.

Results: Health budgets in the four states increased by 16% in 2019 and 2020 (US$183.4 vs. US$213.4 million). The states' 2019 budget performance was an average of 55% (government health expenditures of US$101 million). Although Nigeria delegates the delivery of primary health services to LGAs, health spending declines from the central level (67%), to the state level (26%)and only a small proportion reaches the local level (7%). In Nigeria, 80% of the burden of disease can be managed at the PHC level; however, only 13% of government health expenditures were spent at this level (<US$2.00 per capita) in the 4 states. Local government budgets are meant to finance PHC but only a third of facilities receive any form of cash grants to meet their operational costs. This results in 74% of PHCs charging user fees for drugs, delivery services and antenatal care. The financial burden imposed to households results in 70% of total health expenditures financed by out-of-pocket (OOP) costs. Health reforms in the 4 states have enshrined an average 1.4% (US$8.4 million) of their revenue (US$600 million) as earmarked funding structured as statutory transfers. Earmarked budgets will result in an additional US$5 million or 60% of total resources being spent at the PHC level. These budgetary legal reforms are ring-fenced from political forces and discretionary executive decisions.

Conclusion: Budget earmarks increase the predictability of resources to plan multi-annual health priority goals and are explicit, transparent, and directed by statutory law. This mandatory spending can be improved one step further by: (1) adding equitable allocation formulas determined by the number of beneficiaries, (2) adjusting by differentials in needs, and (3) guaranteeing explicit package of health services. Earmarks protect important health programs from short-term fluctuations in funding that hinder the national objective of ending preventable deaths of mothers, newborns and children.

Factors Associated with the Likelihood of Disbursements of Development Assistance for Health Allocations in Low- and Middle-Income Countries, 2002-2017

PRESENTER: **Dr. Angela Esi Micah**

AUTHORS: Modhurima Moitra, Ian Cogswell, Emilie Maddison, Kyle Simpson, Hayley Stutzman, Ms. Golsum Tsakalos, Dr. Joseph Dieleman

Background: In 2017, development assistance for health (DAH) comprised 5.3% of total health spending per GDP in low income countries. Despite the key role DAH plays in health-spending in low-resource settings, the effectiveness and clarity of its allocation methods have been called into question. Aid flows from donors to recipients use different metrics which limit tracking efforts. Additionally, little is known about the factors such as type of aid and public perception of corruption or risk of political fragility that may be associated with the likelihood of disbursement of allocated aid. In this analysis, we examine associations between these potential drivers and the proportion of committed aid that is disbursed.

Methods: Three data sources (Creditor Reporting System data by the Organization for Economic Co-operation and Development, DAH data estimated by the Institute for Health Metrics and Evaluation, and the World Health Organization National Health Accounts expenditure data) were used for this analysis. The outcome variable was the proportion of committed aid that was disbursed for a given country-year. Ratios below 1 indicated low disbursement to commitment whereas ratios above 1 indicated higher disbursement to commitment. Factors examined were off-budget aid, administrative expense, perceived level of corruption and fragility in recipient country, and the proportion of DAH from public sources. A panel linear regression model with mixed effects was used for analyses by region and income group.

Findings: Factors that were associated with a higher likelihood of disbursement include off-budget aid (p-value < 0.001), lower administrative expenses (p-value < 0.01), lower perceived corruption in recipient country (p-value < 0.001), and higher fragility in recipient country (p-value < 0.05). By income-level, DAH allocated to low-income countries was associated with the highest relative increase in DAH disbursed compared to other income groups.

Interpretation: Substantial gaps remain between commitments and disbursements at the regional and income group levels. The form of aid delivered (administrative, publicly sourced) and indicators of government transparency and fragility are also important drivers associated with disbursement of DAH. There remains a continued need for better aid flow reporting standards and clarity around aid types for better measurement of DAH.

Primary Care and Universal Health: Measuring What Matters

PRESENTER: **Magdalena Rathe**, Fundación Plenitud

Context:

The goal of the SDGs is to achieve universal health and there is consensus on the key role that primary health care (PHC) plays in achieving it. In order to ensure progress in this direction, it is essential to increase and ensure efficient use of all investments in primary care and be able to measure these advances in a robust and comparable way. This requires reaching consensus on the primary care spending indicators and on how to measure them. The OECD and WHO have proposed definitions and estimation methods and preliminary figures have been published for a set of countries, with quite different results.

Objectives:

Discuss different definitions of primary care spending within the framework of the System of Health Accounts (SHA 2011) illustrating its results with LAC and OECD countries, to offer recommendations that contribute to an international standard measurement.

Methods:

Review of the definitions of PHC proposed by the OECD and the WHO, both based on the System of Health Accounts (SHA 2011). The OECD starts from the concept of Basic Health Services from the functional classification and crosses it with that of outpatient providers, presenting separately the expenditure on medicines and system administration. The WHO definition is based on the same functional classification, without crossing it with providers, but adds 80% of the expenditure on medicines and of administration. Preventive services are included selectively in some components, for example, epidemiological surveillance is excluded by OECD but included in WHO. The paper discusses the relevance of the definitions and the consequences for policy. Comparative statistics are presented for the LAC and OECD countries for which there is data.

Results and discussion:

The results show great disparity, resulting in relatively high expenditures with the WHO definition, given that total spending on medicines, when household out-of-pocket spending is included, substantially raises the figures. High OOPs is inconsistent with policies to achieve universal health that promote increased investment in PHC. On the other hand, although spending on epidemiological surveillance and disease control is small, conceptually it is questionable to exclude its amount at the national level, given the distribution and characteristics of its activities and its increased relevance due to Covid 19.

The analysis requires detailed level in the data to ensure that the monitoring can lead to an approach to the efficiency in the use of resources. Theoretically, a very detailed conceptual framework leads to reliability, while in practice, more aggregated data is appropriate. But, as in all experience of Health Accounts, measurements need to be comprehensive in its dimensions, (consumption, provision and financing) to ensure quality control and plausibility. Indicators and alternative ideas are offered to contribute to the international discussion.

Trends in Primary Healthcare Spending: Evidence from Subnational Health Accounts in Nigeria

PRESENTER: **Azara Agidani**, Health Strategy and Delivery Foundation

AUTHORS: Yewande Ogundeji, Husaina Aliyu, Joseph Kolo, Ibrahim Dangana, Kelechi Ohiri

Background

Now more than ever, primary health care has been identified as the foundation of any health system and is critical to achieving universal health coverage. Bringing PHC to the front and center of any health systems requires substantial financial investments, leading to the call for policy and decision makers to increase PHC spending especially from domestic source to improve the sustainability of financing. Health accounts study provides granular estimates of health expenditure in the health sector across actors- government, donors, development/implementing partners, enterprises, private health insurance and households.

This paper highlights the pattern of Primary Health Care (PHC) spending in Niger state in Nigeria using data from a multi-year subnational health accounts study, with the aim of providing reliable evidence to inform policy dialogues and planning decisions.

Methods

Adopting the system of health accounts (SHA) 2011 framework, we administered surveys to government, donors, non-governmental organizations (NGOs), private health insurance organisations and employers in the health sector for the reference year 2015-2017. Household

health expenditure was derived from a household surveys administered to a representative number of households across all districts within the state. Disease expenditure was estimated through a health provider survey across a sample of health facilities. Analysis was conducted using Microsoft Excel, Stata and the Health Accounts Production Tool.

Conclusion

The findings revealed PHC spending increased significantly by 57% over the three years. Beyond households, health spending by source revealed donors as key drivers of PHC spending and government spending averaging 34% of total health expenditure (THE). Majority of PHC spending was seen to be on wages, salary and compensation to employees. The findings highlight two (2) policy priorities for the state government to consider: (i) Dependence on donors for financing PHC and (ii) poor mobilization of domestic resources to finance PHC. As countries face declining donor support, the government will increasingly need to determine how to allocate enough resources for PHC using domestic public resources.

Institutionalizing Capacity for Health Financing and Analytics in Nigeria

PRESENTER: **Chukwuemeka Azubuike**, Health Strategy and Delivery Foundation

AUTHORS: Yewande Ogundeji, Nuhu Natie Butawa, Kelechi Ohiri

Background

The National Health Accounts is an analytical exercise through which countries monitor and map the flow of money in their health sector. Health Accounts, when conducted routinely, can serve as a tool to inform the health policy and planning process. Whilst many high-income countries conduct health accounts routinely, the number of low- and middle-income countries that have institutionalized the Health Accounts is still limited due to structural and technical constraints as well as challenges with sustainability for donor funded health accounts. This has negative implications for planning, evidenced based decisions, and efficient allocation of resources in countries like Nigeria, where health accounts are not produced routinely despite demonstrated utility and potential benefits of granular estimates of expenditure. This study presents the process of institutionalizing Health Accounts through government stewardship and strategic collaboration with academia and other institutional actors in Kaduna state, Nigeria.

Methods

Institutionalization of the Health Accounts in Kaduna State was based on a 4-year institutionalization plan underpinned by 3 pillars: Stewardship, Capacity, and Data.

To foster stewardship, a policy advisory group (PAG) was constituted. This included policy actors, lawmakers, and other relevant stakeholders. The PAG was domiciled in the state ministry of health and their roles including leadership, governance, distilling the key policy questions they wanted the health accounts to answer, and ensuring the translation of the findings into action.

To domicile and sustain local capacity, multiple capacity building sessions were conducted with key technical stakeholders. We also facilitated collaborations with local institutions such as the Kaduna State University to develop and integrate a health accounts curriculum and a memorandum of understanding (MOU) for the collaboration between the institution and the ministry of health.

Findings and conclusion

Whilst the process of institutionalisation is a continuous and long process, Kaduna state has made impressive strides and key achievements in institutionalising the process health accounts. The key factors that facilitated this include stewardship by the State Ministry of Health, co-creation in the process of capacity building, and intergradation of capacity building and data collection within domestic organisations. The state stewardship for the health accounts ensured a stable "analytical home" for the SHA study and formed a vital link between production and use of SHA findings for decision making at the policy level. For example, findings from the health accounts informed and facilitated the signing into law of the state health insurance scheme, as well as the premium setting and benefit packages for the insurance scheme to ensure equitable allocation of resources. In addition, the engagement of academia to sustain capacity has proven important, as capacity to conduct health accounts is domiciled within the state and can be sustained despite high turnover of ministry staff. This in turn will ensure that there are minimal time lags between the routine conduct of health accounts to continuously support the evidence-based decision making process.

Mapping Progress Towards Strategic Purchasing for Healthcare in Imo State, South East Nigeria: A Critical Review of Evidence

PRESENTER: **Charles C Ezenduka**, University of Nigeria, Enugu Campus

Background: Achievement of Universal Health Coverage is hinged on effective implementation of strategic purchasing for healthcare (SHP) directly linked to enhanced health system performance, for efficiency, equity and quality of service delivery. Strategic purchasing for healthcare (SHP) enhances the optimal attainment of health system goals, through the efficient use of financial resources. The study examined the purchasing practices and arrangements in the Imo state healthcare system to understand the extent of implementation of SHP functions and make recommendations for policy

Methods: The study critically reviewed and analyzed the tax-based health system in Imo state southeast Nigeria, to assess the purchasing practices based on a descriptive qualitative case study approach. Reviews of relevant documents (reports, policy, and regulatory documents) were undertaken including interviews with stakeholders. Information on external factors and governance, purchasing practices, other capacities, and resulting outcomes of the state's financing scheme were collected and analyzed. The analytic framework was guided by recommended framework for monitoring progress towards SHP, which derived from the themes developed by Cheryl Cashin et al 2018, examining practices across strategic health purchasing functions.

Findings: Purchasing practices of the SMOH are mostly passive with a few strategic purchasing functions. While the benefits package of healthcare provision significantly reflects the needs of the population, the stewardship role of the government is characterized by substantial inadequate budgetary allocations and poor accountability. As an integrated system, there is no purchaser-provider split. Provider selection, monitoring, and paying processes do not promote equity, quality, and efficiency. Providers have limited or no autonomy over decision-making except for percentages of retained revenues for secondary and tertiary health providers. There is little or no capacity for strategic purchasing. However, the state recently developed a Health Financing Policy & Strategy with policy guidelines that align with strategic purchasing functions. The state has also established an insurance agency (IMSHIA) in which strategic purchasing functions inform purchasing arrangements and practices; from benefits packages, provider selection processes, appropriate provider payments mechanisms and regulatory control of providers. The agency is currently in the early stages of operation for any meaningful assessment of results.

Conclusion: There is very limited implementation of strategic purchasing for health care in Imo state. The main challenges stem from the lack of the government's commitment towards meeting its governance responsibilities at implementing strategic purchasing. Appropriate legal and regulatory frameworks need to be put in place for appropriate implementation. The establishment of the social insurance agency IMSHIA with the projected increase in enrollment of citizens and effective implementation of the state HFP&S will facilitate the implementation of strategic healthcare purchasing in the state.

5:15 PM –6:30 PM WEDNESDAY [Economic Evaluation Of Health And Care Interventions]

Economic Evaluation of Health and Care Interventions Poster Session

MODERATOR: **Adrian Towse**, The Office of Health Economics

Why Is It Important to Publish Cost-Ineffective Findings from Studies That Are Not Clinically Effective? A Case Study

PRESENTER: **Charlotte Davies**, University of East Anglia
AUTHOR: Tracey Sach

Objective: To consider the importance of publishing findings from economic evaluations even where clinical outcomes were found ineffective using a case study to illustrate. The case study sought to determine the cost-effectiveness of daily all-over-body application of emollient during the first year of life for preventing atopic eczema in high-risk children at 2 years.

Design: A within-trial economic evaluation using data on health resource use and quality of life was undertaken as part of the BEEP study from a health services perspective. The BEEP study was a multicentre, pragmatic, parallel-group randomised controlled trial in 12 hospitals and four primary care sites across the UK. Infants were randomly assigned to study arms and followed up over a two year period.
Participants: 1394 infants were randomly assigned (1:1) to receive either emollient and best practice skin-care advice (emollient arm) or best practice skin-care advice only (control arm).
Intervention: Families in the emollient arm (n=693) could choose between Doublebase Gel or Diprobase Cream. Parents were advised to apply emollient to their child at least once daily to the whole body until they reached 1 year of age. Both arms received advice on general skin care.
Main Outcome(s): The primary economic outcome measure was incremental cost per eczema case prevented in a cost effectiveness analysis. Secondary analysis reported a cost-utility analysis using Quality Adjusted Life Years (QALYs) estimated using utility scores obtained from the proxy CHU-9D at 24 months and parental utility as captured in the EQ-5D-5L.
Results: Daily all-over-body application of emollient during the first year of life was not found clinically effective in preventing atopic eczema in high-risk children. This study found the emollient arm had a higher mean cost per participant and slightly lower mean QALYs (CHU-9D) per participant compared to the usual care arm. However, it is important to share the results of this study for a variety of reasons. There is an moral argument to publish the findings as participants have invested significant time sharing their data. The data will be useful in other ways, for instance in understanding the resource use and costs of high-risk infants and their quality of life. The data may also help inform future economic models in related topics which seek to synthesise available data to inform evidence based decisions. Publishing the results can also be important to avoid publication bias and offer a different conclusion to previously published evidence. Prior to this study a paper had been published which modelled the cost effectiveness of using emollients as a preventative strategy for eczema and found that such use may be cost-effective but it was based only on published pilot data.
Conclusion: Overall, the emollient intervention was not found to be cost-effective. These findings are in keeping with the main clinical findings where there was no evidence to support the use of a daily emollient during the first year of life to prevent eczema in high-risk children. However, it is important to publish these findings to inform future evidence syntheses and economic modelling.

Are Estimates of the Health Opportunity Cost Being Used to Draw Conclusions on Cost-Effectiveness Analyses? A Scoping Review in Four Countries

PRESENTER: **Laura Vallejo-Torres**, ULPGC
AUTHORS: Dr. Borja Garcia Lorenzo, Laura Edney, Niek Stadhouders, Ijeoma Edoka, Iván Castilla-Rodríguez, Lidia García-Pérez, Renata Linertová, Cristina Valcarcel-Nazco, Jonathan Karnon

Introduction: In many health care systems, reimbursement decisions are informed by cost-effectiveness evidence. To do so, the cost per unit of effectiveness of new technologies needs to be compared with a ceiling value which indicates whether the introduction of a new technology leads to an efficient use of limited health resources; this figure is known as the cost-effectiveness threshold (CET). Several countries use - implicitly or explicitly – somewhat arbitrary CET figures, based on the observation of past decisions or on conventions established in the literature. The lack of a theoretical and empirical basis regarding available CET figures has contributed to an on-going debate about the appropriate way of estimating CETs and to an increasing body of empirical research in this area in many countries. Recent research have emphasised that CETs should represent the health opportunity costs of funding decisions, and multiple countries have recently published empirical estimates following this approach. The extent of the adoption of this information to set a CET to draw conclusions and to inform health care funding decisions is unknown.

Objectives: To identify the CET figure used to draw cost-effectiveness recommendations in four countries, Australia, Spain, The Netherlands and South Africa, where empirical estimates of the health opportunity costs are readily available. The following specific objectives will be pursued: i) to identify cost-effectiveness analyses reporting a cost per Quality-Adjusted Life Year, Disability Adjusted Life Year or Life Year gained, ii) to identify the value and source of the CET figure used (if any) before and after the publication of the estimate of the health opportunity cost value in these settings, and iii) to identify the characteristics of the studies using different CETs values.

Methods: We are undertaking a scoping review of cost-effectiveness analyses published in the scientific literature and in Health Technology Assessment reports in Australia, Spain, The Netherlands and South Africa between 2016 and 2020. Among other study characteristics, the CET value used before and after the publication of the estimates of the health opportunity cost in the relevant settings will be recorded. The review will be carried out in accordance with the methodology developed by the Cochrane collaboration and will be presented following the PRISMA-ScR guidelines. Regression analyses will also be conducted to identify factors driving the use of different CETs.

Results: The following resources have been searched: MEDLINE, SCOPUS, ISI Web of Science, International HTA Database by INAHTA, CEA Registry, Econlit and Embase. After removing duplicates, the search identified a total of 10,810 studies. Following title and abstract screening, a 15% of full papers will be screened. Full-text screening, data extraction and synthesis will be completed by the end of 2020 and beginning of 2021.

Conclusions: The review of the use of evidence-based CETs will describe the adoption of the scientific evidence on CETs by health authorities and the scientific community. The study will also provide insights on variability in the use of CETs by other factors, such as disease area, source of funding and the study-specific cost-effectiveness results.

Challenges and Opportunities with Developing Economic Evaluation Methods for Public Health Programmes: A UK Qualitative Study with Health Economists

PRESENTER: **Ms. Sonja Charlotte Margot Bloch**, University of Birmingham
AUTHORS: Louise Jackson, Emma Frew, Jonathan Ross

Background

Public health interventions often strive to achieve gains beyond health such as educational, productivity and wider wellbeing gains and are regularly implemented in settings where there are multi-sectoral costs and outcomes. Methodological guidance for economic evaluation in public health therefore places careful consideration upon choice of appropriate time horizon; methods for measuring costs and trading off with outcomes; and adopting different criteria for making recommendations such as maximisation versus a sufficiency/equity principle.

Although evaluations are often used to inform decision-making at the English national level, evidence suggests that they are rarely considered by local decision-makers. Very little research has focussed on the experiences and methodological challenges faced by health economists when working with local decision-makers and how to adapt national methodological guidance to local settings.

Aims

The specific aims of this study were:

- To explore health economists' experiences of collaborating with local public health decision-makers.
- To discuss how economic evaluation methods might be improved to better fit with a local public health context.

Methods

Twelve qualitative interviews with health economics researchers across the UK were conducted. Participants were purposefully sampled through a snowballing approach and all interviews were conducted using audio-video software until saturation was reached.

The framework analysis method was applied based on the seven-stage process outlined by Gale et al. (2013). The main researcher (SB) transcribed the interviews and developed the framework, which was checked with another researcher (LJ) and the data was further interpreted based on the framework matrix.

Results

Interview participants consisted of six men and six women who all held positions at a UK University. Four main themes with a number of sub-themes were identified. The participants described the (de)commissioning process of public health services with reference to the Health and Social Care Act 2012 in England, and the resulting impact on local authorities in terms of responsibility for public health and resulting budget pressures from national funding cuts since 2015.

Participants reported that it was crucial to understand that public health decision-makers may have objectives beyond health maximisation and that these objectives should be addressed within an economic evaluation. This was discussed in tandem with the political and wider context in which public health programmes are implemented.

One of the main challenges experienced by the researchers when generating economic evidence for decision-makers was timing, as it was felt difficult to deliver a high-quality evaluation within the timeframes required by local decision-makers.

Participants suggested methods to improve existing approaches including disaggregating the data by population subgroup and combining a cost-effectiveness analysis with a budget impact analysis to illustrate cashflow. Others suggested applying a distributional cost-effectiveness analysis to highlight equity impacts. Finally, aspects such as timing and trust between the decision-maker and the researcher were emphasised as important.

Discussion

This research provides an overview of the various challenges encountered when undertaking an economic evaluation of public health programmes and suggests some improvements to methods to better support public health decision-making.

Systematic Review of Rotavirus Vaccination in High-Income Settings Utilizing Dynamic Transmission Modeling Techniques

PRESENTER: **Tim Jesudason**, Triangulate Health Ltd

AUTHORS: Alejandra Rodarte, David Tordrup, Cristina Carias, Yao-Hsuan Chen

Purpose: To support future rotavirus vaccination evaluation by Health Technology Assessment Agencies, this systematic review presents synthesized findings reported in cost-effectiveness studies in high-income settings based on dynamic transmission modeling.

Methods: We searched CEA Registry, MEDLINE, Embase, Health Technology Assessment Database, Scopus, and the National Health Service Economic Evaluation Database for studies published since 2002. Full economic evaluations studies based on dynamic transmission models, focusing on high-income countries, live oral rotavirus vaccine and children ≤ 5 years of age were eligible for inclusion. Included studies were appraised for quality and risk of bias using the Consensus on Health Economic Criteria (CHEC) list and the Philips checklist. The review protocol was prospectively registered with PROSPERO (CRD42020208406).

Results: A total of four economic evaluations were identified. Study settings included England and Wales, France, Norway, and the United States. All studies compared either pentavalent or monovalent rotavirus vaccines to no intervention; all were cost-utility analyses that reported incremental cost per QALY gained, and consistently concluded that rotavirus vaccination is cost-effective compared with no vaccination relative to the respective country willingness to pay thresholds in high-income countries when the modeling assessment framework takes into account herd protection benefits (Table 1).

Conclusions: Rotavirus vaccination was found to be cost-effective in all identified studies that used dynamic transmission models in high-income settings, where child fatality rate due to rotavirus gastroenteritis is close to zero. Previous systematic reviews [1,2] of economic evaluations took into account mostly static and a few dynamic transmission models and have less conclusive finding about the rotavirus vaccination results than the current study. We hypothesize that that choice of modeling techniques could have significantly influenced cost-effectiveness evaluation results for rotavirus vaccination. Further research is underway to substantiate this hypothesis.

References:

[1] Thiboonboon, Kittiphong, et al. "A systematic review of economic evaluation methodologies between resource-limited and resource-rich countries: a case of rotavirus vaccines." Applied health economics and health policy 14.6 (2016): 659-672.

[2] Kotirum, Surachai, et al. "Global economic evaluations of rotavirus vaccines: A systematic review." Vaccine 35.26 (2017): 3364-3386.

Table 1: Key characteristics of the studies of rotavirus vaccines in high income countries utilizing dynamic transmission modeling techniques

Study	**Shim et al**	**Atkins et al**	**Yamin et al**	**Edwards et al**
Year	2009	2012	2016	2017
Setting	USA	England and Wales	France	Norway
Intervention	RotaTeq™ vs no	RotaTeq™ vs no	Pentavalent rotavirus vaccine	Rotarix™ vs no vaccination and RotaTeq™

and comparator	vaccination; Rotarix™ vs no vaccination	vaccination	vs no vaccination	vs no vaccination
Conclusion	RotaTeq™: Cost effective from healthcare perspective when considering child with one caregiver; cost-saving from societal perspective	RotaTeq™ is cost effective; possibly cost-saving	Pentavalent vaccine: Cost effective from societal and third payer perspectives	RotaTeq™ and Rotarix™: Cost effective from healthcare perspective; cost-saving from societal perspective.
Baseline ICER	USD 80,740 - USD 192,100	GBP -3,222 - GBP 47,057	EUR 12,500 – EUR 39,500	EUR 47,447 – 52,709
Cost-effectiveness threshold used	3x GDP/capita	GBP 20,000-30,000	EUR 30,000 and EUR 50,000	EUR 73,444

A Systematic Review of the Methods for Evaluating the Benefits and Harms of Antenatal and Newborn Screening Programmes Adopted By Health Economic Assessments

PRESENTER: **May Ee Png**, University of Oxford

AUTHORS: Miaoqing Yang, Oliver Rivero-Arias, Stavros Petrou

Extensive resources and complex organizational arrangements are required to deliver antenatal and newborn screening programmes in industrialized nations. National screening committees and health technology assessment agencies consider cost-effectiveness assessments alongside viability, accuracy of screening and confirmatory tests, effectiveness of treatments and appropriateness criteria. It is not clear what approaches health economic assessments have adopted to measure and value benefits and harms of antenatal and newborn screening programmes. Therefore, this study aims to systematically review and critique published and grey literature on methods for identifying, measuring and valuing the benefits and harms of antenatal and newborn screening adopted by economic assessments in OECD countries.

The PICOS (Population, Intervention, Comparator, Outcome and Study design) framework was applied to the literature searches. Bibliographic database searches of the published literature were supplemented by manual reference searching of bibliographies, contacts with experts in the field, citation searching and author searching. The grey literature was identified from a pool of relevant websites informed by a recent systematic review of national policy recommendations on newborn screening that identified websites of national and regional screening organizations with documentation about antenatal and/or newborn screening recommendations. The search strategies combined terms for health economic assessments with those for antenatal and newborn screening programmes. Studies were selected for review if they reported health economic assessments of antenatal or newborn screening programmes from any OECD country and published from year 2000. The study selection process followed PRISMA guidelines. Data were extracted into a bespoke form created to understand the handling of benefits and harms by authors, as well as adherence to the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement. A protocol for this study was registered in the International Prospective Register of Systematic Reviews (PROSPERO) (registration number CRD42020165236).

Preliminary results suggested that the reporting of information to understand what and how benefits and harms are incorporated in these studies is currently limited. Authors rarely provide sufficient information on their methods to assess how benefits and harms are incorporated in terms of screening outcomes (true positives, false positive, true negatives and false negatives). The reporting of the structure of underpinning decision models and accompanying modelling assumptions is also poor. Often, authors focus on limited biomedical outcomes within their incremental cost effectiveness ratios that limit comparability across studies. These expressions of cost-effectiveness often do not capture the breadth of benefits and harms modeled by authors.

Findings from this review should inform recommendations about whether the techniques used to measure and value benefits and harms adopted by health economic assessments of antenatal and newborn screening programmes are appropriate or whether a new framework for these economic evaluations is needed.

Impact and Cost-Effectiveness of Potential Interventions Against Infant Respiratory Syncytial Virus (RSV) in Low- and Middle-Income Countries

PRESENTER: **Ranju Baral**, PATH

AUTHORS: Deborah Higgins, Katie Regan, Clint Pecenka

Background. Respiratory syncytial virus (RSV) is a leading cause of respiratory illness among infants, globally. Interventions currently available to prevent childhood RSV disease are limited; and the one currently available is costly even for high income countries. A few candidate interventions to protect against childhood RSV illness are in relatively advanced stages of development and could be available for global use in the foreseeable future. In this paper, we evaluate the potential impact and cost-effectiveness of two such interventions: a maternal vaccine and a monoclonal antibody (mAb), both targeted towards averting RSV disease burden among young infants, to help inform decision making around further development of such interventions and eventual use in low- and middle-income countries (LMICs).

Methods. We used a static population-based cohort model to evaluate the potential impact and cost-effectiveness of RSV interventions, across 131 LMICs, for 10 years (2030 to 2039), from health care systems perspective. Disease burden inputs as well as unit cost inputs were based on published literature. Intervention characteristics such as efficacy and duration of protection were derived from available clinical trial data for maternal vaccine and from the targeted product profile (TPP) for mAb, and the assumed baseline efficacy and duration of protection were higher for mAb compared to maternal vaccine. Both interventions were evaluated at a $3 per dose for Gavi-eligible countries and $5 per dose for non-Gavi countries. This analysis does not examine country-specific vaccine co-financing from Gavi for eligible countries. A range of input values were considered to explore uncertainty in model inputs. Costs are expressed in 2016 US$.

Results. Under baseline assumptions, both interventions are projected to be impactful across all countries, with maternal vaccine and mAb averting roughly 25% and 55% of RSV related deaths among under 6 months old, respectively. The average incremental cost-effectiveness ratio (ICER) expressed in US$ per DALY averted was estimated to be $1,342 (range $800 to $1,866) for maternal RSV vaccine and $431 (range 167 to 692) for mAb, under baseline assumptions. For maternal vaccine, the estimated ICERs were less than 50% of the GDP per capita in 60 countries (12 Gavi and 48 non-Gavi). The estimated ICERs for RSV mAbs were below the 50% GDP per capita threshold in 118 countries (62 Gavi and all non-Gavi). Under alternative scenarios that consider both RSV interventions with similar characteristics, we observe no substantial variation in impact and cost-effectiveness.

Conclusions. Both RSV maternal vaccine and mAb are projected to be impactful and cost effective in many countries, a finding that would be enhanced if country specific Gavi co-financing to eligible countries were included. Under the assumptions of higher efficacy and duration of protection for mAb, mAb are more cost-effective than RSV maternal vaccines though final product characteristics and their relative prices will influence this finding. LMICs should consider maternal vaccine and mAb as potentially impactful and cost-effective interventions to avert RSV burden in young infants, once available.

Evaluating an Access Increasing Intervention: Cost-Effectiveness of Gas-Insufflation-Less Laparoscopic Surgery to Increase Access to Minimally Invasive Surgery for Abdominal Conditions in Rural North-East India

PRESENTER: **Ms. Bryony Dawkins**, University of Leeds

AUTHORS: Noel Aruparayil, Tim Ensor, Jesudian Gnanaraj, Julia Brown, Dr. David Jayne, Dr. Bethany Shinkins

Laparoscopic surgery is a minimally invasive alternative to open surgery to treat abdominal conditions and is widely favoured due to equivalent safety and efficacy, and quicker return to normal function. However, in rural regions of North-East India access to laparoscopic surgery is very limited. This is due to limited equipment, including reliable supplies of CO2 gas, lack of surgical expertise and a shortage of anaesthetists. Consequently, many abdominal surgeries in North-East India that would be amenable to laparoscopic surgery, are instead performed using open surgery. This means that in contrast to more urban centres, many patients in this area miss out on the benefits of laparoscopic surgery, exacerbating inequalities in health.

Gas-insufflation-less laparoscopic surgery (GILLS) is a modified form of laparoscopic surgery that uses an abdominal wall lift device to create an intra-abdominal working space. There is no need for pneumoperitoneum or special laparoscopic ports, and it can be performed under spinal rather than general anaesthesia. As such, safe adoption of GILLS (with appropriate training) could provide an alternative to conventional laparoscopic surgery in resource limited settings and offer a means to increase access to minimally invasive surgery, thereby improving quality of care and patient outcomes compared to open surgery.

Non-inferiority of the GILLS technique in India has been demonstrated in terms of surgical time, intra-operative vital signs and post-operative pain. However, existing RCT data comes from urban centres in India and there is limited data specific to the rural Indian setting of interest. Consequently, we conducted an early economic evaluation to produce preliminary estimates of the cost-effectiveness of GILLS as a means to increase access to minimally invasive surgery for abdominal conditions in rural North-East India based on existing evidence, and sought to identify evidence gaps to inform future research in this area.

A decision tree model was developed to compare costs and health outcomes associated with undergoing abdominal surgery via GILLS, conventional laparoscopic surgery or open abdominal surgery in rural North-East India. The main outcomes were costs, evaluated from a societal perspective, and improvements in quality adjusted life (disability-adjusted life years avoided). Data on current provision of surgery for abdominal conditions in North-East India was used to inform analysis of the impact of scaling up GILLS in the region as a means to increase access to minimally invasive surgery.

The results indicate that minimally invasive surgery, performed as GILLS or conventional laparoscopic surgery, is less costly and produces better outcomes, less DALYs, than open surgery. Scale up of GILLS as a means to increase access to minimally invasive surgery for abdominal conditions would reduce the cost burden to patients and increase the number of DALYs averted. Consequently, GILLS is likely to be a cost-effective alternative to open surgery for abdominal conditions in rural North-East India, can increase access to minimally invasive surgery in resource limited settings, and, provides a possible bridge to the adoption of full laparoscopic services.

An Economic Analysis of Adjunctive Steroid Combination in Ocular Trauma (ASCOT) Trial

PRESENTER: **Rhiannon Tudor Edwards**, Centre for Health Economics and Medicines Evaluation (CHEME), Bangor University

AUTHORS: Lucy Bryning, Victory Ezeofor, Bethany Fern Anthony, Philip Banerjee, Victoria Cornelius, Rachel Phillips, Catey Bunce, Jo Kelly, Caroline Murphy, Elizabeth Robertson, Daniela Narvaez, Suzie Cro, David Broadway, David Charteris

Background. Injuries to the eye or occular trauma is more likely to occur in men under 40 years of age and in the workplace. Due to lost productivity, medical expenses, and workers' compensation, eye injuries cost over $300 million per year in the United States. This equates to an annual cost to the U.K. economy (for which no comparable data exist) of £37.5 million.

Objective. (1) To explore the incremental cost-effectiveness of adjunctive intraocular and periocular steroid (triamcinolone acetonide) treatment versus standard treatment (no adjunctive treatment) in vitreoretinal surgery for open globe trauma in terms of improved visual acuity. (2) To explore the cost per quality adjusted life year (QALY) of adjunctive intraocular and periocular steroid (triamcinolone acetonide) treatment versus standard treatment (no adjunctive treatment) in vitreoretinal surgery for open globe trauma, and does this fall below the NICE threshold of £20,000 to £30,000 per QALY?

Methods. From an NHS perspective, using data from the ASCOT trial (ISRCTN30012492) we are undertaking a primary cost-effectiveness analysis using visual acuity (≥10 letter improvement in ETDRS score) as the measure of effect, developing incremental cost-effectiveness ratios (ICERs) to express cost-effectiveness in £ Pounds Sterling. We are also undertaking a secondary cost-utility analysis using the EQ-5D-5L as the measure of utility to generate a cost per QALY, and a cost-effectiveness analysis using vision specific quality of life as the measure of effect. We are also comparing generic (EQ-5D-5L) vs visual specific (VFQ-25) utility measures.

We are recording primary and secondary health and social care service use using a Client Service Receipt Inventory (CSRI) as part of a Case Report Form (CRF), collected at baseline, 3 and 6 months.

Preliminary results. We are using a unit price of adjunctive corticosteroid medication - Triamcinolone acetonide 40 mg per 1 ml NHS indicative price £7.45. We are undertainge a bottom-up costing of Pars plana vitrectomy (PPV). To date, average cost is £1,634.25 (including overheads £1379.55–£1787.15). We found that NHS Improvement (2019) national tariff for adults vitrectomy surgery (range from BZ80A Very complex vitreous retinal procedure £1722 to BZ87A Minor £277). We also found that Moorfields reference cost for surgery is £2,146 per procedure, classified as: Very Complex Vitreous Retinal Procedures, 19 years and over, with CC Score 2+.

(Cost effectiveness results will be available January 2021.)

Conclusion. This is a low-cost intervention. What is methodologically interesting is the measurement of outcome in ophthalmic surgery and whether visual acuity correlates with generic health-related quality of life measures used for QALY calculation.

Economic Consequences of Adult Living Kidney Donation: A Systematic Review

PRESENTER: **Rui Fu**, Institute of Health Policy, Management and Evaluation, University of Toronto

AUTHORS: Nigar Sekercioglu, Manabu Hishida, Peter Coyte

Objectives: Current guidelines mandate organ donation to be financially neutral such that it neither rewards nor exploits donors. This systematic review was conducted to assess the magnitude and type of costs incurred by adult living kidney donors and to identify those at risk of financial hardship.

Methods: We searched English-language journal articles and working papers assessing direct and indirect costs incurred by donors on PubMed, MEDLINE, Scopus, the National Institute for Health Research Economic Evaluation Database, Research Papers in Economics and EconLit in 2005 and thereafter. Estimates of total costs, types of costs and characteristics of donors who incurred the financial burden were extracted.

Results: Sixteen studies were identified involving 6,158 donors. Average donor-borne costs ranged from US$900 to US$19,900 (2019 values) over the period from pre-donation evaluation to the end of the first postoperative year. Less than half of donors sought financial assistance and 80% had financial loss. Out-of-pocket payments for travel and health services were the most reported items where lost income accounted for the largest proportion (23.2%-83.7% across studies) of total costs. New indirect cost items were identified to be life and health insurance difficulty, exercise impairment and caregiver income loss. Donors from lower-income households and those that travelled long distances reported the greatest financial hardship.

Conclusions: Most kidney donors are under-compensated. Our findings highlight gaps in donor compensation for pre-donation evaluation, long-distance donations, and lifetime insurance protection. Additional studies outside of North America are needed to gain a global prospective on how to provide for financial neutrality for kidney donors.

Cost Savings of Paper Analytical Devices (PADs) to Detect Substandard and Falsified Antibiotics: Kenya Case Study

PRESENTER: **Sachiko Ozawa**, University of North Carolina-Chapel Hill

Background:

Over 10% of antibiotics in low- and middle-income countries (LMICs) are substandard or falsified. Detection of poor-quality antibiotics via the gold standard method, high-performance liquid chromatography (HPLC), is slow and costly. Paper analytical devices (PADs) and antibiotic paper analytical devices (aPADs) have been developed as an inexpensive way to estimate antibiotic quality in LMICs.

Aim:

To model the impact of using a rapid screening tool, PADs/aPADs, to improve the quality of amoxicillin used for treatment of childhood pneumonia in Kenya.

Methods:

We developed an agent-based model, ESTEEM (Examining Screening Technologies using Economic Evaluations for Medicines), to estimate the effectiveness and cost savings of incorporating PADs and aPADs in amoxicillin quality surveillance in Kenya. We compared the current testing scenario (batches of samples tested together by HPLC) with an expedited HPLC scenario (testing smaller batches at a time), as well as a screening scenario using PADs/aPADs to identify poor-quality amoxicillin followed by confirmatory analysis with HPLC.

Results:

Scenarios using PADs/aPADs or expedited HPLC yielded greater incremental benefits than the current testing scenario by averting 586 (90% uncertainty range (UR) 364–874) and 221 (90% UR 126–332) child pneumonia deaths annually, respectively. The PADs/aPADs screening scenario identified and removed poor-quality antibiotics faster than the expedited or regular HPLC scenarios, and reduced costs significantly. The PADs/aPADs scenario resulted in an incremental return of $14.9 million annually compared with the reference scenario of only using HPLC.

Conclusion:

This analysis shows the significant value of PADs/aPADs as a medicine quality screening and testing tool in LMICs with limited resources.

Does Improved Risk Information Increase the Value of Cholera Prevention? An Analysis of Stated Vaccine Demand in Urban Bangladesh.

PRESENTER: **Dr. Sonia Aziz**, Moravian College

As the world's longest running pandemic, cholera poses a substantial public health burden in Bangladesh where human vulnerability intersects with climatic variability. Barriers to safe water and sanitation place the health of millions of Bangladeshis in jeopardy – especially those who have highly constrained choices in preventing and responding to cholera. In this paper we investigate demand for cholera prevention among residents in urban Dhaka. Using survey data from 2023 households in two slum areas, we analyze responses from a contingent valuation questionnaire that elicited willingness to pay (WTP) for cholera vaccines across household members and under varying disease risk scenarios, finding higher valuation for cholera prevention for children and under scenarios of greater epidemic risk. We estimate the average WTP for a cholera vaccine for a child ranges from TK 134-167 (US$ 1.58-1.96). Consistently, respondents with prior knowledge of the cholera vaccine reported lower WTP valuations, providing suggestive evidence of concerns about vaccine effectiveness and preferences for cholera treatment over prevention. We supplement the contingent valuation analysis with cost of illness estimates from both our household sample as well as from administrative hospital records of over 34,000 cholera patients. We estimate that a household incurs costs of TK 719-831 (US$ 8.46-9.78) per episode of cholera that requires medical treatment. Taken together, these findings indicate higher WTP for cholera treatment compared to prevention, but increased interest in prevention under early warning system scenarios of high disease risk.

A Systematic Review of Economic Studies Evaluating Ophthalmic Drugs: An Analysis of the Health-State Utilities.

PRESENTER: **Inês Souto Ribeiro Ribe**, Southampton Health Technology Assessments Centre
AUTHORS: Francisco Batel Marques, Diogo Mendes, Carlos Alves

Background: The use of different techniques to derive health-state utilities may lead to variable conclusions about the cost-utility of a given therapy, with implications on clinical and regulatory decisions.

Objectives: To characterise the techniques used to derive health-state utilities in the cost-utility studies of ophthalmic drugs.

Methods: A systematic review was performed in Pubmed and Embase from its inception until October 2019. Cost-utility studies evaluating ophthalmic drugs were included. The therapeutic area, the technique to derive health-state utilities and the sources of health-state utilities were extracted. It was analysed whether the health-state utilities and the other parameters of the cost-utility studies were collected from the same or different populations. The techniques to derive health-state utilities used in the cost-utility studies and the ones recommended by the country-specific economic evaluation guidelines were compared.

Results: Seventy cost-utility studies were included. Most (n=39; 55.7%) assessed drugs indicated in age-related macular degeneration, followed by diabetic retinal oedema (n=6; 8.6%), conjunctivitis (n=5; 7.1%), glaucoma (n=4; 5.7%) and uveitis (n=4; 5.7%). The remaining (n=12; 17.1%) assessed drugs used in other ophthalmic conditions. Forty-three (61.4%) studies used direct techniques to derive health-state utilities,

19 (27.1%) used indirect techniques, 1 (1.4%) used direct and indirect techniques and seven (10.0%) used other or unknown techniques. Twelve (17.1%) studies collected the health-state utilities and the other study parameters from the same population: nine (12.9%) retrieved utility data from experimental studies, two (2.9%) from observational studies and one (1.4%) from other sources. Forty-eight (68.6%) studies collected the health-state utilities and the other study parameters from different populations: 33 (47.1%) retrieved utility data from observational studies, eight (11.4%) from experimental studies, six (8.6%) from other sources, and one (1.4%) from both experimental and observational studies. It was not possible to identify the population from whom data were obtained in 10 (14.3%) studies. Twenty-one (30.0%) studies did not follow recommendations from guidelines on techniques to derive health-state utilities, 11 (15.7%) followed them, and it was not possible to ascertain whether those guidelines were followed in 38 (54.3%) studies.

Conclusions: This systematic review showed that the techniques used to derive health-state utilities varied across the cost-utility studies of ophthalmic drugs. Guidance to conduct cost-utility studies in specific diseases, such as ophthalmology, should be developed and followed to enhance the role of these studies as a decision-making tool.

An Analysis of the Construct Validity and Responsiveness of the ICECAP-SCM Capability Wellbeing Measure in a Palliative Care Hospice Setting

PRESENTER: **Gareth Myring**, University of Bristol

Background

To fully capture the outcomes of interventions in social care and end of life care settings, broader measurement of quality of life beyond health-related quality of life may be needed. Increasingly, capability wellbeing-based outcome measures are being used in economic evaluations of health and care to determine their impact on quality of life. One such measure, the ICECAP-Supportive Care Measure (ICECAP-SCM), was developed to identify what matters to people at end of life and is potentially valuable for economic evaluations in palliative care. However, before the ICECAP-SCM can be used to inform decision-making, its suitability for measuring outcomes in such settings must be assessed. The ICECAP-SCM has been demonstrated to have face validity and feasibility when used in hospice care, however its other psychometric properties have not yet been assessed.

Aims

To explore if the ICECAP-SCM measures the constructs it is designed to (construct validity) and any changes in those constructs over time (responsiveness) in hospice inpatient and outpatient settings.

Methods

Data used in the analysis were collated from two studies in which inpatients and outpatients attending three hospices were recruited, fifty six to a study evaluating the use of palliative care day services and twelve to a study examining an educational intervention for managing constipation in hospice patients. Both studies collected outcome data using the ICECAP-SCM and EQ-5D-5L and one also used the McGill Quality of Life Questionnaire–Expanded (MQOL-E), Patient Health Questionnaire-2 (PHQ-2), and Palliative Outcome Scale–Symptoms (POS-S). An analysis of the construct validity of the ICECAP-SCM was carried out which assessed correlations between: (i) its domains and the domains of the other outcome measures, (ii) its final scores and the domains of the other measures, (iii) its final scores and the final scores of the other measures. The ICECAP-SCM final scores were based on general population valuation tariffs with and without interactions, along with an unweighted summary score. The appropriateness of the other measures for use in responsiveness analysis was assessed based on whether data were collected at both baseline and follow-up timepoints and on their correlation with the ICECAP-SCM final scores. The responsiveness of the ICECAP-SCM was then explored, using the appropriate anchor measure to assess whether changes in the ICECAP-SCM final scores corresponded to changes in the anchor measure final score.

Results

Strong correlations were found between the ICECAP-SCM and the MQOL-E, a measure designed to capture the impact on general quality of life of a life-threatening illness; this provides supporting evidence for the use of the ICECAP-SCM in this context. The ICECAP-SCM final scores did not strongly correlate with the EQ-5D-5L final score. For responsiveness, both unweighted and interaction ICECAP-SCM scores showed statistically significant differences for people who improved or worsened over time on the anchor measure (MQOL-E).

Conclusions

This study provides evidence for the validity of the ICECAP-SCM within a hospice setting. It also raises important considerations in terms of what outcome measures and choice of valuation tariffs are most appropriate to use in economic evaluation of end of life care.

Valuing Frailty: A Compensating Variation Approach

PRESENTER: **Dr. Jiunn Wang**, University of Exeter Medical School

AUTHORS: Claire Hulme, Silviya Nikolova

This paper examines the longitudinal relationships between subjective well-being, frailty and age with a sample of around 55,000 observations from the English Longitudinal Study of Aging (ELSA). Focusing on the demand side, we derive the monetary values for frailty interventions with the compensating variation approach. In addition, we investigate the pattern of the association between frailty and subjective well-being across ages. Our results confirm the negative association between frailty and subjective well-being. Moreover, we find that this negative association diminishes with age. The resulting compensating variations for the progression in frailty are substantial, implying the high level of willingness-to-pay for frailty interventions.

Does One Retirement Scheme Fit All? an Investigation of Heterogeneous Treatment Effects and Policy Learning of Health after Retirement

PRESENTER: **Mr. Nikolaj Udengaard Hansen Sr**, Aarhus University

By 2030 the Danish retirement system for old-age workers will transition to be a longevity-based system. This system is set in place such that every retired individual can spent, on average, 14.5 years on retirement. In this paper we investigate whether such reform is regressive in the sense that individuals with characteristics associated with lower socio-economic status, systematically, end up with less retirement time. To do so, we use a detailed dataset using administrative Danish records of demographics, financial indicators and labour market history as well as diagnosis, prescription medication and admission history to estimate heterogeneous nonparametric local average treatment effects. We answer the question by analysing if individuals benefit from retiring earlier by exploiting random variation induced by a reform of old-age pension as an instrument. Using a novel instrumental forest we characterize the distribution of heterogeneous treatment effects and document presence of heterogeneity in the post-retirement and mortality relationship. Moreover we find evidence of delayed effects hitting at two points, post-retirement, in particular. Finally we use policy learning to obtain sub-group optimal retirement strategies based on estimated gains in lowered mortality risk from retirement at all ages after becoming eligible. This also suggest a means of implementing a data-driven retirement system that accounts for both fiscal sustainability and individual welfare.

5:15 PM –6:30 PM WEDNESDAY [Demand And Utilization Of Health Services]

Demand and Utilization of Health Services, and Demand for Health Insurance Poster Session 2

MODERATOR: **Erin Strumpf**, McGill University

Expanding Access to Hepatitis C Virus Treatment through the Extension for Community Healthcare Outcomes (ECHO) Project: Evidence from the Medicare Program

PRESENTER: **Ms. Linh Tran**

AUTHORS: Dr. Jeah Jung, Roger Feldman, Thomas Riley Jr.

Background: Direct-acting antivirals (DAAs) are highly effective in treating hepatitis C virus (HCV). However, uptake of DAAs in rural and underserved areas is low due to limited access to specialists with experience in HCV care. Project ECHO (Extension for Community Healthcare Outcomes) is a distance-education model training primary care physicians to improve access to care for underserved populations with complex diseases such as HCV infection. Evidence on whether ECHO enhances DAA use is limited.

Methods: We used data from Medicare beneficiaries who newly sought HCV care between 2014 and 2017, after a one-year washout period. We estimated discrete-time hazard models with state fixed effects to evaluate the impact of ECHO on DAA use in rural and underserved areas.

Results: Of the sample (283,468 patients), 87.6% lived in states that had ever launched ECHO since 2006 and 32% initiated a DAA. For every 100 clinicians attending ECHO, the odds of DAA initiation among HCV patients increased by 10% (adjusted odds ratio (OR) = 1.10, 95% CI: 1.05-1.14). The odds of DAA use for patients in underserved areas increased by an additional 4% for every 100 ECHO participants (adjusted OR = 0.96, 95% CI: 0.94-0.98). The ECHO program did not significantly change the odds of DAA use among patients in rural versus urban areas (adjusted OR = 0.98, 95% CI: 0.95-1.01).

Conclusion: ECHO is a promising way to improve access to DAA treatment through expanding the capacity of primary care physicians to treat HCV, especially in underserved areas.

Women's Access to Family Planning: Experimental Evidence on the Role of Peers and Vouchers

PRESENTER: **Mahesh Karra**, Boston University

AUTHORS: Dr. Catalina Herrera Almanza, S Anukriti

Social norms and low autonomy constrain women in developing countries from seeking family planning (FP) and reproductive health (RH) services when they want them. We test if these barriers can be overcome by (a) offering women voucher subsidies to seek care, and (b) enabling women to seek FP services with their peers. We conduct a field experiment in rural India in which women are randomly assigned to either a) receive a voucher for subsidized FP services at a private FP clinic for their own personal use, b) receive a voucher for subsidized services that would also allow them to invite their peers to accompany them to the FP clinic, or c) a control group. We compare the individual and joint effects of the individual and "bring-afriend" vouchers on clinic visits, service utilization, contraceptive use, and other FP outcomes. We find that women who received either a solo or "bring-a-friend" voucher are 17 percentage points (p.p.) more likely than the control group to visit our partner clinic for FP-RH services. Moreover, the voucher increased modern contraceptive use by 6.8 p.p., a 56 percent increase with respect to the control mean. This finding suggests that a woman's visits to the FP clinic translated into an increase in her uptake of modern FP methods. Finally, women who received the "bring-a-friend" voucher were 17 p.p. more likely than women who received a solo voucher to ask a friend to accompany her to the FP clinic. Our findings serve to inform policymakers and contribute to the limited literature on the role of peers and the effectiveness of vouchers in improving women's access to health care.

Exploring User-Centered Counseling in Contraceptive Decision-Making: Evidence from a Field Experiment in Urban Malawi

PRESENTER: **Ms. Kexin Zhang**, Boston University Department of Economics

AUTHOR: Mahesh Karra

As a means to achieve full, free, and informed choice and promote reproductive autonomy, family planning programs have increasingly begun to adopt user-centered approaches to counseling and service provision. These approaches have stressed the role of the individual client as the focal point of interaction and the key decision-maker. However, little is known about how user-centered approaches in family planning, particularly through family planning counseling, may shape women's and couple's preferences and choices. In this study, we test how a woman-centered, preference-based approach to counseling may help women to realize their family planning preferences by means of a multifactorial randomized controlled trial. Specifically, we explore how a woman's decision-making for family planning may be shaped by: 1) the number and types of methods presented to her based on her stated preferences for contraception (targeted counseling); and 2) the presence of her husband / male partner at the time of counseling. A total of 782 women were recruited and randomized to one of four treatment arms (targeted or untargeted counseling, cross randomized with male involvement or no male involvement in counseling). Following randomization, women received a counseling session, during which they were presented with a range of contraceptive methods. After the counseling session, women were offered free transport and free access to family planning services at a local private clinic for one month. Our findings show that women who received targeted counseling were 16.8 percent less likely to be using their stated ideal method at follow-up and were 12.1 percent more likely to be unsatisfied with their method at follow-up, plausibly due to their inaction about preferences. On the other hand, women who were encouraged to invite their husbands to the counseling session were 15 percent less likely to change their ideal method from counseling to follow-up, 25.4 percent more likely to switch methods between counseling and follow-up, and 17.0 percent more likely to be using their stated ideal method at follow-up. Women assigned to husband invitation group were no more satisfied with their current method at follow-up. While both approaches aimed to achieve the goal of "helping women make informed choices on family planning", neither seems to yield strictly preferred outcomes for women.

The Tale of Two Systems: Understanding the Demand and Supply Driven Access to Primary Health Care Among Women of Reproductive Age in India

PRESENTER: **Md Zabir Hasan**, University of British Columbia

To strengthen the healthcare provision, India launched National Rural Health Mission – later redesigned as National Health Mission – which initiated the world's biggest supply-driven community-based healthcare system delivered by Accredited Social Health Activists (ASHA). Later in 2018, in the wake of the Sustainable Development Goal, India introduced the Ayushman Bharat Program. As part of this program, comprehensive primary health care will be delivered by upgraded Health and Wellness Centers. The success of this paradigm shift – from supply to demand-driven healthcare delivery – will depend upon the access of the population to primary care services. Using the 2015–16 National Family Health Survey (NFHS), this study examined the reported demand-driven access (DDA) and supply-driven access (SDA) to the healthcare of women of reproductive age in India.

This cross-sectional study has analyzed the 4th NFHS data, which was implemented nationwide among women from 15 to 49 years. We have constructed DDA as a binary variable, where reporting any reasons (e.g., not having permission, money, transport, or companion; distance to the facility, no female providers, etc.) for not to access health care for herself from the facility was coded as "0" (DDA = No) and "1" (DDA = Yes) otherwise. On the other hand, having been contacted by any frontline health workers – such as ASHA – in the participant's home within the last three months was defined as SDA (Yes = 1 and No = 0). The prevalence of DDA and SDA was estimated, followed by implementing logistic regression to investigate associated factors related to DDA and SDA.

Among 699,686 women who responded to the survey, the overall prevalence of reporting DDA was 33.5%, and SDA was reported by 15.1%. The highest DDA level was estimated for Southern India (50.5%), and the lowest was reported from the Eastern region (18.2%). In reverse, the Eastern region reported the highest (17.8%), and the Southern region reported the lowest (12.3%) of SDA. Comparing to the urban settings, rural women were less likely to report DDA (Odds Ratio [OR] = 0.88, 95% CI = 0.82–0.92), and more likely to have higher SDA (OR = 1.56, 95% CI = 1.48–1.64). The odds of DDA were significantly higher among older, more educated, and more wealthy women. Whereas an exactly attenuated trend of odds for SDA was observed for these demographic subgroups. The likelihood of DDA was not significantly different for a Muslim woman compared to a Hindu woman. However, a Muslim woman had a 1.31 times higher likelihood of having SDA (95% CI = 1.24–1.38) than their Hindu counterparts.

Overall, the DDA proportion was almost two times higher than SDA among women of reproductive age in India. Nevertheless, supply-driven healthcare is critical for demographically marginalized and disadvantaged population groups. Thus, it is imperative to continue future

investments in community-based healthcare delivery system while going through the health systems transformation phase. It seems that the tale of the two systems for healthcare delivery in India has yet to unfold during the era of the 'Ayushman Bharat' Program.

Sexual and Reproductive Health of Venezuelan Migrants in Colombia: Assessment of Barriers and Means for Achieving Universal Health Coverage

PRESENTER: **Mariana Calderón-Jaramillo**, Profamilia

AUTHORS: Juan Carlos Rivillas, Marta Royo

Background: In Colombia one out of 47 people is a Venezuelan migrant. In 2019 around 1,4 million migrants have arrived with multiple unmet needs in sexual and reproductive health (SRH), and it is important to trace them for achieving true universal health coverage. We have a short window to get on track 2030 goals. The purpose of this research was two folds: i) to assess the implementation of the Minimal Initial Service Packages (MISP) in Reproductive Health in Colombian humanitarian crisis settings; and ii) to identify the main unmet needs in SRH of the migrants, in particular irregular migrant women and girls.

Methods: This is a qualitative research through the implementation of the toolkit for assess the MISP for Reproductive Health in crisis situations designed by Inter-Agency Working Group IAWG. Four cities in the Colombia-Venezuela border with higher proportions of migrants were assessed: Arauca, Cucuta, Riohacha and Valledupar. The research combined quantitative and qualitative methods. Field work was composed by: 23 interviews with key informants in SRH, Gender-Based Violence and HIV; 21 assessments to healthcare facilities that are providing care for migrants; and 24 focus groups of discussion with migrant women and men between 14 to 17, 18 to 24, and 25 to 49 years old. Ethical approval was granted by Profamilia Ethical Committee in November 2018.

Results: This analysis focused on identifying and understanding the gaps in the implementation processes of MISP response and the unmet SRH needs of migrants in Colombia. First, the lack of appropriateness of MISP and poor inter-sectoral coordination in SRH explained the lack of access to quality sexual and reproductive health services that are safer, migrant women-centered, integrated and efficient; and secondly, unmet needs and barriers in SRH that emerge as critical to migrants, in particular women and girls are: i) access to contraception methods, ii) safe abortion and post abortion care, iii) prevention of STI, and iv) comprehensive prevention of teenage pregnancy.

Conclusions MISP should be successfully implemented through: a better shared objectives in SRH among government sectors and interagency agencies, to identify a leading organization for the implementation of the MISP; priority-setting the approach of Sexual and Gender-Based Violence, HIV/AIDS and the prevention and care of unwanted pregnancy during the emergency; and the strengthening of the healthcare staff in terms of humanitarian response. This calls for more well-coordinated responses and innovations within humanitarian crisis addressing SRH's needs of undeserved migrant groups.

The Immigration-Specific Determinants of Health Care Utilization: A Swiss Cross-Sectional Study

PRESENTER: **Christina Tzogiou**, Zurich University of Applied Sciences

AUTHORS: Dr. Beatrice Brunner, Dr. Stefan Boes

Despite universal health care coverage in Switzerland, there are significant differences in the health care use between some immigrant groups and non-migrants. In our previous work we found that first-generation and culturally different immigrants have a lower likelihood of visiting the doctor, while all immigrants are on average more likely to visit the emergency department. We were able to also identify the demographic, socioeconomic and health-related factors that are associated with these inequalities. However, immigration-specific factors, which are observed for immigrants but not for natives, could by construction not be considered.

In this study we go a step further and concentrate on culturally different immigrants only, in order to explore the role of additional immigration-specific factors. These factors are pre- and post- immigration stressors, such as political persecution or violence in the country of origin or language barriers, that could be associated with health care utilization in the host country. The aim of this study is to identify the factors that are associated with health care utilization in culturally different immigrants and estimate the relative importance of immigration-specific factors.

We draw data from the second Health Monitoring of the Migrant Population in Switzerland 2010, which contains detailed information on various socioeconomic and immigration-specific characteristics, the health status, health-related behavior, and health care utilization of immigrants from five countries.

To identify the factors associated with health care utilization in culturally different immigrants we applied a data-driven approach. The association of the immigration-specific factors and health care utilization was assessed based on six model specifications with hierarchical adjustments. To explore the relative importance of these factors we additionally applied a dominance analysis.

Identifying the factors of health care utilization in immigrants, and, in particular, the role of immigration-specific characteristics, can help in making the Swiss healthcare system more inclusive and efficient.

Socioeconomic Inequality and Inequity in the Screening and Treatment of Diabetes and Hypertension in Kenya: Evidence from a National Survey

PRESENTER: **Robinson Oyando Omondi**, KEMRI-Wellcome Trust Research Programme

Background:

The significant rise in the burden of non-communicable diseases (NCDs) presents a major public health challenge to all countries, especially low-and middle-income countries (LMICs). In Kenya, NCDs account for 50% of hospitalisations and 55% of inpatient deaths. Diabetes and hypertension are among the major NCDs in Kenya. Equitable access and utilisation of screening and treatment interventions are critical for reducing the burden of diabetes and hypertension. This study assessed horizontal equity (equal treatment for equal need) in the screening and treatment for both conditions and further decomposed socioeconomic inequalities in care use in Kenya.

Methods: Cross-sectional data from the 2015 NCDs risk factors STEPwise survey, covering 4,500 adults aged 18-69 years were analysed. Horizontal inequity (HI) index, concentration curves, and concentration indices were used to assess inequity and inequality. Contributions of need (age, sex, NCD comorbidity, and body mass index (BMI)) and non-need (wealth status, education, exposure to media, employment, and area of residence) factors to the observed inequality were evaluated using the Wagstaff decomposition method.

Results: The poor were the most in need of screening services. However, the rich were in greater need for treatment. After adjusting for need, a pro-rich inequity in the use of diabetes (HI = 0.360; $p>0.05$) and hypertension (HI = 0.294; $p>0.05$) screening were observed. Although the use of diabetes treatment was pro-poor (HI = -0.094; $p>0.05$), the use of hypertension treatment was pro-rich (HI = 0.033; $p>0.05$). However, none of these pro-rich and pro-poor HI estimates was statistically significant. Need factors such as sex and BMI were the largest contributors to inequalities in the use of screening services. By contrast, non-need factors like the area of residence, wealth, employment status and exposure to media mainly contributed to inequalities in the use of screening and treatment services.

Conclusion: For universal health coverage goals to be realised in Kenya, among other things, the use of screening and treatment services should be according to need. Specifically, efforts to attain equity in healthcare use for diabetes and hypertension services ought to be multi-sectoral and focused on crucial inequity drivers such as regional disparities in care use, poverty and educational attainment. Also, to increase the use of screening services for NCDs, concerted awareness creation campaigns ought to be channelled through the mass media and other suitable avenues.

Out of Pocket Expenditure for Hypertension Care: A Population- Based Study in Conocoto-Ecuador

PRESENTER: **Mrs. Tatiana Villacres**

AUTHORS: Esteban Londono Agudelo, Anai Garcia

Objective: To estimate the magnitude and composition of the out-of-pocket expenditures (OOPE) incurred by households having at least one family member with hypertension and their impact on households' budget in an urban, middle-income community in Quito, Ecuador.

Methodology: In 2016, using a probabilistic stratified sampling design, we surveyed the community of Conocoto in 158 randomly selected households with at least one hypertensive member aged 35 years or older. We established households quintiles based on the annual basic expenditure. Catastrophic health expenditure for hypertension care was defined as hypertension-attributable OOPE higher than 10% of the total annual basic household expenditure or higher than 40% of the household non-food expenditure. Results were estimated using USD for Ecuador, and adjusted using Purchasing Power Parities.

Results: The average annual basic household expenditure was US dollars at purchasing power parity (USD-PPP) $5,805. On average, households with at least one hypertensive member had to assign 11% of their total income to health. Health expenditures were higher for households in the third and the fifth socioeconomic quintiles, which spent 10% and 11% of their income on health, respectively. The average annual hypertension-attributable out-of-pocket expenditure was USD-PPP $125 (95% CI $73.46 - $198.99). It consisted mainly of direct medical expenses (81.44%), predominantly for pharmacotherapy (68% of the total hypertension care expenditure). Food to attend hypertension appointments represented 72% of the total direct non-medical expenses. Families in the third socioeconomic quintile had the highest average OOPE for hypertension ($239.67 USD-PPP) than the rest of the quintiles (lowest quintile $44.64 and highest quintile $113.88 USD-PPP). Three families had catastrophic expenditure.

Conclusions: Pharmacotherapy implies the greatest percentage of OOPE for hypertension. The third quintile is the one most affected by OOPE for hypertension. It may be explained by the fact that the lowest quintiles are mainly cared for the Ministry of Public Health, while those in the highest quintiles are covered by the public-social or the private insurance systems. Due to the high informal work level in the third quintile, they usually have no health care coverage. Based on our results, we recommend implementing a public policy measure aimed at strengthening financial protection, mainly covering, for the informal workers, the costs of antihypertensive drugs and food while attending health services.

Assessing Race/Ethnicity Healthcare Spending and Utilization Disparities, 2002-2016

PRESENTER: **Dr. Joseph Dieleman**, University of Washington

AUTHORS: Carina Chen, Sawyer Crosby, Angela Liu, Darrah McCracken, Ian Pollock, Ms. Maitreyi Sahu, Ms. Golsum Tsakalos, Annie Haakenstad, Ali Mokdad, Kirstin Scott, Christopher Murray

Background:

Knowledge of variation in healthcare spending across race and ethnicity groups is important for understanding health system disparities, though they are not comprehensively measured in the US. To fill this gap, we measured US healthcare spending by race and ethnicity from 2002 to 2016, disaggregated by select conditions and type of care in 2016, adjusting for age.

Methods:

Race, ethnicity, health condition, age, sex, type of care, insurance coverage, and health condition notification was extracted from the National Health Interview Survey, the Medical Expenditure Panel Survey, the Medicare Current Beneficiaries Survey, and the US Census. These were combined with healthcare spending estimates from the Disease Expenditure project in order to estimate healthcare spending independently for six race and ethnicity groups. Variation in healthcare spending for each of these groups was adjusted for age and then decomposed into utilization of services and price and intensity of services to understand the relative driver of key spending differences. Healthcare spending per notified case by race and ethnicity for seven major health conditions, including cardiovascular disease, low-back and neck pain, COPD, and diabetes in 2016.

Results:

In 2016, 72.5% (95% UI, 71.5%-73.4%) of personal healthcare spending was on White individuals. After adjusting for age, White individuals spent 15.0% (95% UI, 12.9%-16.9%) more on ambulatory care, 15.0% (95% UI, 11.4%-19.1%) more on dental care, and 11.3% (95% UI, 8.8%-13%) more on prescribed pharmaceuticals than the all-population means. Black individuals spent less on ambulatory care 26.2% (95% UI, 18.7%-32.3%) than the all-population mean but 18.7% (95% UI, 3.3%-31.7%) more on inpatient care, and 11.6% (95% UI, 3.7%-23.7%) more on emergency department care (than the all-population means). Hispanics and Asian, Native Hawaiian, or Pacific Islander individuals spent less per person on all types of care, except dental care; American Indian and Alaska Native individuals spent more on emergency department care, and multi-racial individuals spent more on all types of care expect nursing facility care. Similar patterns existed for key health conditions. Black individuals spent most per notified cardiovascular case, cerebrovascular disease, and asthma. White individuals spent the most per notified case on low back and neck pain. Utilization rather than treatment price and intensity drove spending differences.

Conclusions:

Healthcare spending varies dramatically across key race and ethnicity groups. The groups that spent the most on each key health condition relied more on emergency department care and inpatient care, and less on ambulatory care. Making ambulatory care more accessible, especially to Black, Hispanic, and multi-racial groups could improve health and potentially drive down costly spending elsewhere.

Health-Related Inequalities in Unmet Needs: A Consequentialist Approach Based on EU-SILC Data

PRESENTER: **Carlota Quintal**, University of Coimbra, FEUC, CeBER

AUTHORS: Ms. Micaela Antunes, Óscar Lourenço, Luis Moura Ramos

Objectives: One of the main concerns with unmet healthcare needs is that they may increase health inequalities if they are concentrated among vulnerable populations. There is evidence that the probability of unmet needs is higher among individuals with worse health and that unmet needs are more likely among the socioeconomically disadvantaged who in turn tend to enjoy worse health. However, to the best of our knowledge, the direct assessment of health-related inequalities in unmet healthcare needs has not been done. Our objectives are to assess and quantify these inequalities, looking at their progress over time, within and across European countries. We adopt a consequentialist approach; what matters is whether or not an unmet need for medical examination or treatment occurred (irrespective of its cause) and the health status of who suffered it. The higher the prevalence of unmet needs and the greater their concentration among those with worse health, the larger the countries' risk of widening health inequalities.

Methods: Data come from EU-SILC, waves 2008-2018. We calculate: the prevalence of self-reported unmet needs (SUN); the concentration index (CI or |CI| in absolute terms) of SUN; the generalised concentration index (GCI or |GCI| in absolute terms) of SUN. Here individuals are ranked by health status, proxied by self-assessed health (SAH). Sample weights are used.

Results:

All CI are negative (basically all are statistically significant), confirming the concentration of unmet needs among individuals with lower SAH. Some countries present low |GCI| throughout the whole period analysed (e.g. Austria, Luxembourg, Switzerland, Netherlands). Larger |GCI| are found in Romania, Latvia, Poland, Bulgaria and Greece. Combining the information of SUN and CI, different profiles are found: for SUN<0.05 there is great cross-country variation in CIs; and for |CI| between 0.2 and 0.4 there is great cross-country variation in SUN. Different paths over time are observed. E.g., in Austria, SUN decreased while |CI| increased; in Greece, |CI| decreased but SUN substantially augmented; in UK both indicators improved from 2008 to 2013 but from 2013 to 2018 both deteriorated; SUN decreased in Romania but inequality remained high and farther from other countries, especially after 2011.

Discussion: The average |CI| decreased over time while the average SUN in 2018 is similar to the 2008 figure. Hence, in general, the risk of widening health inequalities attenuated mainly via lower values of |CI|. Still, in 2018, 20 countries present a |CI| greater than 0.2, though about half of them have a SUN up to 5% which weakens the risk of increasing (absolute) health inequalities.

Eight Year Analysis of Frequent Emergency Department Use in Southern Ontario

PRESENTER: **Mr. Gianluca Calcagno**, McMaster University

Eight Year Analysis of Frequent Emergency Department Use in Southern Ontario

Objectives: Individuals who are high frequency users of the healthcare system are a relatively small portion of the Canadian population who account for up to two-thirds of the healthcare costs. However, only limited information exists regarding characterization of high frequency users and tracking their prolonged use of the emergency department (ED). The objective of this study was to characterize high frequency use of the ED among residents of the Hamilton Niagara Haldimand Brant Local Health Integration Network (HNHB LHIN, population: 1.5 million) in Southern Ontario, Canada.

Methods: A descriptive analysis of an eight-year cohort (fiscal years: 2012/13-2019/20) of individuals with high frequency use, defined as having had five (5) or more visits to hospital EDs per year, was undertaken. The individuals were then divided into eight cohorts to identify how many years they had remained a high frequency user of the ED over this timeframe. Information on ED visits (number, discharge diagnoses), hospitalizations (number, length of stay, discharge diagnoses), and patient characteristics (gender, age, region of residence, rurality, chronic disease history) was abstracted. Data were obtained from Integrated Decision Support (IDS) hosted by Hamilton Health Sciences using the National Ambulatory Care Reporting System and the Discharge Abstract Database.

Results: Between 2012/13 and 2019/20, 85,641 unique adults had high frequency use of the ED, representing 1,014,574 ED visits. Individuals were found to access the ED between 5 and 348 times in a single year. The majority of patients only exhibited high frequency use for 1 or 2 years (87%) over an 8-year period. However, the mean number of annual ED visits increased in every cohort as high frequency use persisted with cohort 1 having a mean of 6 annual visits (SD: 2) and cohort 8 having a mean of 23 annual visits (SD: 27). Females were consistently found to represent larger percentages of high frequency users in each of the cohorts (range: 52-65% female). Patients who had remained high frequency users of the ED were more likely to have four or more chronic conditions (27-82% among cohorts). Arthritis was the most common co-morbidity (36-88% among cohorts), along with hypertension (31-36%) and chronic obstructive pulmonary disease (18-46%). A substantial amount of patients reported a history of having no permanent address (3-34%). The majority of patients were more likely to have ever been hospitalized in the past (65-88%). In terms of socioeconomic status, a large proportion of high frequency users resided in neighbourhoods that were most deprived according to the Ontario Marginalization Index (31-54%).

Discussion: Patients from the HNHB LHIN who are high frequency users of the ED have a disproportionate amount of visits. This study identifies and compares the characteristics of these patients in relation to how long patients have been exhibiting high frequency use of the ED. Data tracking persistent high frequency use is currently quite limited and as such, findings from this study may inform upstream community interventions.

Factors Associated with Take-up of Medicaid in Expansion and Non-Expansion States in the US

PRESENTER: **Dr. Salam Abdus**, US Agency for Healthcare Research and Quality
AUTHORS: Dr. Sandra Decker, Brandy Lipton

The introduction of Medicaid and Medicare in 1965 together with a series of congressional acts expanding Medicaid eligibility have together greatly increased the role of public coverage and reduced uninsurance rates. The Affordable Care Act (ACA) intended to do the same for non-disabled, non-elderly adults, expanding Medicaid eligibility up to 138 percent of the poverty level. Although a substantial body of work has documented the ACA's effect on insurance status and use of health care, previous work has not summarized how many (non-elderly) adults became eligible for Medicaid due to the ACA and how complete enrollment is, especially among childless adults who had generally not been eligible for Medicaid in the past. In this study, we used 2014-2017 Medical Expenditure Panel Survey Household Component (MEPS-HC) data to simulate eligibility for Medicaid in the post-ACA era, and examined the demographic and socioeconomic factors associated with take-up of Medicaid.

The MEPS-HC collects information from individuals and their families on socioeconomic and demographic characteristics, health care use and expenditures, and insurance coverage. MEPS-HC also collects detailed information that facilitates simulating Medicaid eligibility including: earned and unearned income, assets, family relationships, and state of residence. This information was used in combination with the PUBSIM model of the AHRQ to simulate eligibility for Medicaid and estimate take-up rates. Our sample consisted of adult citizens aged 19-64. We excluded disabled individuals, since Medicaid coverage for this group did not change as a result of the ACA. We define take-up as enrollment in Medicaid for at least one month of the year.

We found that in 2014-2017, more than one-in-five non-elderly, non-disabled adults were eligible for Medicaid in expansion states; about a third of adults aged 21-44 years and over half of those without a high school degree were eligible. Overall, about one-in-ten adults in expansion states enrolled in Medicaid. In contrast, about 3 and less than 2 percent of adults were eligible for and enrolled in Medicaid in non-expansion states, respectively. Take-up rates overall were comparable between expansion and non-expansion states: about 44-46 percent of adults eligible for Medicaid enrolled for at least one month. In expansion states, enrollment rates were lower for childless adults compared to parents (37.0 of those eligible compared to 61.8 percent, respectively). About one-in-five (21.1 percent) of eligible childless adults remained uninsured, compared to only about one-in-ten (12.3 percent) parents. Among Medicaid-eligible adults without private coverage, the largest predictor of take-up was having children under the age of 18 in the home, increasing Medicaid participation by 12-14 percentage points, even in expansion states. Eligible African American adults were nearly 13 percentage points more likely than non-Hispanic white eligible adults to be enrolled in Medicaid. Eligible adults who are Hispanic were much less likely to participate in Medicaid in non-expansion states, but not in expansion states. Age, gender, and location were also important predictors of Medicaid take-up. Participation in Medicaid is expected to grow during the coronavirus pandemic. Our study provides baseline estimates for future analyses of enrollment trends.

Update on the Continued Growth in Medicare Advantage

PRESENTER: **Prof. Mark Edward Votruba**, Case Western Reserve University
AUTHOR: Joseph Hnath

In this paper, we update and extend research by Johnson et al. (2016; *Health Affairs* 35: 1707-15) investigating the continued growth in Medicare Advantage (MA) enrollments and the county-level features associated with greater MA penetration. Our analysis draws on data from the Medicare Geographic Variation Public Use Files (GVPUF), the Area Health Resources Files (AHRF), the Small Area Income and Poverty Estimates (SAIPE), and the CMS Medicare Advantage files. The CMS Medicare Advantage files include the Contract/Plan/State/County (CPSC) monthly enrollment and contract files, the State/County/Contract (SCC) monthly enrollment files, the State/County penetration files, and the Part C Plan Payment files. The various CMS Medicare Advantage files allow us to construct county-level Medicare Advantage characteristics by aggregating plan-level characteristics and enrollment counts. All analyses are at the county level, weighted by county Medicare population size.

Nationwide, MA penetration rates have continued their upward climb, rising approximately 6 percentage points (30% to 36%) from 2014 to 2020, after increasing 8 percentage points over the 2008-2014 period. Growth remained particularly strong in Southern counties, in lower income counties, and in counties with a higher fraction of Black Medicare beneficiaries. While urban counties experienced particularly strong growth over 2008-2014, a disproportionate share of rural counties were represented among the quartile of counties experiencing the most MA growth over 2014-2020. Cross-county variation in MA penetration rates also declined over 2014-2020, as counties with the highest baseline rates of MA penetration (>50% in 2014) experienced little MA growth on average, while counties with baseline rates of 10-30% experienced average increases of about 10 percentage points.

The growth in MA penetration also raises questions about the risk selection of Medicare beneficiaries drawn into MA plans, especially in light of recent changes in the methodology used to calculate MA plan risk scores. Starting in 2015, supplemental diagnoses data from chart reviews were incorporated in the calculation of MA plan risk scores, contributing to sizable upwards adjustments in mean scores. Plans that benefited

the most from this change might be expected to have pursued more aggressive growth strategies, contributing to differential MA growth across counties. We therefore extend the research of Johnson et al. (2016) by investigating how relative MA risk scores (county average, divided by the county FFS risk score) co-evolved with MA penetration rates.

Over the period of 2008-2014, growth in MA penetration was associated with slightly lower MA relative risk scores, indicating the MA plans in high-growth counties tended to draw disproportionately healthier beneficiaries from the county. However, no such relationship was found in the 2014-2020 period. The large increase in risk scores was relatively constant across countries and uncorrelated with MA penetration growth.

5:15 PM –6:30 PM WEDNESDAY [Specific Populations]

Specific Populations Poster Session 2

MODERATOR: **Edward Okeke**, RAND Corporation

The Effect of Child Time-Poverty on Human Capital Accumulation.

PRESENTER: **Mr. Rolando Leiva Granados**, University College London
AUTHORS: Jolene Skordis, Neha Batura

While the effect of income poverty on human capital development has been widely documented, little is known about the effect of child time-poverty on child health and cognition. Time poverty is defined as not having enough discretionary time because most time is devoted to committed activities such as paid and unpaid work, school and household chores, among others. Children experiencing time poverty may lack time to allocate to health- and cognitive-enhancing activities. The aim of this study is to fill this gap in the literature by studying the effect of time poverty on human capital accumulation in the context of a middle-income country with high rates of domestic and paid labour. We use data from the Young Lives Study for Peru, which collects information on time allocation, health, and cognitive outcomes for a cohort of children between 5 and 15 years old, as well as information on household wealth, parental investments and parents' health. We estimate a Cumulative Value-Added Model of human capital accumulation, controlling for household resources and parental investments, to test whether experiencing time poverty in childhood affects long-term cognitive outcomes. Our preliminary results show a negative effect of experiencing time poverty at the age of 5 on vocabulary test scores at the age of 15 (p-value < 0.05).

The Effects of Parental Unemployment during Childhood on Children's Future Health

PRESENTER: **Mario Martinez-Jimenez**, Lancaster University

While the effects of unemployment on the health of the unemployed is well-documented, its long-run spillover effects on the health of their relatives, especially children, remain poorly understood. This research focuses on the impact of parental unemployment spells during their children's early (0-5 years), mid- (6-10 years) and late- (11-15 years) childhood on the child's consequent mental and physical health when they become young adults (18-33 years). The analysis exploits data drawn from the British Household Panel Survey (BHPS) and the UK Household Longitudinal Study (UKHLS) that include detailed socioeconomic and health-related information on both parents and children for three decades (1991-2019). This paper employs a Correlated Random Effects (CRE) probit model that allows accounting for unobserved heterogeneity and potential selection bias as well as a Generalized Estimating Equations (GEE) random effects estimator accounting for the dependency structure of the data (i.e., families). Results indicate that experiencing parental unemployment during early childhood (0-5 ages) and early adolescence (11-15 ages) has a negative impact on physical health of the child later on in life, while experiencing parental unemployment during middle childhood (6-10 ages) affects the young adults mental health negatively. These results may help policymakers implementing policies to mitigate the psychological and physical burden suffered by children and adolescents whose parents are unemployed during critical years of their development.

The Impact of WIC Program on Early-Life Language Development

PRESENTER: **Dr. Corneliu Bolbocean**, Oxford University

Existing scholarly evidence suggests that early-life environments play a critical role in shaping an individual's long-term socioeconomic outcomes. The impact of safety net programs on early-life environments and outcomes is largely unknown.

This study uses novel data to estimate the impact of the Women, Infants and Children (WIC), the Supplemental Nutrition Assistance Program (SNAP) and home visitation (HV) programs program on cognitive and language outcomes in children up to 24 months.

Repeated measurements on participation in public programs and early-life outcomes for a large sample of children and mothers in Memphis, Shelby county, TN were collected. Within this dataset the exposure-outcome relationship is directly observable over time. The specific structure of the data enables us to address endogeneity concerns via the use of first-difference estimators combined with a rich set of time-varying covariates.

We provide empirical evidence to conclude that WIC participation is associated with a positive and statistically significant impact of 0.32 and 0.16 standard deviations in receptive communication and expressive communication scores. Overall, participation in these safety net programs is shown to have meaningfully contributed to improving developmental outcomes among children up to two years of age. Presented empirical evidence might be critical at a time when funding for WIC, SNAP or other safety-net programs is in peril.

Early-Life Nutrition and Academic Achievement

PRESENTER: **Florencia Borrescio-Higa Borr**, Universidad Adolfo Ibanez
AUTHORS: Federico Droller, Carlos Guillermo Bozzoli

We identify and quantify the effect of exposure to a large supplemental nutrition program on academic achievement of children ages 6–13 in Chile. We use individual-level data from representative samples from the 1960, 1970, 1982 and 1992 censuses. We define a sample of siblings and rely on maternal fixed effects for identification, and also show the full census sample with a rich set of maternal and household control variables render similar results. We find a positive and meaningful contribution of the supplemental nutrition program on years of schooling. The most significant effects appear in the 1970 and 1982 censuses, which capture children born when the expansion of the program was strongest. The magnitude of the result implies an additional year of exposure to the program resulted in an average increase of 0.24 years of schooling. Our results show that enhancing nutrition in early life had a meaningful effect on the education of a large fraction of the population.

Effect of Adolescent Births on Educational Attainment in Nigeria: A Propensity Score Matching Approach

PRESENTER: **M. Femi Ayadi**, University of Houston-Clear Lake
AUTHORS: Grace Onodipe, Lola E Adepoju

Background: Nigeria is one of 4 countries in the world with the highest early adolescent birth rates of 10 births per 1,000 for girls. Potential health, social, and economic disadvantages that young mothers face have widely been published. Fertility under age 15 is associated with high fertility in later adolescence (15-19), higher total fertility rates of women aged 15-49, and high population growth rates. Studies have shown that there is a negative correlation between educational attainment and early childbearing. Adolescent pregnancy jeopardizes future educational attainment and reduces economic viability of adolescent mothers. Reduction and elimination of very early fertility is critical for breaking the cycle of deprivation in young girls and women and ensuring access to continued education, reproductive healthcare and livelihood opportunities. Studies have suggested that a large proportion of the observed educational differential between teen mothers and teenagers who have not had a birth is a function of other environmental factors and unobservables.

Objectives: Using the 2018 Nigerian Demographic and Health Survey, this study examined the effect of teenage fertility on educational attainment of young mothers in Nigeria.

Data and Methods: Using a nationally representative data set, we utilized the propensity score matching technique to construct a matched sample of women 15-19 year old who have not had a birth in the past 5 years and are not currently pregnant (control group; Non-fertile) that corresponds as closely as possible to a sample of those who have given birth within the 5 years preceding the survey or are currently pregnant with their first baby (treatment group; Fertile). The difference between the Fertile women and the matched non-fertile women would approximate the true causal effect. The outcome variable, the woman's educational attainment, is measured as the number of years of schooling at the time of the survey (continuous), and as whether they completed primary or secondary education (categorical). Based on evidence from the literature, covariates used to estimate the propensity scores included household wealth, region, religion, age, whether the women reside in a rural or urban location, marital status, contraceptive knowledge, and exposure to mass media proxied as frequency of watching tv. Matching was made using the nearest neighbor matching procedure, and standard pre- and post matching checks were conducted.

Results: Our sample consisted of 8,359 women, of which 1,517 were in the treatment group and 6,847 in the control group. Estimated propensity scores were balanced within the region of common support for the treatment and control groups. Results show that the causal effect of being fertile is a reduction in education attainment by almost two and half years. The causal effect of being fertile is a reduction in the probability of completing secondary school by about 25 percent.

Conclusions: Reducing the high rate of adolescent and maternal mortality is a key Sustainable Development Goal (SDG 3.1 and 3.7.2) and the question of what effect early adolescent birth rate has on educational outcomes of young women is very important to address SDG 5.3.1 goal of gender equality.

How Are Maternal and Fetal Outcomes Constructed in Cost-Utility Analyses of Pregnancy? A Systematic Review

PRESENTER: **Lucy Abel**, Nuffield Department of Primary Care Health Sciences

AUTHORS: Helen Dakin, Oliver Rivero-Arias, Abigail McNiven, Richard McManus

Introduction: Medical interventions used in pregnancy can affect the length and quality of life of both the pregnant woman and her unborn baby. Which of these individuals' outcomes are included in a cost-utility analysis and how we combine outcomes for babies and mothers is therefore likely to have a substantial bearing on whether an intervention appears cost-effective. The aim of this systematic review was to evaluate how QALYs and DALYs have been constructed and analysed in cost-utility analyses of pregnancy interventions.

Methods: Searches were conducted in the Paediatric Economic Database Evaluation (PEDE) database (up to 2017, when the database ceased being updated), as well as Medline, Embase and EconLit (for publications since 2017). Abstracts and full texts were screened in duplicate and any discrepancies resolved through discussion. Inclusion criteria were economic evaluations of interventions during pregnancy – defined as between conception and delivery – published in English. Included publications were categorised according to type of economic evaluation and the following data was extracted: country of analysis; clinical condition; study design; QALY/DALY construction (life expectancy, quality adjustment, discount rate); and methods for combining maternal and fetal outcomes.

Results: Searches identified 2026 unique studies; 127 were eligible for inclusion, of which 89 reported QALYS and 38 DALYs. Fifty-nine studies (46%) included only fetal outcomes, 13 (10%) only maternal outcomes, and 49 (39%) included both. Where both were included, methods for combining these outcomes varied. Twenty-nine studies added together the QALYs/DALYs for maternal and fetal outcomes, with no adjustment. The remaining 20 studies took a number of different approaches to combining maternal and fetal outcomes, including shortening the time horizon for maternal outcomes (two studies) and assigning a single utility to a set of combined maternal and fetal outcomes. Six studies included a maternal disutility associated with poor fetal outcomes, either in place of or in addition to fetal QALYs or DALYs. Decision models were used in 110 studies (87%), with 107 of these being decision-trees where long-term QALYs were constructed using a life expectancy and quality adjustment. Sources of life expectancy and utility values were poorly reported and varied substantially, even for analyses conducted within the same country.

Conclusion: Methods for analysing outcomes in cost-utility analysis in pregnancy vary widely, with only a minority considering both fetal and maternal outcomes. This review indicates the need for a consistent approach to constructing lifetime outcome measures for maternal and fetal outcomes, as well as for analysing these outcomes jointly where appropriate.

The Long-Term Impact of the Ebola Epidemic on Access to Reproductive, Maternal, Newborn and Child Healthcare in Sierra Leone

PRESENTER: **Jessica King**, London School Of Hygiene & Tropical Medicine

AUTHORS: Zia Sadique, Josephine Borghi

Introduction

The Ebola epidemic of 2014-2016 had a devastating impact on health outcomes and is expected to have a long-term impact on access to health services. Across all countries affected by the epidemic, health care workers were 21 to 32 times more likely to be infected than the general population. It is estimated that 7% of all health care workers in Sierra Leone died during the epidemic, and modelling work has suggested this may cause an increase in maternal and infant mortality. Additionally, fear of infection undermined population trust in health services. Although it is known that utilisation of routine services was lower during the epidemic period than it had previously been, little is known about the longer-term effects on access to and uptake of RMNCH services in the population and variation across geographical locations.

Methods

This study used national household surveys conducted before (MICS 2010, SLIHS 2011 and DHS 2013) and after (MICS 2017 and SLIHS 2018) the epidemic to estimate coverage of 18 key indicators in Sierra Leone's RMNCH strategy, health care expenditures and catastrophic spending and impoverishment effects. Linking with Ebola incidence data at the chiefdom level, a difference-in-differences analysis with propensity score matching was used to compare chiefdoms with few or no Ebola cases to those with high incidence, examining the effect of the Ebola epidemic on change in RMNCH coverage and financial protection. Household income and expenditure data was used to investigate whether the impact of Ebola varies with the socioeconomic status of the household, controlling for geographical characteristics.

Results

There was a significant negative effect on coverage of having a skilled provider at delivery in chiefdoms with large Ebola epidemics, but no impact on the other indicators. Results will also be presented on affordability of care and financial protection, and for the interaction between coverage and household socioeconomic status.

Discussion

The effect on the availability of skilled providers at delivery, without a corresponding impact on utilisation of services, suggests a human resources crisis. Maternal and newborn mortality remain high in Sierra Leone, and there is concern that disruption to the health system caused by the Ebola epidemic may impede efforts to reduce mortality rates. This work will identify areas and groups most at need of targeting with interventions.

Costs of an Integrated Model of Maternal Health and Non-Communicable Disease Package of Care Services: Estimates from Two Nigerian States

PRESENTER: **Chigbo Chikwendu**, Health Strategy and Delivery Foundation

AUTHORS: Yewande Ogundeji, Aishatu Fodio, Kelechi Ohiri

Abstract

Background: Several non-communicable diseases are becoming more implicated as indirect risk factors for worsening maternal health outcomes globally. Scaling up the access to the prevention, early detection, diagnoses and management of these NCD-related risk factors in women of reproductive age has, therefore, become imperative in the reduction of maternal mortality and morbidity in many low- and middle-income countries including Nigeria. A recommended and contemporary strategy for achieving this is the innovative integration of NCD care services into routine maternal health care services. An innovative integrated model of care was recently piloted (donor supported) in two states (Lagos and The Federal Capital Territory-FCT) in Nigeria with early promising results, which has piqued the interest of government and other potential funders for potential scale up of the model. However, there is limited evidence on the costs of providing this integrated package of MH/NCD care, which is required to aid policymakers, program planners and implementers to make rational investment decisions regarding such innovative approaches. The aim of this study was to estimate the costs of this integrated model of care in Nigeria.

Methods: This study was a cross-sectional quantitative study that estimated and compared costs of the integrated model to the traditional model of care. Costs were estimated from a provider perspective and only financial costs were considered. Primary and secondary costing data collection was between October and December 2019, from a sample of four primary health care centers (PHCs); two from each of Lagos State and the Federal Capital Territory, and two Hospitals; one from each of the states. A bottom-up micro-costing technique was used to model costs on an excel-based cost-accounting engine developed to suit the objectives of the costing.

Results: The mean unit costs of providing the package of MH and NCD care services using the traditional, and the integrated model of care at the PHC level were estimated to be and ₦45,419 ($148.4) and ₦46,065 ($150.5), respectively, in the FCT, and N44,137 ($144.2) and N45,441 ($148.5), respectively. At the hospital level, the costs were N78,486 ($218) and N78,750 ($257) for the traditional and integrated models, respectively in FCT, and N62,451($204) and ₦62,611($204.6) in Lagos State. Disaggregated costs showed that management of hypertension was the major driver of costs, while family planning service was the least across all care levels. Drugs and medical supplies were the most expensive resource inputs.

Conclusion: The unit costs of the integrated package of care are comparable across the two sampled states but differ significantly between the levels of care provision. The lower production costs in the PHCs may be indicative of greater efficiency of care, compared to the hospital costs. In addition, estimated costs of the integrated package of care were similar to the costs of the traditional model of care – with only marginal differences. This indicates potential cost savings within the integrated care model. Additional research is, however, recommended to determine in greater details, the cost-effectiveness of integrating MH and NCD care compared to the traditional model of care.

Does Health Insurance Status Affect Screening for Hypertension? Evidence from Kenya

PRESENTER: **Mr. Bishnu Bahadur Thapa**, Brown University

AUTHOR: Omar Galarraga

Background

Hypertension is a significant contributor to the growing burden of non-communicable diseases (NCDs) in low-and lower-middle income countries (LMICs). Kenya is no exception. Accounting for nearly half of the inpatient admissions and two-fifths of the hospital deaths, hypertension is one of the biggest public health concerns for Kenya. Kenyan Ministry of Health (MoH) estimates that by 2027, the disease will account for the vast majority of the disease burden. The World Health Organization (WHO) recommends regular screening as an essential step towards systematically addressing the growing problem of hypertension. Despite this, screening remains a low priority for many countries.

This study examines hypertension screening in the context of Kenya. In particular, the study looks at the role of health insurance on screening for hypertension.

Methods

Data and variables

We use data from the 2014 Kenyan Demographic and Health Survey (KDHS-14), a nationally representative cross-sectional survey. The analytical sample comprises of 27,560 men and women between the ages of 15 and 54. Our analysis is at the person-level. Outcome variable is *screening for hypertension* and the main explanatory variable is *health insurance status*. Additional covariates include a number of individual- and household-level variables. Individual-level variables include sex, education, age, occupation, marital status, use of tobacco (smoking), and body mass index (BMI). Household-level variables include household size, wealth index, and ethnicity.

Empirical strategy

We use propensity score matching (PSM)-based linear probability model to estimate the relationship between health insurance status and screening for hypertension. As a part of the estimation strategy, we first create a matched comparison group using one-to-many (1:3) matching algorithm. We then compare the likelihood of being screened for hypertension among those who have health insurance with those who do not have health insurance. We control for individual and household-level characteristics in all our regression specifications. For sensitivity analysis, we re-analyze our sample using the inverse probability of treatment weighting (IPTW).

Findings

When we regress hypertension screening on health insurance status using our unmatched sample, we find that having health insurance is significantly associated with a 3.7 percent increase in the likelihood of being screened for hypertension. The magnitude of the estimate decreases to 1.1 percent when we adjust for the potential confounders but still remains positive and significant. Our matched analysis also suggests that there is a modest impact (0.9 percent) of health insurance on the likelihood of hypertension screening. While the IPTW results suggest that there is no association between health insurance status and screening, we reject these results in favor of our results based on the matched sample. This is because IPTW sample is not fully balanced on the baseline covariates.

Policy implications

We conclude that health insurance is significantly associated with screening for hypertension. The policy implication of our finding is that if Kenya is to control the hypertension epidemic, it has to increase health insurance coverage rates. Since, private health insurance is largely minimal, the increase in coverage rates has to occur through the National Hospital Insurance Fund (NHIF).

Economic Effects of Long-Term Care Insurance: Evidence from Panel Data for Korea

PRESENTER: **Hoolda Kim**, Black Hills State University

AUTHOR: Sophie Mitra

Long Term Care Insurance (LTCI) for older people is a pressing policy issue. While long term care services are designed to assist people with limited functional ability and income, the breadth of coverage varies from country to country. The narrow coverage often hinders older people's access to long term care services. With a rapidly aging global population, there is a debate on the problem of increasing care needs and its costs. Understanding the consequences of LTCI is central to implementing or expanding LTCI policies. Yet there is little evidence on the impact of insuring the uninsured on care utilization, disability and health outcomes, and economic well-being. In 2008, the Korean government initiated a national public contributory LTCI to help older people through care services lead to more independent and secure lives and support family caregivers. We use the Korean Welfare Panel Study (KOWEPS) and a difference-in-differences (DID) methodology to assess the effect of the program on household expenditures, economic security, and healthcare utilization. We find that LTCI beneficiary households spend less on food and more on healthcare services compared to non-LTCI beneficiary households. Beneficiaries are less likely to experience difficulty in paying for food. While LTCI beneficiary households tend to stay longer in the hospital, they are less likely to visit for outpatient care.

Economic Evaluation of Psychological Treatment Interventions for Common Mental Disorders in Low- and Middle-Income Countries: A Systematic Review

PRESENTER: **Vimbayi Mafunda**, University of Cape Town

AUTHORS: Susan Cleary, Bronwyn Myers, Crick Lund, Katherine Sorsdahl, Esther Chanakira

Background: Common mental disorders (CMDs) are highly prevalent conditions that constitute a major public health and economic burden on society in low- and middle-income countries (LMICs). Several reviews synthesize evidence on the efficacy and effectiveness of treatments for CMDs in LMICs. Yet, there are limited systematic reviews on evaluations providing the economic evidence necessary to support system-wide implementation of psychological treatments for narrowing the large treatment gap in these settings. This review examines the methods, reports the findings and appraises the quality of economic evaluations of psychological treatments for CMDs in LMICs.

Methods/design: We searched bibliographic databases including PubMed, EMBASE, CINAHL, Web of Science, EconLit, APA-PsycINFO, Cochrane library, Centre for Reviews and Dissemination (CRD) and the Cost Effectiveness Analysis (CEA) Registry. We included full economic evaluations of psychological treatments for CMDs defined as depressive, anxiety, and alcohol use disorders conducted in LMICs. Data extraction was done using a pre-populated template. We used the 35-point Drummond checklist for quality appraisal. Our results are presented as a narrative synthesis.

Preliminary Results: Twenty-two studies mostly from South Asia (9) and Africa (8) were reviewed and quality assessed. The majority of studies were Cost Effectiveness Analyses (CEAs) (11), some were Cost Utility Analyses (CUAs) (4), there was one stand-alone Cost-benefit Analysis, and the remainder reported a combination of economic evaluations.

Cost-effectiveness: Most studies reported that the interventions were either cost-effective (6) or potentially cost-effective (8), however 3 interventions were not cost-effective.

Incremental Cost-Effectiveness Ratio (ICER): the evidence highlights inconsistencies in the interpretation of the ICER, with some studies applying a "societal" ICER in an attempt to include the wider economic impacts of mental health treatment outside the health system.

Costing Task-Sharing: Non-specialist health workers delivered most of the treatments (16) across a mix of organisational staffing models of care (task-sharing, stepped, collaborative) to support scaling up delivery at low-cost. Quality of reporting on costs varied with insufficient detail provided on staff compensation. Staff costs should reflect the true opportunity cost of lay health workers' time in order to encourage policy that supports development of a sustainable cadre of healthcare providers for these conditions in LMICs.

Quality Assessment: although quality was generally acceptable some irregularities were noted in reporting resource use, appropriateness of conclusions drawn on intervention cost-effectiveness and application of cost-effectiveness thresholds.

Conclusion: Economic evaluations of CMD interventions have evolved over the past two decades, with a three-fold increase in the number of studies conducted in the second compared to the first decade. Although the evidence base has grown, better quality economic information is required to support decision-making. More work is needed to guide researchers to ensure that the results of the studies are transferable, generalizable and useful for policy makers needing this data to inform resource allocation towards high burden CMDs. This is particularly important in LMIC settings where psychological treatments for CMDs are being considered for scale up and inclusion in universal care packages.

Systematic review registration: PROSPERO registration number: CRD42020185277.

Keywords: common mental disorders, psychological treatment, economic evaluation, Low-Middle Income Countries.

The Impact of Automatic Enrolment on the Mental Health Gap in Pension Participation: Evidence from the UK

PRESENTER: **Karen Arulsamy**, University College Dublin

A large body of evidence shows that individuals with poor mental health have lower income over the lifespan but a dearth of evidence exists on how poor mental health affects savings behaviour. In this paper, we provide novel evidence of a mental health gap in pension participation in the UK using nationally representative longitudinal data from Understanding Society (UKHLS). Beginning in 2012, the UK government introduced automatic enrolment enabling us to assess the impact of one of the largest pension policy reforms in the world on this mental health gap. We measure mental health using the General Health Questionnaire (GHQ-12) which is a commonly used tool for measuring psychological distress. Prior to automatic enrolment, we find that male private sector employees with poor mental health are 3.2 percentage points less likely to participate in a workplace pension scheme while female private sector employees with poor mental health are 2.6 percentage points less likely to participate in a workplace pension scheme after controlling for key observables including age, education, race, marital status, number of children, occupation type, industry type, presence of a physical health condition and cognitive ability. The implementation of automatic enrolment completely removes the mental health gap in pension participation. By documenting the impact of automatic enrolment on the mental health gap in pension participation, we provide additional support for automatic enrolment policies which have already been shown to reduce gaps in pension participation among female and low income employees.

5:15 PM –6:30 PM WEDNESDAY [Cross-Cutting Themes And Other Issues]

COVID 19 and Other Cross-Cutting Issues Poster Session

MODERATOR: **Christopher James Sampson**, Office of Health Economics

Health Shocks and Political Instability – the 1918 Spanish Flu Pandemic and the Collapse of Weimar Germany

PRESENTER: **Mona Foertsch**, ifo Institute - Dresden Branch

AUTHOR: Dr. Felix Roesel

Introduction

The Spanish flu killed some 240,000 Germans in autumn 1918. The flu hit Germany in the most unfortunate moment. Millions of soldiers returned from World War I, and hunger and revolutions swept the country. Farm workers fall ill with the flu, exacerbating the much-needed harvest. Germany started with a toxic mix of high flu death tolls and malnutrition into the new era of democracy in 1918. We investigate to which extent the health shock from the 1918 Spanish flu contributed to political instability in Germany's young democracy after World War One.

Methods

We hand-collect and digitize new local data on mortality, crop yields, and election outcomes for all around 210 Bavarian districts in Weimar Germany over the period 1907 to 1933. We estimate local excess mortality in 1918 for all Bavarian districts and link it to local Reichstag election outcomes before and after World War One in difference-in-differences estimations. Our main dependent variable of interest is the vote share for the largest government party SPD which citizens are most likely to blame for mismanagement of the 1918 pandemic.

Findings

We find that local excess mortality caused by the 1918 Spanish flu vary substantially across Bavarian districts. Difference-in-differences results show that vote shares for the largest government party SPD decrease in districts where more citizens died from the Spanish flu. We find negative effects of 1918 excess mortality on SPD vote shares in all national elections between 1919 and 1933. By contrast, vote shares for

Conservative parties increase. We find no effects on voter turnout. Preliminary evidence suggests that agricultural labor markets play an important role in mediating flu effects and political outcomes.

Policy, Poverty, and Politics. How Public Health, Inequality and Political Leadership Influenced the Global COVID-19 Pandemic

PRESENTER: **Prof. Sergio Bautista-Arredondo**, Instituto Nacional de Salud Publica

AUTHORS: Carlos Pineda, Diego Cerecero, Arantxa Colchero, Marjorie Opuni

Background: In early 2020, countries worldwide implemented non-pharmaceutical interventions (NPIs) to slow the spread of COVID-19. NPIs varied between countries in degree and timing of implementation. The effectiveness of NPIs depends on public compliance, and the extent to which NPIs resulted in population mobility reductions varied. We assessed the effects of NPIs on new COVID-19 cases from February 20th to August 17th in 93 countries controlling for ability and willingness to comply with government restrictions.

Methods: We retrieved information on government policy responses from the Oxford Covid-19 Government Response Tracker. Mobility data was obtained from Google's Community Mobility Reports, and demographic and economic indicators from the World Bank. We constructed an indicator of political leadership type using the Global Party Survey. We used a panel model with random effects to identify the effect of policy response on the number of new cases. Countries were included when 300 cases were reported. The dependent variable was the number of new cases with a 14 days lag from NPI implementation.

Results: We observed variation in responses and epidemics. Our model showed that compliance explains the impact of policy responses. We find a strong association between stringency of government responses and new cases. The association is moderated by mobility. We also found a positive relationship between mobility reduction and new cases. Our results are consistent with our hypothesis that ability to comply (measured by GINI coefficient) and willingness to comply (measured by type of leadership - populist or not populist) are strong predictors of the epidemic behavior (Table 1).

Conclusions: Similar to prior studies, our findings suggest that NPIs implemented in early 2020 substantially reduced COVID-19 cases. We also show that public compliance was fundamental to NPI effectiveness. We further explain the heterogeneity in cases by including measures of inequality and political leadership. To our knowledge, there are no previous studies that address these factors.

Table 1. Panel data regression results.

Variables (N=12,182, Countries=93)	**New cases**			
Government response	-7*	41***	41***	41***
Mobility reduction		7,096***	7,084***	7,083***
Government response & Mobility reduction		-140***	-140***	-140***
GINI			154**	161**
Populist leadership				2,019**

*** p<0.01, ** p<0.05, * p<0.1

Note: All models controlled by Gross Domestic Product, Population size, Days since first case in China (as a proxy of the time to prepare for the epidemic.)

Adherence to COVID-19 Social Distancing Measures: Unequal Opportunities and Health Impacts

PRESENTER: **Laure de Preux**, Imperial College London

AUTHOR: Dheeya Rizmie

The first lockdowns in Europe was supported by a strong public health message, yet questions regarding its adherence and equity arise. Central to these questions is understanding the impacts of reducing mobility, such as the relationship between mobility and income. Compliance to, and the ability to be compliant to, COVID-19 interventions are likely to be related to socioeconomic status. In this project, we identify the key socio-economic determinants of mobility during the pandemic using one of the richest sources of mobility data (Facebook data) combined with socio-economic characteristics at the Lower Super Output Area (LSOA) level from Eurostat for Europe and the Office of National Statistics in the UK. We model the shocks in the Facebook mobility data using network methods and derive various measures of shock magnitude and resilience at a very fine geographical scale. We consider the volume of trips as well as their distances. The granularity of the analysis allows to us to identify social disparities, the employment impact and deaths related to COVID-19. We create a very rich dataset that captures socio-economic characteristics, deprivation, mobility indicators related to lockdowns, perceptions and deaths. Preliminary results suggest that the most deprived areas according to several dimensions of deprivation were the least likely to reduce their mobility suggesting that these individuals were the most exposed. We are now exploring the possible causes and consequences of such an increased risk of COVID-19 exposure and model the determinants of COVID related deaths in relation to mobility. Preliminary results suggest a strong role of education and deprivation again as predictors of mobility contraction and return to normality.

The Impact of COVID-19 on Changes in Work Productivity and Activity Impairment in the United States from April to September 2020

PRESENTER: **Dr. Ning Yan Gu**, University of San Francisco

AUTHORS: Nadine Zawadzki, Xiayu Jiao, Cynthia L. Gong, Kelly McDermott, Richard Callahan

Objective: The COVID-19 pandemic has significantly affected the work routines of millions of individuals around the world, compared to the work settings pre-pandemic. Negative impacts of the pandemic on many facets of life have been observed. This study examines the impact of COVID-19 on productivity and regular daily activity among MTurk workers in the US using the Work Productivity and Activity Impairment Questionnaire (WPAI:GHv2) adjusted for COVID-19.

Methods: Three waves of a panel survey were designed and implemented to capture the impact of COVID-19 on the US population using Amazon MTurk online respondents. The first wave was completed in April 2020 shortly after the lockdown (n=2,740). The second wave was collected in September 2020 after 5-months into the lockdown (n=2,454). This analysis included 1,469 respondents who completed both waves of survey to permit time 1 vs. time 2 comparisons on the same cohort. The EQ-5D-5L was also included to assess changes in health-related quality-of-life. The WPAI-GHv2 consists of 6 questions that can be used to calculate 4 work impairment domains to reflect: 1) % work time missed due to COVID-19; 2) % work impaired due to COVID-19; 3) % overall work impairment due to COVID-19, and 4) % regular daily activity impairment due to COVID-19. The EQ-5D-5L consists of 5 domains evaluating health in terms of mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Item responses range from no problems to extreme problems, and can be converted into single index utility scores ranging from 0 (death) to 1 (perfect health). We assessed the association between WPAI:GHv2 scores and EQ-5D-5L domain and utility scores. The association was also stratified by age group.

Results: 60% of respondents reported full-time employment in April compared to 62% in September. With a recall time of 7 days, % work time missed due to COVID-19 was about 19% in April and reduced to 12% in September ($p<0.01$). The % work impaired due to COVID-19 was 30% in April and 29% in September ($p=0.41$). The % overall work impairment due to COVID-19 was 38% in April and reduced to 34% in September ($p<0.01$). The % regular daily activity impairment was 40% in April and reduced to 34% in September ($p<0.01$). These patterns remained similar among different age groups, expect that % activity impairment for young adults (18-24 years) increased from 37% to 43% ($p<0.01$). Greater work impairments due to COVID-19 in WPAI:GHv2 domains were all significantly associated with more pronounced EQ-5D-5L domain problem scores and worse health state utilities ($p<0.01$).

Conclusion: The COVID-19 pandemic imposes negative impacts on all facets of life. This descriptive analysis showed that, due to COVID-19, impairment on work productivity and regular daily activity resulted in significantly worsened EQ-5D-5L health states and utilities. At the same time, impairment seems to be less pronounced from April to September. Further investigation will evaluate these outcomes by adjusting for key factors using a multivariable regression model and additional waves of survey.

Examining the Effect of COVID-19 Policy on Personal Support Worker (PSW) Leave of Absence in a Canadian Home Care Setting

PRESENTER: **Katherine Zagrodney**, University of Toronto

AUTHORS: Lady Bolongaita, Emily King, Sandra McKay, Kathryn Nichol

During the first wave of the COVID-19 pandemic in Ontario, Canada, the number of home care Personal Support Workers (PSWs) going on a leaves of absence (LOAs) was particularly striking, with important implications for those seeking home care services since PSWs represent the largest proportion of frontline home care workers. The provincial government implemented multiple policies in an attempt to address challenges related to the pandemic, including PSW labour supply shortages. Whether the government-led policies were successful in reducing PSW LOAs once accounting for other factors such as contextual and individual factors is yet to be fully understood. This study sought to understand the extent to which COVID-19 pandemic policies, contextual variables, and individual-level factors influenced home care PSW LOAs in the 'first wave' of the COVID-19 pandemic in Canada. The study's focus on home care is highly relevant for four key reasons: 1) COVID-19 restrictions sought to keep patients in the home; 2) PSW supply in home care was already particularly strained prior to the COVID-19 pandemic; 3) PSWs in the home care sector have been found to receive lower wages than other sectors and therefore may be expected to be particularly responsive to policies such as wage incentives, and; 4) the home care sector has received relatively little attention in prior literature. We used weekly administrative data from the weeks of March 9th to August 24th, 2020, for all PSWs employed and actively working within a home care organization (VHA Home HealthCare) the week prior to the World Health Organization (WHO) COVID-19 pandemic declaration. PSWs' LOA status was modelled as a binomial outcome variable (not on an LOA (0) versus on an LOA (1)) using a multilevel logistic regression with weekly fixed effects and standard errors clustered at the individual level. Results are presented as marginal effects. The majority of the ~1200 PSWs who were actively working the week before the WHO declared the COVID-19 pandemic were female (96.4%) with an average age of 47.3; 17.6% of these PSWs took an LOA at some point during the first wave (March 9th to August 30th, 2020). PSWs' top three self-reported reasons for an LOA were childcare (31.5%), illness/injury (15.8%), and the single-site employer restriction policy (15.5%). Results here suggest that the COVID-19 wage policy had a small but significant effect on reducing LOAs for PSWs working in a home care organization in Ontario, Canada during the pandemic. Significant decreases in LOAs were found both after the wage policy was announced (-3.72%, $p=0.00$) and after PSWs started receiving retrospective pay from the wage policy (-2.56%, $p=0.00$). If a PSW worked outside of their assigned geographic work region in the last month of work, this correlated with a 2.6% higher likelihood of taking an LOA ($p=0.00$). Findings emphasize the importance of wages and scheduling considerations in driving PSW's level of participation which may be generalizable to other home care organizations. Policy-makers seeking to increase PSW labour supply should note the expected impact of wage policies on PSWs' decision to work.

The Financial Impact of COVID-19 on Publicly Traded Health Systems

PRESENTER: **Junying (June) Zhao**, University of Oklahoma Health Sciences Center

AUTHORS: Tejas Ghirnikar, Stephane Verguet

How did the COVID-19 pandemic impact the healthcare industry? Using 2015Q1--2020Q2 financial data of 26 publicly traded health systems, consisting of 11,322 hospitals and facilities, we find that the COVID-19 pandemic shock is associated with large losses of revenue and profit, as well as increases of debt and cash holdings. Our time series analysis finds the trends of key financial indicators. After the pandemic onset, healthcare corporations' financial viability and profitability worsen, while their liquidity and short-term debt grow in response to a gloomy and uncertain future. Our panel data analysis shows a 21.9% significant decrease in net operating revenue, a 16.9% significant increase in current liabilities, and an insignificant increase in long-term liabilities. Concurrent with these results, we find that an average healthcare corporation has suffered $30.6 million significant losses in net income per quarter in 2020. The extent of the negative financial impact on providers varies with the CARES Act fiscal aid. The aid reduces the median provider's revenue loss, funds some individual providers that incurred no revenue loss (e.g., Option Care Health Corp.) but does not fund others that suffered up to 38.5% revenue loss (e.g., Magellan Health Corp.) and 56.4% profit loss (e.g., Encompass Health Corp.) in 2020Q2, compared to 2019Q2. With depleting temporary CARES Act aid and skyrocketing national debt, our results warn policymakers of the financial unviability of the healthcare industry, whose services are most needed during successive waves of the COVID-19 pandemic.

Age and Sex-Specific Acute Care Resource Use during the First Wave of COVID-19 in Ontario, Canada: Population-Based Retrospective Cohort Analysis

PRESENTER: **Stephen Mac**, Institute of Health Policy, Management and Evaluation, University of Toronto

AUTHORS: Kali Barrett, Yasin A Khan, David MJ Naimark, Laura Rosella, Raphael Ximenes, Beate Sander

Introduction: Understanding resource use for COVID-19 is critical for planning and a first step in understanding economic burden of COVID-19. We conducted a population-based cohort study using public health data to describe COVID-19 associated age- and sex-specific acute care use, length of stay (LOS), and mortality in Ontario, Canada.

Methods: We used Ontario's Case and Contact Management (CCM) Plus database of individuals who tested positive for COVID-19 in Ontario from March 1 to September 30, 2020 to determine age- and sex-specific hospitalizations, intensive care unit (ICU) admissions, invasive mechanical ventilation (IMV) use, LOS, and mortality. We stratified analyses by month of infection to study temporal trends and conducted subgroup analyses by long-term care residency, and three co-morbidities: diabetes, immunocompromised status, and renal conditions.

Results: During the observation period, 56,476 COVID-19 cases were reported (72% < 60 years, 52% female). The proportion of cases shifted from older populations (> 60 years) to younger populations (10-39 years) over time. Overall, 10% of individuals were hospitalized, of those 22% were admitted to ICU, and 60% of those needed IMV. The proportion of all reported cases of COVID-19 requiring hospitalization decreased over time: it was highest in March at 21% and decreased to 3% by the end of September. This trend is apparent for all age groups: among the elderly 70 to 79 years (47% dropping to 18%), and also in younger age groups: 40 to 49 years (13% dropping to 2%). On average, individuals were hospitalized 7.8 days after their reported onset date. Overall, 22% of hospitalized patients required admission to the ICU, with male patients being more likely to require ICU care (26%) compared to female patients (17%). ICU admission was highest for male patients and female patients between the ages of 50 and 69 years, at 37% and 28% respectively.

Mean LOS for individuals admitted to the ward, ICU without IMV, and ICU with IMV use was 12.8, 14.6 (8.5 days in the ICU, and 6.1 days in the ward pre- or post-ICU), 29.7 days (20.5 ICU with IMV, 1.2 days in the ICU pre- or post-ventilation, and 7.94 days in the ward pre- or post-ICU care), respectively. Similarly, the duration of IMV use for ICU patients decreased from 21.5 days in April to 14.4 days in September. Mortality for individuals receiving care in the ward, ICU without IMV, and ICU with IMV was 24%, 30%, and 45%, respectively. Mortality for individuals requiring ICU admission was highest in individuals age 70 to 79 years (43% no IMV, 54% with IMV), and over 80 years (65% no IMV, 75% with IMV).

Conclusion: This descriptive study shows acute care use and mortality varying by age, and decreasing between March and September in Ontario. Changes were not solely due to evolving demographics. Improvements in clinical practice and changing risk distributions among those infected may have contributed to fewer severe outcomes among those infected with COVID-19.

Estimating the Cost of COVID-19 Testing and Treatment in Burkina Faso

PRESENTER: **Rachel Sanders Sand**, Avenir Health

Background: As of November 15, 2020, Burkina Faso—a country of more than 19 million people—had more than 2,650 confirmed cases of COVID-19 with 68 deaths. Projections vary, but evidence suggests that Burkina Faso could see a large epidemic, causing disruptions across the health system and the economy. Projections suggest that the country could reac around 400,000 cases. Of the symptomatic cases, around 80% would be mild or moderate, with the remaining 15% severe, and the final 5% critical. Based on these estimates, we projected the resource requirements in Burkina Faso for testing and treating COVID-19.

Methods: Estimates of the number of cases were drawn from projections by L'École Polytechnique de Ouagadougou. Draft diagnosis, care, and treatment assumptions based on the WHO Essential Supplies Forecasting Tool and the Health Workforce Estimator were shared with the Burkinabé Ministry of Health and other partners for review and revision. Commodity and equipment requirements were based on packages of equipment, consumables, and service delivery for mild, moderate, severe and critical cases, based on the package of supplies that WHO envisions being needed for an average group of clients. Unit costs were drawn from Management Sciences for Health's Drug Price Indicator Guide, UNICEF's Supply Catalogue, and medical supply databases.

We modeled two scenarios: (1) targeted testing (i.e., testing of critical and severe suspected cases and restricted testing of asymptomatic, mild, and moderate cases), and (2) testing all travelers, exposures, and suspected cases.

Results: Total costs including labor and essential supplies for the targeted testing scenario (Scenario 1) were projected to reach around $100 million, while the costs of the expanded testing scenario (Scenario 2) would reach nearly $182 million. In Scenario 1, the costs of the key equipment and consumables were projected to be around US$ 60 million. However, in Scenario 2, the cost would rise to around 140 million, primarily due to costs for diagnosis which were projected to rise drastically from 11 million to 78 million for the expanded testing, with the costs driven by laboratory equipment and cartridges for the tests.

Labor costs varied as well. In Scenario 1, 14 million hours of provider time were projected to be needed over the course of the pandemic, most significantly from nurses (8 million), followed by doctors and respiratory therapists. Scenario 2 would require 1.4 million more hours, primarily from nurses. Labor costs for Scenario 1 were projected to reach around 40 million USD, with the bulk of costs coming from doctors and nurses. Scenario 2 was projected to require an additional 2 million in labor costs.

Estimating the Indirect Health Impacts of COVID-19: Impact of Declines in Utilization of Key Health Services

PRESENTER: **Michelle Weinberger**, Avenir Health

Background: As of June 15, 2020, Burkina Faso had 894 reported COVID-19 cases with 53 deaths. At that time, it was feared that Burkina Faso could see a large epidemic, causing disruptions across the health system and the economy. Evidence from past disease outbreaks, and emerging evidence specific to COVID-19, suggested that utilization of key health services is likely to decline as a result of a range of supply- and demand-side factors. We estimated the potential impact of COVID-19 on several health areas based on different scenarios of the severity and duration of COVID-19 in Burkina Faso.

Methods: We modeled the potential impact of COVID-10 based on the outlook of the epidemic in the country as of July 2020. The severity of COVID-19 impact on health interventions was determined based on: (1) Level of touch (i.e., how much face-to-face interaction with healthcare workers is required to deliver the intervention), and (2) Time sensitivity (i.e., the degree to which the intervention can be delayed without significant health impacts). We used these factors to determine the degree to which COVID-19 may cause service disruptions; we developed scenarios for short-term (6-month) and long-term (12-month) durations of disruptions, with sensitivity testing around the magnitude of declines. Disruptions were projected to be concentrated in 2020, with a lingering effect in 2021 before returning to the underlying coverage in 2022. All analyses were conducted using the Spectrum policy modeling suite.

Results: Collectively across the five health areas we estimated that between 4,800 and 19,700 additional deaths could occur in 2020 alone as a result of disruptions from COVID-19**.** For some health areas, the impacts of even short disruptions may be seen for years to come. Therefore, in addition to the potential deaths that could result from COVID-19 infection, there is the potential for significant indirect mortality due to reductions in availability and use of other health services. Interruptions in seasonal malaria chemo-prevention campaigns, case management, distribution of insecticide-treated bed nets, and indoor residual spraying could cause an additional 2,800 to 9,300 deaths and 1 to 5 million more malaria disease episodes between 2020 and 2025. Disruptions to contraceptive services could lead to a 2 to 7 percentage point drop in the contraceptive prevalence rate in 2020, resulting in between 28,000 to 97,000 unintended pregnancies over the coming year. Reductions in coverage of key maternal and child health interventions could contribute to between 7,000 and 27,000 additional maternal and child deaths between 2020 and 2025. Disruptions to case detection and treatment efforts for TB may lead to 700 to 2,600 additional deaths over 2020–2025. Interruptions in HIV prevention and treatment interventions could lead to an additional 170 to 500 deaths over 2020–2025.

Conclusions: As of November 2020, Burkina Faso has not seen as many COVID-19 cases as was predicted; this modeling provided evidence to advocate for maintaining essential health services. A next step is to consider the severity and length of service disruptions actually seen in the country, to compare these with the modeling assumptions.

Foregone Healthcare during the COVID-19 Crisis: Evidence from High-Frequency Phone Surveys in Low- and Middle-Income Countries

PRESENTER: **Julia Dayton**, The World Bank

AUTHOR: Dr. Jakub Kakietek

The COVID-19 pandemic has been characterized by significant excess mortality. There is concern the population health impacts of the COVID-19 disease itself could be amplified by disruptions in access to healthcare for routine preventive and other curative needs, particularly in LMIC settings where health system capacity was already constrained. The diverting of healthcare resources to pandemic readiness could have further limited the capacity of health systems to meet non-COVID19 healthcare needs. Simultaneously, the non-pharmaceutical interventions such as restrictions on movement and economic activity could have reduced household resources and willingness to seek care amidst the pandemic. Since April of 2020, the World Bank has conducted monthly phone surveys in over 100 countries. These phone surveys provide contemporaneous measurement of households' economic status and disruptions in access to basic services including education and healthcare. In addition, in the instance of healthcare, households are prompted to provide reasons for not accessing healthcare where need was indicated. Drawing on this large-scale phone survey data, we document the extent of subjective healthcare need and self-reported healthcare access. Although there is substantial variation in the prevalence of foregone care across countries, we find a large share of households report not accessing care when needed. The most common reason for not accessing care when needed is lack of money. These findings suggest efforts to mitigate the health impacts of the crisis need to include efforts to address disruptions to non-COVID related care, including demand side drivers of healthcare access such as income.

Changes in Prices and Consumption of Food, Beverages and Tobacco during the COVID-19 Epidemic in Mexico

PRESENTER: **Arantxa Colchero**, Instituto Nacional de Salud Pública

AUTHORS: Luis Alberto Moreno, Juan Carlos Salgado Hernandez, Prof. Sergio Bautista-Arredondo

Objective- The objective of the study was to explore changes in food, beverage and tobacco prices and consumption associated with COVID-19 in Mexico. We compared prices and consumption of a set of food, beverages and tobacco between January to July 2020 with the same period in 2018 and 2019. **Design-** We graphically explored the trend in food and beverage consumption during the COVID-19 period in 2020 compared to 2018-2019 and contrasted with with trends in the economic acctiviy and mobility. We then estimated absolute and relative changes in apparent consumption and index prices comparing average 2018-2019 with 2020 for the same period January to July and derived price elasticities. **Setting-** Mexico. **Participants-** National level aggregated data on sales and prices. **Results-** Our findings show a reduction in the apparent consumption of alcoholic and non-alcoholic beverages, except for coffee. For essential food, from the 18 items included in the analysis,

9 had increases in consumption. In contrast, the consumption of most of the non-essential energy dense food decreased. **Conclusions-** These findings suggest that there was an increase in basic food during the lockdown period compared to the previous two years.

Thank You for Smoking! How Loopholes Create Big Rents for Big Tobacco

PRESENTER: **Dr. Andreas Kohler**, ZHAW School of Management and Law

While legal loopholes in regulations are ubiquitous in many sectors of the economy, understanding and estimating their economic effects is challenging. Using an example from the tobacco sector, this paper illustrates how legal loopholes are exploited, and quantifies their economic effects. Since 2004 the EU has effectively banned the production of cigarettes exceeding maximum yield limits of 10 mg tar, 1 mg nicotine, and 10 mg carbon monoxide, whereas Switzerland still allows the production of stronger cigarettes for the export market. Cigarette exports from Switzerland to countries with laxer or no maximum yield limits skyrocketed after 2004. I identify the effect of this loophole in Switzerland's tobacco regulation by carefully constructing various comparison groups, and quantify it by implementing a difference-in-difference estimator and synthetic control method. I show that the loophole creates big rents in the form of additional foreign sales for Big Tobacco, the world's five biggest tobacco companies. In the decade from 2004 to 2014, Big Tobacco's foreign sales were between $1.5 billion and $2.5 billion higher than they would have been without the loophole in Switzerland's tobacco regulation.

Telemedicine Coverage Under Employer-Sponsored Health Insurance Plans

PRESENTER: **Dr. Alice Zawacki**, U.S. Census Bureau

AUTHORS: Thomas Hegland, Dr. G. Edward Miller

Telemedicine coverage, utilization, and provision has expanded during the COVID-19 pandemic. But to what extent were workers offered employer-sponsored health insurance plans with telemedicine coverage prior to 2020? This paper contributes to understanding pre-pandemic group coverage using new data collected in the 2018 and 2019 Medical Expenditure Panel Survey-Insurance Component (MEPS-IC).

Employers in the private sector and in local and state government units are asked whether each of the health plans they offer to workers covers telemedicine. These MEPS-IC data have been used to describe the relationships between offering plans with telemedicine coverage and employer characteristics, including employment size, geographic location, single- versus multi-unit firm status, for-profit versus not-for-profit status, and industry. In addition, the MEPS-IC data have been used to examine the characteristics of workers offered an employer health plan with telemedicine coverage. These worker characteristics include age, sex, union membership, full versus part time employment status, and wage. Finally, these data support analyses on additional health plan characteristics such as the type of plan (single, employee-plus-one, family coverage), premiums, deductibles, self-insured status, and provider arrangements (HMO, fee-for-service, PPO, POS).

These relationships between telemedicine coverage and employer, worker, and health plan characteristics are important for understanding how telemedicine might improve access to health care services. Our analyses will improve our understanding of how services delivered via interactive telecommunications for evaluating, diagnosing, and treating patients are available through plan coverage to underserved populations. For example, our analyses will provide details on the geographic location of employers and workers to highlight whether particular regions have greater access to telemedicine coverage to improve access to health care. By studying the out-of-pocket costs associated with health plans with and without telemedicine coverage, we can improve our understanding on whether enrollees face higher costs when choosing a plan with telemedicine. Finally, we also observe whether historical telemedicine coverage patterns on average reinforce, or instead work against, long standing disparities in care access by an array of socioeconomic characteristics.

Please note: Actual data estimates using these confidential MEPS-IC data have not undergone the U.S. Census Bureau's disclosure avoidance process and could not be provided in the abstract.

5:15 PM –6:30 PM WEDNESDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Health Beyond Health Care Services: Non-Medical Production of Health Poster Session 2

MODERATOR: **Sally Stearns**, The University of North Carolina at Chapel Hill

Externalities of Conditional Cash Transfers: A Review of the Evidence

PRESENTER: **Ana Correa**

AUTHORS: Neha Batura, Lara Goscè, Jolene Skordis

IConditional cash transfers (CCTs) are social protection programmes that aim to alleviate poverty and develop human capital (Rawlings and Rubio, 2005; Fiszbein and Schady, 2009). Most evaluations of CCTs focus on the impact on beneficiaries. Few evaluations have explored the impact on non-beneficiaries or externalities of the programme. Externalities may change the overall impact of such programmes (Ribas et al., 2010). If a CCT programme is evaluated based on the private impacts for beneficiaries alone, and there exist greater social impacts, then the CCT programme may be over- or under-valued owing to the divergence between the two. This paper reviews the evidence of externalities from CCT programmes, or the impact on non-beneficiaries.

We conducted a systematic scoping review. Search strings included "conditional cash transfers" and various terms related to externalities, such as "spillover" or "indirect effects". The inclusion/exclusion criteria excluded papers evaluating social programmes other than CCTs, papers evaluating unexpected impacts on beneficiaries, and papers evaluating intra-household externalities for beneficiary households. Papers in Spanish and English published until January 2020 were included. No geographical or literature source exclusions were applied.

The search identified 20 relevant papers evaluating CCT programmes in six countries in Latin America and Southeast Asia. We disaggregated the literature across three type of externalities: peer effects, public health effects, and local economy effects. Peer effects refer to social pressure and diffusion of information from CCT beneficiaries to non-beneficiaries (Lehmann, 2010; Lalive and Cattaneo, 2009). This is common in places with strong social networks, such as rural Mexican villages (Handa et al., 2001; Hoddinott and Skoufias, 2004; Avitabile, 2012).

Public health effects arise from the reduced risk of disease in the community as a result of changes in behaviour by beneficiaries, either due to the stipend or the conditionality. CCTs were shown to reduce risk factors for crime and violence (Camacho and Mejía, 2013; Lance, 2014; Chioda et al., 2016; Crost et al., 2016), and incidence of communicable diseases in the community (Angelucci and De Giorgi, 2009).

Local economy effects are changes in the local economy as a result of the increased income of beneficiaries or their increased use of education or health services. Evidence of the price externalities of CCTs is mixed, depending on local price elasticity of demand (Handa et al., 2001; Filmer et al., 2018). Evidence is also mixed on whether the supply of education or health responds to increased demand from beneficiaries (Benson, 2012; Filmer et al., 2018).

Most studies showed evidence of externalities, indicating that this is a worthwhile but underexplored area of research. Most papers focused on education-, economic-, or crime-related externalities. There is a gap in the literature for health-related externalities in CCTs, spanning all three types: peer effects changing health behaviours, public health effects affecting the risk of disease, and local economy effects impacting healthcare supply. Health-related externalities will impact the health of the community, not just beneficiaries. Without good community health, CCT programmes may not be able to achieve their aims of alleviating poverty and building human capital.

The Role of Hyperbolic Discounting on the Socioeconomic Disparities in Obesity

PRESENTER: **Barbara Falana**

AUTHORS: Renee Okhiria, Luwaiza Mirza, Makishaa Nanthakumar, Kinjal Jadeja, Oscar X Perry

Background: The socioeconomic disparities in obesity have been well-defined in literature, yet exploration into a behavioural component that could drive this relationship is lacking. Differences in hyperbolic discounting, the tendency to increasingly choose smaller-sooner rewards over

larger-later rewards as the time delay shortens, in particular, has not been investigated.

Aims: To establish the extent to which hyperbolic discounting accounts for the socioeconomic disparities in obesity through a SLR and quantitative study.

Methods: A SLR was conducted to explore the relationship between hyperbolic discounting, socioeconomic status and obesity by looking at how hyperbolic discounting affects obesity and socioeconomic status independently due to sparsity in literature on all three variables. Five electronic databases were used to yield 3043 eligible studies, which was cut down to 21 papers to review. A quantitative study was conducted utilising a structured questionnaire that included Kirby et al.s' ICQ to yield an individual's discount rate (K). There were 218 respondents who were categorised into socioeconomic groups by household income. Statistical analysis was performed using R Software to explore the impact of discount rate on the relationship between socioeconomic status and obesity.

Results: The SLR concluded that individuals with a higher discount rate were more likely to be obese. Furthermore, the SLR showed that the lower the socioeconomic status of an individual, the higher their discount rate, although the direction of causality was not confirmed. The quantitative study revealed a negative correlation between BMI and household income (P=0.490). When adjusting for income, age and gender, statistical significance increased (P=0.140). However, this result decreased in significance when log K was introduced into the model (P=0.199) to examine the effect of hyperbolic discounting on the relationship between income and obesity.

Conclusion: Literature has depicted hyperbolic discounting to have a negative correlation with socioeconomic status and a positive correlation with obesity likelihood. Yet, a significant effect of hyperbolic discounting on the socioeconomic disparities in obesity is unproved, and further research will be needed to confirm the influence. If hyperbolic discounting were to be a driver of the socioeconomic disparities in obesity, health policies in countries with high obesity prevalence may be designed to tackle obesity from a more behavioural approach.

The Causal Effect of Physical Activity on Health in Early Adulthood: A Gene By Environment Instrumental Variables Approach

PRESENTER: **Ivan Tzintzun**, Paris School of Economics

This article explores the effect of Physical Activity (PA) on subjective health status and non-communicable diseases (NCDs) during early adulthood. In particular, it analyzes the respective impacts of leisure time physical activity (LTPA) and work-related physical activity (WRPA). To deal with a potential endogeneity bias, we combine an instrumental variables approach with a fixed effect strategy. We instrument the measures on physical activity by exploiting the interaction of environmental dynamic characteristics with a unique and rich database on genetic markers in the AddHealth data project. In order to reduce its dimensionality, we apply a post-Lasso estimation to find an optimal combination of instruments. Results suggest that LTPA has a significantly positive effect on subjective health status and has a negative effect on the number of NCDs. WRPA has the opposite effect: it decreases subjective health status and increases the number of NCDs. Lastly, we explore potential heterogeneities between LTPA and WRPA, and we find that only sedentary workers experience a positive effect on health by increasing their LTPA.

Comparing Alternative Policy Mechanisms to Promote Healthy *and* Environmentally Sustainable Diets

PRESENTER: **Cherry Law**, London School of Hygiene and Tropical Medicine

AUTHORS: Michela Faccioli, Nicolas Berger, Catherine Caine, Richard Smith, Ian Bateman

Food taxes, such as on soft drinks, are shown to have the potential to impact on dietary behaviours associated with non-communicable diseases. Research in this area is dominated by modelling single food or nutrient tax strategies, with few studies of combinations of taxes or other measures such as education and information provision. This omission becomes crucial where dietary choices can result in multiple externalities affecting both the individual, such as personal health implications, and wider society, in the form of environmental impacts such as greenhouse gas emissions. Policies aimed at promoting human health can either reinforce or conflict with those promoting environmental sustainability, highlighting the need for more comprehensive evaluation of different policies aimed at dietary transformation. For example, plant-based foods are generally good for health and the environment, but not all foods that have low emissions (e.g. sugary drinks and confectioneries) are also good for health.

To address this policy-relevant research gap, we employ a unique blend of revealed and stated preference data to critically assess the impacts on GBhouseholds' food and beverage purchases of different policy mechanisms aimed at achieving healthier and/or more environmentally sustainable diets. A large UK-representative household food purchase dataset is combined with a further large sample survey to examine a wide food choice environment combining present and potential future consumption patterns under different taxation, subsidy, and information scenarios. Applying Nutrient Profiling and carbon footprint information of these foods we assess consumer response to these fiscal and informational measures both in terms of their purchase decisions and corresponding health and emission implications.

From the collected data, we measure the level of total carbon emissions of the reported purchases of food products as well as the proportion of healthy to unhealthy food purchased for each scenario. These two indicators are then compared across scenarios to draw conclusions on the potential of each policy to improve health *and* reduce carbon emissions. We also estimate demand elasticities for each food product to generate economic (welfare) gains or losses from each policy scenario.

Daily Stressors and Food Choices: A Lab Experiment with Low-SES Mothers

PRESENTER: **Nicolai Vitt**, University of Bristol

AUTHORS: Michèle Belot, Jonathan James, Martina Vecchi

We investigate experimentally the effects of daily-like stressors on immediate and planned food choices, in a sample of low socioeconomic status (SES) mothers. We design a novel stress protocol that aims to mimic everyday stressors experienced by low socioeconomic status individuals. The protocol consists of budget and time allocation tasks to be performed under time and financial pressure. Immediate consumption is measured with in-laboratory consumption of low calorie and high calorie snacks; planned consumption is measured with an incentivized food shopping task. We find no evidence of a significant effect of the stressor on planned food consumption. We do find a notable increase in high-calorie snacking following the stress protocol but it is not precisely estimated. Overall, we find little support for the hypothesis that daily-life stressors induce unhealthy food choices.

Effect of Alcohol Abuse Consumption on Wages: Estimates for State of Goiás in Brazil

PRESENTER: **Larissa BARBOSA Cardoso**, UNIVERSIDADE FEDERAL DE GOIAS

AUTHORS: Lara Ramos, Sandro Eduardo Monsueto

BACKGROUND: The state of Goiás is one of the Brazilian states with the highest prevalence of alcohol abuse. In 2013, approximately 17% of individuals made harmful use of the substance. In addition to the damage caused to health, alcohol abuse increases the risk of traffic accidents, occupational accidents and generates losses in the labor market. These losses reflect less participation in the labor market or low productivity and, consequently, lower wages among abusive drinkers.

OBJECTIVES: The objective of this study is to estimate the effect of alcohol abuse on wages in the State of Goiás in Brazil.

METHODS: Using data from the 2013 National Health Survey - NHS, individuals were classified as heavy drinkers based on the number of doses consumed on a single occasion (men: 5 or more and women: 4 or more). The probit OLS two steps estimate was performed to explain the individual decision to drink a lot of alcohol and to correct the selection bias in the salary equation. We estimate the model by considering three selection equations that consider different combinations of covariates: i) religious activity, smoking and depression; ii) religious activity, depression and low esteem; and iii) religious activity, smoking, depression and low self-esteem. We consider the problem of endogeneity that can arise between alcohol abuse and income.

RESULTS: Alcohol abuse is more prevalent among individuals with an income between R $ 700 and R $ 1200. Overall, models findings show that alcohol abuse reduces wages by approximately 24 - 26% compared to non-heavy drinkers. Although the separate estimates for men and women are not significant, the results show that men who drink abusively have 25% lower salaries than those who non-heavy drinkers. For women, the penalty is 6p.p. lower than that observed among men. The results were not very sensitive to the different specifications of the selection equation.

CONCLUSION: This study shows that alcohol abuse imposes a salary penalty, which is not significant to men and women separately. In this manner, policies to control alcohol consumption in Goiás should be developed to reduce alcohol consumption and minimize this indirect cost of alcohol.

Understanding Long-Term Trends in Smoking Behaviour in England, 1972-2019: An Age-Period-Cohort Approach

PRESENTER: **Dr. Magdalena Opazo Breton**, The University of Sheffield

AUTHORS: Duncan Gillespie, Robert Pryce, Ilze Bogdanovica, Colin Angus, Monica Hernandez Alava, Alan Brennan, John Britton

Background and aim: In England smoking prevalence has been falling for many years, but there are still 5.9 million smokers and over 77,000 deaths attributed to smoking each year. It is essential to understand population subgroup patterns of smoking underlying the overall decline in prevalence so that new interventions and policies can be targeted effectively. Therefore, the aim of this work was to describe long-term trends in smoking behaviour, and to estimate an Age-Period-Cohort (APC) model to disentangle lifecycle, historical and generational patterns of individual smoking behaviour in the population of England.

Design: Population based retrospective study combining three nationally representative datasets to describe long-term period and age trajectories of birth cohorts' smoking behaviour, and an APC model to disentangle age, period and cohort effects from long term trends.

Setting: England between 1972 and 2019.

Participants: Individuals aged 18 to 80 years old grouped into 5-year birth cohorts from 1907-1911 to 1997-2001, and into 2-year survey periods from 1972-1973 to 2018-2019, using data from General Lifestyle Survey (GLF, 1972-1991), Health Survey England (HSE 1992-2013) and Annual Population Survey (APS, 2014-2019).

Main outcome measures: Current regular cigarette smoking.

Findings: We found a consistent age pattern of increasing smoking uptake up to around age 25 (at 25 years old OR 1.48; 95% CI: 1.41 to 1.46) followed by a sustained decline (OR at 90 years old: 0.06; 95% CI: 0.04 to 0.08), with some persistence around 36 to 42 years old. The odds of being a smoker have decreased almost linearly among successive time periods when compared to the period 1972-1973 (at 2018-2019 OR 0.30; 95% CI: 0.26 to 0.34). The odds have also decreased substantially among successive birth cohorts when compared to the birth cohort 1902-1906 (youngest birth cohort 1997-2001 OR 0.35; 95% CI: 0.74 to 0.88), with a larger decrease among birth cohorts 1927-1931 (OR: 0.81; 95% CI: 0.74 to 0.88), 1932-1936 1936 (OR 0.67; 95% CI: 0.63 to 90.74) and the two youngest birth cohorts, 1992-1996 (OR 0.44; 95% CI: 0.35 to 0.46) and 197-2001 (OR 0.35; 95% CI: 0.27 to 0.44).

Conclusions: The study combines three data sources to create the most extensive APC analysis of smoking behaviour in England reported to date. Our results are especially relevant in the context of the latest Tobacco Control Plan for England, and its target of creating a smokefree generation by 2022, and suggest that UK tobacco control policy has delivered substantial reduction in smoking uptake, with a relatively smaller effect on the lifetime likelihood of quitting smoking.

Standardised Packs and Larger Health Warnings: Visual Attention and Perceptions Among Colombian Smokers and Non-Smokers

PRESENTER: **Carlos Sillero Rejon**, University of Bristol

AUTHORS: Osama Mahmoud, Ricardo M Tamayo, Sally Adamas, Olivia M Myanard

Aims

Through two experiments (eye-tracking and discrete choice), we examined how the type of cigarette packaging (standardised packaging and branded packaging) and the size of the health warning labels affected visual attention and preferences among Colombian smokers and non-smokers.

Design

To explore visual attention to health warnings in comparison to branding information on cigarette packets, we used an eye-tracking experiment with a mixed model design with warning size (percentage of the cigarette pack covered by the health warning: 30%-version 1, 30%-version 2, 50%, 70%) and branding (standardised packaging, branded packaging) as within-subject factors; and smoking status (non-smoker, weekly smoker, and daily smoker) as a between-subject factor. To examine the impact of warning size, branding, and brand name on preferences to try, expected taste preferences and harm perceptions, we designed a series of forced and non-forced discrete choice experiments with factorial and optimal designs for the estimation of the main effects and branding $_x$ brand name interaction.

Setting

Eye-tracking laboratory, Universidad Nacional de Colombia, Bogotá, Colombia.

Participants

For both types of experiments, participants (n =175) were Colombians aged between 18 to 40 years. Participants were either non-smokers, weekly smokers, or daily smokers.

Measurements

For the eye-tracking experiment, our primary outcome measure was the number of fixations towards health warning and branding. We also measured the duration of fixations and the first fixation. For the discrete choice experiments, outcome measures were preferences to try, taste perceptions and harm perceptions.

Findings

For the eye-tracking experiment, the principal analysis was a 4 (health warning size: 30%-version 1, 30%-version 2, 50%, 70%) $_x$ 2 (branding: branded and standardised packaging) $_x$ 3 (smoking status: non-smoker, weekly smoker, daily smoker) mixed model MANOVA of the three outcome variables. Results showed greater visual attention to warning labels on standardised than branded packages (F(3,167)=22.87, p<.001, η_p^2=.29) and when health warnings labels were larger (F(9,161)=147.17, p<.001, η_p^2 =.89). As health warning size increased, the difference in visual attention to warnings between standardised and branded packaging decreased (F(9,161)=4.44, p<.001, η_p^2=.2). Finally, non-smokers visually attended towards the warnings more than smokers, but as warning size increased these differences decreased (F(6,334)=2.92, p=.009, η_p^2=.05). For discrete choice experiments, conditional logit models were used to estimate the main effects and the interaction on each outcome for forced and non-forced experiments. We also adjusted our models for smoking status, age, and gender. Forced discrete choice experiments showed that increasing the warning size by 10% reduced the preferences to try by 17%, taste perceptions by 12% and harmfulness perceptions by 17%. Standardised packaging (in comparison to branded packaging) reduced preferences to try by between 63%-66% (depending on the

brand name), taste perceptions by 67%-75% and harmfulness perceptions by 21%-45%. Non-forced discrete choice experiments provided similar results. These results were stronger among non-smokers, females, and younger participants.

Conclusions

These findings suggest that standardised cigarette packaging may reduce misleading perceptions about cigarette products in Colombia where these policies remain to be implemented.

Factors Associated with Flu Vaccine Take-up and the Role of Self-Reliant Health Attitudes and Flu Risk

PRESENTER: **Didem Bernard**, US Agency for Healthcare Research and Quality

AUTHORS: Thomas Selden, Zhengyi Fang

Background:

- The most recent nationally representative study of factors associated with flu vaccine take up to date is based on the 2009 National H1N1 Flu Survey. This study found that workers who have paid sick leave are more likely to get flu vaccine controlling for sociodemographic characteristics and industry and occupation.
- In addition to a wide range of socioeconomic characteristics, two important factors in vaccine take up are the likelihood of being infected and needing substantial care, and attitudes toward medical care and health. As proxies for flu risk, we include medical conditions considered high risk for flu and the presence in the household of other family members with such medical conditions. As proxies for attitudes we include, agreement with the following statements: "I do not need health insurance," and "I can overcome illness without help from a medically trained person." Another proxy for attitudes that we consider, among adults living with children, is whether their children had any vaccinations during the year.
- Determinants and patterns of flu vaccine take up among adults may have broader applicability to decisions regarding other vaccines, and may potentially inform efforts to promote take up of Covid-19 vaccination among the adult population.

Study Objectives:

- Examine the relation between flu vaccine take up among adults and a range of factors including self-reliant health attitudes, other measures of risk and socioeconomic characteristics.

Data and Methods:

- 2014-2016 Medical Expenditure Panel Survey, the latest years in which both flu vaccination and health-related attitude data are available.
- Multivariate logistic regressions for flu vaccine take up in the past twelve months among non-elderly adults (age 18-64) by health related attitudes and other socio-demographic variables.

Preliminary Results:

- In 2014-2016, 36.3% of adults, on average, got a flu vaccination. Adults without self-reliant health attitudes (i.e., ability to overcome illness without help from a medically trained person) are approximately 30 percent more likely to have flu vaccinations. Adults with diabetes, asthma, high cholesterol, emphysema, heart disease, cancer or high blood pressure are more likely to get flu shots, (ranging from 48 percent more likely for diabetes to 15 percent more likely for high blood pressure). Adults living in households with other family members with one of these priority conditions are 16 Berpercent more likely to get flu shots compared to adults living in households in which no family member has these conditions. Adults with children in the household with vaccination are approximately 40 percent more likely to have flu shots compared to all other adults. Presence of elderly adults in the household, having paid sick leave among workers and working in education, health and social service – related industries increase the probability of flu shots. Compared to Whites, Asians are more and Blacks and Hispanics are less likely to get flu shots. Adults with a usual source of care are approximately 50 percent more likely to get flu shots.

Opioid and Non-Opioid Analgesic Prescribing before and after the CDC's 2016 Opioid Guideline

PRESENTER: **Didem Bernard**, US Agency for Healthcare Research and Quality

AUTHORS: William Encinosa, Thomas Selden

Importance: Recent federal and state interventions to reduce opioid prescribing have changed the treatment of pain in the U.S.

Objective: To determine how the CDC Guidelines and state opioid reforms affected opioid use and non-opioid analgesic use among those with chronic pain.

Design: Retrospective cohort study of adults from the Medical Expenditure Panel Survey (2014-2017) files. We use a multi-event study analysis with state fixed effects, separately for adults with and without chronic pain treatment.

Setting: Nationally representative data for the civilian noninstitutionalized population.

Participants: All adults without cancer, comparing those with and without chronic pain.

Measurements. Exposures: Announcement of the CDC Guidelines. State reforms including comprehensive Prescription Drug Monitoring Programs, Pill Mill laws, and limits on the quantity of opioids. Main Outcomes: Initiation of opioid treatment, persistence of use, tapering among long-term opioid users, and substitution of non-opioid prescription analgesics.

Results: An average of 28 million adults have chronic pain treatment during the year. The percent with opioid use is 38% and 9.5% for adults with and without chronic pain treatment, respectively. State reforms decreased new opioid starts by 20% (p=.14) for those with chronic pain and by 25% (p=.05) for those without chronic pain. The CDC Guidelines increased opioid discontinuations for those with and without chronic pain (p=.01). Among opioid discontinuers with chronic pain, the CDC Guidelines increased non-opioid-only analgesic use by 66% (p=.03), and by 131% (p=.05) for long-term users. For long-term opioid users with chronic pain who did not discontinue, the CDC Guidelines were associated with tapering of the number of opioid prescription fills (p=.01).

Limitations: We do not observe illicit use of opioids.

Conclusions: The CDC Guidelines fulfilled their main goal of shifting treatment for non-cancer chronic pain away from opioids and towards non-opioids, while state reforms reduced only the initiation of opioids, without affecting chronic pain patients already using opioids.

The Effect of Mental Health on Social Capital: An Instrumental Variable Analysis

PRESENTER: **Michael Lebenbaum**, University of Toronto

AUTHORS: Audrey Laporte, Claire de Oliveira

Although a large body of literature has examined the effect of social capital on health and theoretical models suggest a reciprocal relationship between the two variables, there are relatively few studies that have investigated the effect of mental health on social capital. This paper evaluates the impact of mental health on the stock of social capital using data from the cross-sectional Canadian Community Health Survey – Mental Health edition. Mental health was measured retrospectively as self-rated mental health, past year mental health conditions, and past 30-day psychological distress (K6). Given the reciprocal relationship, we used an instrumental variable approach with family history of mental

health problems as the instrument and examined forms of social capital – sense of belonging and workplace social support – that are largely measures of social capital provided by non-family members in the community and workplace. There are large and significant associations, which persist in the instrumental variable analyses, between measures of mental health and both outcomes. These findings highlight the urgent need for policy makers to implement greater prevention and treatment of poor mental health and greater support for individuals with poor mental health to build and maintain their social capital.

Assessing the Long-Term Impact of Severe Chronic Depression on Labor Market Outcomes. Evidence from French Longitudinal Register Data

PRESENTER: **Quentin Cau**, Institute for Research and Information in Health Economics (IRDES)

AUTHORS: Coralie Gandré, Pascale Lengagne

Severe mental illnesses have huge detrimental consequences on individuals' social and economic conditions and are associated with large and growing social welfare expenditures. The literature shows that, among the working age population, these illnesses yield a significant risk of long term employment exit and permanent entry into disability insurance schemes. However, the long-term impact of severe mental illnesses on labor market outcomes remains a relatively undocumented issue so far. Our study focuses on the effect of severe chronic depression diagnosed in adulthood and leading to inclusion in the chronic illness insurance scheme of the Statutory Health Insurance (SHI) fund on labor market outcomes several years after in the entry into this scheme. We use register data from the French General Retirement Insurance scheme of private-sector employees matched at the individual level with register data from the SHI. The outcomes are employment status, annual employment earnings and disability beneficiary status observed six years before the entry into the chronic illness scheme and seven years after.

The population of interest, aged 25 to 60 at the date of entry into the scheme, has a work history before this date, and therefore has initial employment attachment. Persons eligible to the scheme are patients having a disease assessed as inducing major functional consequences affecting daily life and requiring costly long-term mental health treatment. The claim to the SHI is made by the gatekeeper physician in charge of the regular follow-up of the patient. The protocol established by this physician is only medical; it does not include the provision of employment support for facilitating return to work or job retention. Our empirical approach is based on a difference-in-difference method and individual fixed effects, with propensity score matching. We compare labor market outcomes of individuals entering into the scheme with a depression, to those who do not. We also stratify analyses by gender, age category and past employment career. We assess the potentiality that the entry into the scheme is driven by a reverse causality effect; to that end, we estimate effects of labor market outcome changes on the entry into the scheme. We perform analyses of the sensitivity of the results to omitted variable bias.

Findings indicate that employment rates and employment earnings decrease sharply after the entry into the scheme, with no sign of recovery over time, in all subpopulations. The negative effect of depression on employment rate is estimated to 42 percentage points over the next seven years. The magnitude in effect is markedly higher than for older people and particularly high for those with a discontinuous career before the entry into the long-term illness scheme. A large share of individuals with diagnosed depression moves to disability within the subsequent five years. Our results point out the need for coordinated health and labor policy intervention during the phase of SHI recognition of the disease, aimed at preventing subsequent permanent employment exit.

Effects of HIV on employment and mitigation through ART: Evidence from the HPTN 071(PopART) population

PRESENTER: **Julius Ohrnberger**, Imperial College London

Background: There is a reverse-causal relationship between HIV and employment. HIV can decrease employment probabilities through deteriorated health outcomes, while employment can affect HIV knowledge and risk-behaviours. Existing studies fail to establish the causal effect of HIV on employment. Neither assess existing studies the mitigation potential of anti-retroviral treatment (ART) and timing of ART initiation for this relationship. There is also a lack of understanding heterogeneities by gender and the mid- to long-term effects of this relationship.

Objective: We aim to fill these gaps in the literature. We build our analysis on panel-data from four survey rounds of the HPTN071 (PopART) population. PopART is the largest HIV universal test and treat cluster randomised trial to date. It was fielded in Zambian and South African communities between 2013 and 2018. We use a sample of 10,276 adults from Zambia and 7,665 adults from South Africa. Our outcome of interest is whether an individual is currently employed. The main explanatory variables are laboratory confirmed HIV-status, whether an individual is currently on ART, and the time since ART initiation. To establish the unbiased relationship of HIV with employment in the mid- to long-term, addressing reverse-causality and individual unobserved heterogeneity, we use the Andersen-Hsiao (A-H) estimator. The A-H estimator is a dynamic panel estimator applying internal instrumental variables and first-differencing. We further use sub-sample analysis for HIV-positives with the A-H estimator to understand the effect of ART and timing of ART on employment. To understand gender-heterogeneities of these effects, we re-estimate the models and fully interact the main explanatory variables with a gender indicator. All specifications are estimated separately for the South African and the Zambian sample and control for potential confounders of the relationship.

Results: HIV has a negative effect on employment. The effect varies by gender and country, with reduced employment probabilities for HIV-positives of 7% in Zambia and 11% in South Africa. We find gender-heterogeneities in employment for HIV-positives in South Africa, with HIV-positive females being 22% less likely to be employed than HIV-positive males. ART mitigates the negative relationship in Zambia with positive employment effects of 10% about 1-1.5 years after initiation. We find for South Africa negative employment effects for individuals within their first six months on ART (12.5%). ART-timing effects are heterogenous by gender, positive for Zambian females (10%) and South African males (37%) and negative for South African females (15%). Findings are robust to using a balanced sample, conditioning on the active labour force, and dropping individuals who are not currently on ART but were in the past.

Conclusion: Our analysis corroborates existing research identifying significant negative effects of HIV on employment. Different to existing research, we address reverse-causality, unobserved heterogeneity, and identify the mid- to long-term effects of this relationship. Our study is the first to show that ART can mitigate the negative relationship of HIV with employment. However, it is not a silver bullet and more needs to be done, especially to support HIV-positive females in South Africa at the early ART stage.

Thursday

6:30 AM –7:30 AM THURSDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: The Cost-Effectiveness of Obesity Prevention Interventions in Australia

SESSION CHAIR: **Jaithri Ananthapavan**, Deakin Health Economics

DISCUSSANT: **Marj Lucy Moodie**, Deakin University

Economic Evaluation of the Western Australian Livelighter® Mass Media Campaign

PRESENTER: **Jaithri Ananthapavan**, Deakin Health Economics

AUTHORS: Huong Tran, Belinda Morley, Ellen Hart, Kelly Kennington, James Stevens-Cutler, Steven Bowe, Paul Crosland, Marj Lucy Moodie

Background: Approximately 70% of Western Australians (WA) are affected by overweight or obesity, posing a considerable health and financial burden on society. Mass media campaigns have been recommended as a key component of a comprehensive public health approach to address overweight and obesity. The WA LiveLighter® campaign, funded by the WA Department of Health, has implemented a series of mass media advertising campaigns that aim to encourage the maintenance of a healthy weight through healthy lifestyle behaviours. LiveLighter® commenced in 2012 and there have been seven television-led phases of the campaign delivered in WA over 22 campaign periods (referred to as waves). This study aimed to assess the cost-effectiveness of the LiveLighter® campaign in preventing obesity-related ill health in the WA population from the health sector perspective.

Methods: The impact of an average LiveLighter® campaign delivered in three waves over 12 months for the WA population aged 25-49 years was assessed. Campaign effectiveness was estimated from a meta-analysis of campaign cohort studies that surveyed a representative sample of the WA population on discretionary food (sweet food and sugary drink) consumption one month prior and one month after campaign airing. The intervention effect on discretionary food consumption was assumed to last for the duration of the campaign. Campaign costs were derived from campaign invoices and interviews with Cancer Council WA staff, and adjusted to A$2017 values. The long-term health (measured as health-adjusted life years (HALYs)) and health care cost-savings resulting from reduced obesity related diseases as a consequence of reduced discretionary food consumption were modelled over the lifetime of the target population using a validated multi-state lifetable Markov model (ACE-Obesity Policy model). This model simulates the impact of changes in body mass index (BMI) on the incidence, prevalence, mortality and morbidity of nine obesity-related diseases. Sensitivity analyses tested: the impact of extending the effect of LiveLighter® to the whole adult WA population; alternative models of campaign delivery; and a shorter time horizon.

Results: The meta-analysis indicated a reduction in the consumption of sugary drinks by 0.78 serves per week (95% uncertainty interval (UI): 0.57; 1.0) and sweet food by 0.28 serves per week (95% UI: 0.07; 0.48). The 12 month intervention was estimated to cost approximately A$2.46 million (M) (95% UI: 2.26M; 2.67M) and resulted in an estimated reduction in average weight of 0.58 kilograms (95%UI: 0.31; 0.92), 204 HALYs gained (95%CI: 103; 334) and healthcare cost-savings of A$3.17M (95%CI: A$1.66M; A$5.03M) over the life of the study population. The mean incremental cost-effectiveness ratio showed that LiveLighter® was dominant (cost-saving and health promoting; 95%UI: dominant; A$7,703/HALY gained). The intervention remained cost-effective in all the sensitivity analyses conducted.

Conclusion: The LiveLighter® campaign is likely to represent very good value-for-money as an obesity prevention intervention in WA.

Cost-Effectiveness of an Intervention to Reduce Children's Sedentary Time and Increase Physical Activity: The Transform-Us! Cluster RCT

PRESENTER: **Vicki Brown**, Deakin University

AUTHORS: Lauren Sheppard, Jo Salmon, Lauren Arundell, Ester Cerin, Nicola Ridgers, Kylie D Hesketh, Robin M Daly, David Dunstan, Helen Brown, Jacqueline Della Gatta, Marj Lucy Moodie

Introduction: Increasing physical activity and reducing sedentary behaviour are important targets for obesity prevention intervention. This study aimed to determine the cost-effectiveness of a multi-arm primary school-based intervention (*Transform-Us!*) to increase physical activity and/or reduce sedentary time in 8-9 year old children.

Methods: Results from a cluster-randomised trial undertaken with children from 20 primary schools in Melbourne, Australia were used to estimate cost-effectiveness from a public-payer perspective. Participants were randomised by school to a: (i) sedentary behaviour arm (SB-I), (ii) physical activity arm (PA-I), (iii) combined arm (SB+PA-I); or (iv) control arm (C). The intervention incorporated a mixture of educational, pedagogical, behavioural, social and environmental strategies delivered in school and home environments. Intervention costs were collected contemporaneously, using researcher records and teacher time diaries. Effects were estimated by intervention arm for body mass index z-score (BMI-z) and sedentary time at 30 months.

Results were extrapolated to estimate the costs and outcomes of the intervention if delivered to 8-9 year old children attending Australian Government primary schools. A validated multi-state multiple-cohort lifetable model was used to estimate the obesity and physical activity-related health outcomes and healthcare cost-savings over the lifetime of the 2010 Australian population. Results were reported as health-adjusted life years (HALYs) saved and healthcare cost-savings from diseases averted. Sensitivity analyses were conducted, to estimate the impact on cost-effectiveness given variations in key parameters. Other factors considered important to decision-makers, but difficult to quantify within the analysis (e.g. intervention feasibility, sustainability), were presented alongside cost-effectiveness results.

Results: Participants in the SB-I intervention arm reported statistically significant effects relative to controls for BMI-z (-0.14 (95% UI -0.26 to -0.03)), and sedentary time (-62.8 minutes per weekday (95% UI -92.0 to -33.9)). Participants in the PA-I arm reported a statistically significant effect relative to controls for BMI-z (-0.13 (95% UI -0.24 to -0.03)). Cost-effectiveness was not estimated for the combined arm (SB+PA-I) as statistically significant effects were not reported for either BMI-z or sedentary time. Assuming wide-scale implementation, the PA-I and SB-I intervention arms were both "dominant", resulting in net health benefits and healthcare cost-savings if intervention effects were maintained over the lifetime. The PA-I intervention resulted in 60,780 HALYs saved (95% UI 15,007-109,413) and healthcare cost-savings of AUD$641M (95% UI AUD$165M-1.1B) over the lifetime. The SB-I intervention resulted in 61,126 HALYs saved (95% UI 11,770-111,250) and healthcare cost-savings of (AUD$654M (95% UI AUD$126M-1.2B)) over the lifetime. While the costs of the intervention are incurred upfront, the benefits in terms of healthcare cost-savings of obesity and physical activity-related diseases do not start to accrue until at least 20 years in the future and peak at around the time that the cohort of children reach 70 years of age. This highlights the importance of a lifecourse approach to obesity prevention in children, so that the longer-term health benefits may be realised.

Conclusions: The PA-I and SB-I *Transform-Us!* intervention arms offer significant potential for cost-effectiveness, and could lead to health benefits and healthcare cost-savings related to the prevention of chronic disease in later life.

Cost-Effectiveness of Scaling up a Whole of Community Intervention to Prevent Obesity in Pre-Schoolers Nationally: The Romp & Chomp Early Childhood Obesity Prevention Intervention

PRESENTER: **Huong Tran**, Deakin University, Deakin Health Economics

AUTHORS: Anagha Killedar, Andrew Tan, Marj Lucy Moodie, Alison Hayes, Boyd Swinburn, Melanie Nichols, Vicki Brown

Background: Romp & Chomp was a community-wide, multi-setting and multi-strategy obesity prevention intervention implemented in the City of Greater Geelong and Borough of Queenscliffe, Victoria, Australia (2004-2008). The intervention focused on improving eating and activity environments for children aged under five (n~12,000) via community capacity building and environmental changes in early childhood and care settings. While the intervention was effective in reducing body mass index (BMI), it is not known whether it represents good value-for-money if delivered nationally to all pre-school aged children in Australia. To have an impact at the population level, effective and cost-effective obesity prevention interventions need to be scaled-up and widely available. This study aims to assess the cost-effectiveness of scaling up the Romp & Chomp program to a national level, from a government funder perspective and measured against a no-intervention comparator.

Methods: The intervention cost included personnel, travel and intervention material costs. All costs were estimated in 2018 Australian dollars based on trial records of the quasi-experimental intervention and extrapolated to estimate the delivery cost to all Australian children aged under five in early care and education settings. The intervention was assumed to be in steady state, running at its full effectiveness potential. The Early Prevention of Obesity in Childhood micro-simulation model (EPOCH model) was used to estimate BMI trajectories to age 15 years based on within-trial BMI outcomes at age 3.5 years. Key outcomes were incremental cost-effectiveness ratios (ICERs; cost per BMI unit saved at age 5 years from within-trial results and at age 15 years from modelling results, cost per quality-adjusted life year (QALY) gained at age 15 years). Utility weights associated with child weight status informing the estimation of QALYs were obtained from a recent systematic review and meta-analysis. Healthcare costs of participants to age 15 years were modelled following a 'top down' method, using administrative records of annual hospital, doctor and medical costs by age adjusted by weight status. All future costs and benefits were discounted using a 5% discount rate. Sensitivity analyses tested the impacts of intervention delivery modes, intervention costs and effects on cost-effectiveness results.

Results: Estimated total 3-year intervention cost was AUD177,536,705 and cost per child was AUD93. At age 5 years, the intervention resulted in 0.054 BMI units avoided. The ICER was AUD1,711 per BMI unit avoided. At age 15 years, the intervention resulted in 0.069 BMI units avoided and 0.003 QALYs gained per child. The ICER was AUD1,126 per BMI unit avoided and AUD26,399 per QALY gained, with a 64% probability of being cost-effective using the AUD50,000 per QALY threshold. The intervention was cost-effective in all sensitivity analyses except under sensitivity analysis 1, assuming all intervention costs borne by the 4-5 years and a 'worst-case' scenario, assuming a lower impact on BMI and higher intervention cost.

Conclusions: Romp & Chomp has a fair probability of being a cost-effective early childhood obesity prevention intervention when delivered nationally. The intervention should be considered as part of a package of interventions to reduce the prevalence of obesity in children.

Financial Incentives for Weight Loss By Private Health Insurers: A Cost-Effectiveness Study

PRESENTER: **Phuong Nguyen**, Deakin University

AUTHORS: Steven Bowe, Gary Sacks, Jaithri Ananthapavan

Background Many Australian Private Health Insurers (PHIs) offer subsidises for commercial weight loss programs (WLPs) for members with extras cover. Systematic reviews have shown that financial incentives added to WLPs result in increased participation and weight loss compared to programs without financial incentives. However, the effect of incentives on the maintenance of weight loss remains unclear, and there is limited evidence of the value for money of financial incentives designed to promote weight loss. This study aimed to assess the cost-effectiveness of PHI-provided financial incentives for weight loss from a societal perspective in Australia.

Methods The intervention was a PHI-provided WLP coupled with financial incentives for weight loss for members who are overweight or obese. The intervention involved a six month WLP during which a monthly incentive of $50 was provide if weight loss goals were achieved and an annual incentive of $200 over 5 years contingent on maintaining body weight goals. A network meta-analysis was conducted to estimate intervention effectiveness. The current practice comparator was defined as a combination of usual care (40% of the eligible population seeking weight management advice from a general practitioner; 18% attending commercial WLPs; and 42% taking no action to reduce weight). PHI costs included participant recruitment, WLP fees, financial incentives and administration. Participant travel and time costs and out-of-pocket costs to purchase healthier foods were included. It was assumed that completers met their weight loss goals while the incentives were in place, but regained weight (13% annually, informed by longitudinal WLP studies) once the financial incentive ceased. A Markov model was used to estimate the long term health and economic impact of changes in body weight over the lifetime of the 2010 Australian population. This model simulates the impact of changes in body weight on the incidence, prevalence, mortality and morbidity of nine obesity-related diseases. Sensitivity analyses tested the impact of different rates of weight regain and varied definitions of the intervention comparator.

Results The network meta-analysis showed that WLP with incentives resulted in: 2.19kg weight loss compared to WLPs without incentives; 7.01kg weight loss compared to usual care; and 8.83kg weight loss compared to do-nothing. The intervention resulted in weight loss per participant of 6.87kg (95% UI) after 5 years compared to current practice, resulting in 140,703 Health Adjusted Life Years (HALYs) gained and healthcare cost savings of $752 million. Total incremental costs were estimated to be $1.94 billion with 37% of that cost borne by PHIs and 66% by participants and 3% cost savings for the healthcare sector. The mean ICER was $8,689 (95% uncertainty interval: $695; $19,399) per HALY gained. When it was assumed that the incentives ceased and weight regain started after 1 year, the program remained cost-effective with a mean ICER of $17,636 ($4,845; $39,041) per HALY gained.

Conclusion The intervention is cost-effective from a societal perspective, however, the equity impact needs to be considered as the invention was limited to those with private health insurance and involved substantial out-of-pocket payments by individual.

6:30 AM – 7:30 AM THURSDAY [Cross-Cutting Themes And Other Issues]

HEALTH PREFERENCE RESEARCH SIG SESSION: Pandemics and Preferences/ Methods in Stated Preference Research

MODERATOR: **Jason J Ong**, Monash University

Test-Retest Reliability of 'Best' and 'Worst' Scaling Choices for the EQ-5D-Y: Comparison of Adult and Adolescent Preferences

PRESENTER: **Xiuqin Xiong**

AUTHORS: Kim Dalziel, Li Huang, Oliver Rivero-Arias

OBJECTIVES: Critical questions remain as to differences in adult and adolescent preferences for health states described by the EQ-5D-Y. Information is lacking as to how young children can contribute reliable and valid preferences. There is no existing research comparing the test-retest reliability of adult compared to child reported preferences.

METHODS: A Best Worst Scaling (BWS) experiment was conducted in Spain using health states constructed from the EQ-5D-Y. A general population sample of 1006 adults, and 1000 adolescents (aged 11 to 17 years) completed the first BWS survey online. We compare the test-retest reliability of 'best' and 'worst' ratings. We used count method (BWS scores were calculated using the number of times a level was selected as best minus number of times it was selected as worst) to calculate BWS scores and its normalization. We calculated total scores and dimensions scores for each person. The intra-class coefficient (ICC) of these scores were computed by an absolute agreement, two-way mixed effects model. We also used conditional logit model to estimate preferences to BWS responses.

RESULTS: 470 (47%) adults and 323 (32%) adolescents completed the identical repeat survey (average 2.93 days later for adolescents, 3.36 days for adults). Adolescents and adults consistently rated 'no pain and discomfort' most often as best in original and repeat surveys (Adolescents 49%, 54%, Adults 51%, 53%). Adolescents and adults consistently rated 'a lot of pain and discomfort most often as worst in original and repeat surveys (Adolescents 43%, 48%, Adults 44%, 46%). There were 57% of adults with exactly matched best choice and 53% with exactly matched worst choice. For adolescents, the percentages were 57% and 51% for best and worst choices respectively. The intra-class correlation (ICC) of total scores were similar in adolescents and adults, which were 0.48(95%CI: 0.39,0.56) and 0.48(95%CI:0.40, 0.54). There were not notably differences by year of child age. The ICCs were around the threshold of acceptability (0.50). The conditional logit models also showed that both adolescents and adults consistently rated 'pain and discomfort' as the most important dimension in the original and repeated surveys. The regression coefficients of the original and the repeated survey had good correlation (r>0.9) for both adults and adolescents (all and by age group: 11-12y, 13-14y, 15-17y), which added to the evidence of the reliability of BWS responses.

CONCLUSION: Concerns have been raised regarding the stability of utility values generated using BWS methods. In addition, little is known about how adolescent and adult preferences differ in reliability and how young children can reliably provide responses. This research indicates that repeat responses for the EQ-5D-Y for both adults and adolescents show re-test reliability. This will make critical contributions to gaps in current knowledge and will guide future decisions about how to best elicit preferences for child health utility instruments and the inclusion of children or young people in value sets.

Individual Preferences for COVID-19 Vaccination in China

PRESENTER: **Dr. Anli Leng**

AUTHORS: Elizabeth Maitland, Siyuan Wang, Stephen Nicholas, Rugang Liu, Dr. Jian Wang

Background: Vaccinations are an effective choice to stop disease outbreaks, including COVID-19. There is little research on individuals' COVID-19 vaccination decision-making. Besides, previous studies of vaccine uptake like hepatitis B virus and seasonal influenza identified various vaccine-specific factors that influence an individual's vaccination preferences, but there is no agreement on the importance of these vaccine-specific aspects on the willingness to vaccinate. Also, there is no consensus on whether vaccine-led herd immunity leads to higher vaccine acceptance through altruistic motives or hinders individual vaccinations through the free-rider problem. To our knowledge, this is the first study to estimate individual preferences for a COVID-19 vaccine and vaccine uptake probabilities using a DCE for a nationally representative population in China.

Objective: We aimed to determine individual preferences for COVID-19 vaccinations in China, and to assess the factors influencing vaccination decision-making to facilitate vaccination coverage.

Methods: A D-efficient discrete choice experiment was conducted across 6 Chinese provinces selected by the stratified random sampling method. Vaccine choice sets were constructed using seven attributes: vaccine effectiveness, side-effects, accessibility, number of doses, vaccination sites, duration of vaccine protection, and proportion of acquaintances vaccinated. Conditional logit and latent class models were used to identify preferences.

Results: Although all seven attributes were proved to significantly influence respondents' vaccination decision, vaccine effectiveness, side-effects and proportion of acquaintances vaccinated were the most important. Number of doses and vaccination sites were the least significant attributes. We also found a higher probability of vaccinating when the vaccine was more effective; risks of serious side effects were small; vaccinations were free and voluntary; the fewer the number of doses; the longer the protection duration; and the higher the proportion of acquaintances vaccinated. Besides, higher local vaccine coverage created altruistic herd incentives to vaccinate rather than free-rider problems. The predicted vaccination uptake of the optimal vaccination scenario (e.g. vaccine effectiveness of 85% ,1/100000 risk of severe side-effects, free and voluntary vaccinations, one dose, third level vaccination sites, protection duration of 2 years and 90% of acquaintances vaccinated) in our study was 84.77%. Compared with free vaccinations, charging for the vaccine reduced for 70% of the respondents their utility of vaccinating, resulting in a lower probability of vaccinating. Furthermore, preference heterogeneity was substantial. Individuals who were older, had a lower education level, lower income, higher trust in the vaccine and higher perceived risk of infection, displayed a higher probability to vaccinate.

Conclusions: Preference heterogeneity among individuals should lead health authorities to address the diversity of expectations about COVID-19 vaccinations. To maximize COVID-19 vaccine uptake, health authorities should promote vaccine effectiveness; pro-actively communicate the absence or presence of vaccine side effects; set the price of the vaccine within a reasonable range; and ensure rapid and wide media communication about local vaccine coverage.

Exploring the Trade-Off between Economic and Health Outcomes during a Pandemic: A Discrete Choice Experiment of Lock-Down Policies

PRESENTER: **Kathleen Manipis**

AUTHORS: Deborah Street, Paula Cronin, Rosalie Viney, Stephen Goodall

Background

All countries experienced social and economic disruption and threats to health security from the COVID-19 pandemic in 2020, but the responses in terms of control measures varied considerably. While control measures, such as quarantine, lock down and social distancing reduce infections and infection-related deaths; they have severe negative economic and social consequences.

Objectives

To explore the acceptability of different infectious disease control measures, and examine how respondents trade-off between economic and health outcomes.

Methods

A discrete choice experiment was developed, with attributes covering: Control restrictions, duration of restrictions, tracking, number of infections and of deaths, unemployment, government expenditure, and additional personal tax. A representative sample of Australians (N=1,046) completed the survey, which included eight choice tasks. Data were analysed using mixed logit regression and latent class models.

Results

In general respondents had strong preferences for policies that avoided high infection-related deaths, although lower unemployment and government expenditure was also considered important. There was a significant preference for a shorter duration for restrictions, but the preferences did not vary significantly for particular control measures. Interestingly, respondents preferred tracking by mobile phone or bracelets to no tracking. Significant preference heterogeneity was identified, with two distinct classes: Class 1 (57%) preferred the economy to remain open with some control measures, whereas Class 2 (43%), had stronger preferences for policies that reduced avoidable deaths.

Conclusion

This study demonstrates that the Australian population is willing to accept restrictions with negative economic and social consequences and relinquish some freedom, in the short term, to avoid the negative health consequences of a pandemic.

Is Simpler Better? A Comparison of Full and Partial Choice Set Designs in a Labelled Discrete Choice Experiment

PRESENTER: **Thao Thai**

AUTHORS: Gang Chen, Michiel Bliemer, Jean Spinks, Sonja de New, Emily Lancsar

Background: A default assumption of discrete choice experiments (DCEs) is that respondents evaluate all alternatives/attributes in a choice task to reach their choice outcome. A labelled DCE, while presenting more alternatives which can capture additional information, may increase the cognitive burden on respondents, hence may threaten the validity of preference estimates. To avoid the complexity of labelled choice tasks, a partial choice set design in which a subset of alternatives derived from a full choice set design including all possible alternatives was proposed. However, there has been no evidence on the impact of this design type on preference estimates and choice consistency.

Objectives: Using a nationwide survey to understand employment preferences of Australian pharmacy degree holders, this paper presents a comparison of the full and partial choice set designs regarding their performance of preference elicitation. This includes respondents' preference between the two design types regarding their perceived choice difficulty, order of design appearance, block effects, time spent to answer choice questions, and individual characteristics.

Methods: The labelled-to-unlabelled experiment reformulation method was used to generate a partial design of three alternatives from a full design of six alternatives. All alternatives were described by five attributes- job roles, work schedule flexibility, career development, geographic location and annual salary. A sample of 790 respondents were used with a block of three full design questions and a block of four partial design questions in a random order of appearance.

Results: The Swait-Louviere test shows that the different design types have significant impact on the underlying preference estimates. A subset of attribute parameters including flexibility, career development and salary show preference homogeneity across two data sets. The partial design produces larger willingness-to-pay estimates for the location attribute but smaller estimates for the role attribute as well as less choice variance, although the difference is small. A multinomial logit model on respondents' design preference shows that the full design was preferred if it appeared after the partial design and if respondents perceived the full design easy to answer. By contrast, the full design was less preferred if respondents perceived the partial design easier, used a smartphone to complete the survey ore were female.

Conclusion: This paper provides insights into the potential strengths and weaknesses of the partial choice set design and guides future research on the suitability of its use in different contexts.

Financial Implications of COVID-19 and Other Health Spending Issues

MODERATOR: **Jui-fen Rachel Lu**, Chang Gung University

Impact of Livelihoods Capital on Catastrophic Health Expenditure Among Patients with Critical Illness: A Cross-Sectional Study in Rural Shandong, China.

PRESENTER: **Xin Che**, Shandong University

AUTHOR: Jiajia Li

Background: Poverty caused by illness and the return to poverty due to illness remain a major challenge to poverty alleviation in rural China. Unlike those who depend on income, rural residents rely heavily on livelihood capital, including land, saving and social support, to cope with risk. The objective of this study is to examine how these livelihoods capitals affect the catastrophic health expenditure (CHE) based on a cross-sectional study in Shandong, China.

Methods: 1072 households with critical illness patients from 77 countries in Shandong Province were interviewed face-to-face in Shandong Province, 2019. Based on the sustainable livelihoods framework, human capital, natural capital, physical capital, financial capital and social capital was taken into consideration to explore whether livelihoods capital can effectively prevent families from the risk of catastrophic health expenditures. CHE was defined as out-of-pocket (OOP) payments that were greater than or equal to 40% of a household's discretionary spending. Households that did not sell productive and living assets due to the critical illness were screened to control the endogeneity of livelihoods capitals. Besides livelihood capital, control variables such as gender, marital status and critical illness insurance was included in the anylysis. Chi-square tests, t-tests and Binary logistic regression analysis were performed to identify the affect of livelihoods capital on CHE.

Results: The incidence of CHE for Chinese households were 75%. Health condition(patient) in human capital, agricultural acreage in natural capital, house property and household wealth index in physical capital, savings and loans in financial capital, and alimony in social capital had negative correlation with CHE in significance of $p<0.05$. . Among households with critical illness patients, those who were uninsured were less likely to experience CHE than those covered by critical illness insurance (OR=0.73, p=0.047). Households that has more agricultural acreage (OR=0.72, p=0.027), more house property (OR=0.52, p=0.032) and more household wealth index (OR=0.15, p=0.001) were less likely to occur CHE than their counterparts. On the contrary, households with no savings (OR=1.63, p=0.004), no loans (OR=1.47, p=0.026) and more alimony (OR=1.13, $p<0.001$) are more likely to experience CHE.

Conclusion: The results revealed that all five kinds of capital had significant effects on CHE.

Therefore, we should pay more attention to the rural households' ability to maintain their livelihoods. On the basis of meeting the basic material needs, they should be guided to strengthen health education, increase their income and improve credit environment thus improving their ability to resist disease risks. In addition, extending coverage and improving compensation from critical medical insurance could also alleviate CHE.

Keywords: disease burden; catastrophic health expenditure; sustainable livelihoods; critical illness

Exploring Options to Mitigate the Health Financing Impact of COVID-19 through Fiscal Space Analysis in Ebonyi State, Nigeria.

PRESENTER: **Chidinma Eneze**, The Palladium Group

AUTHORS: Olufunke Falade, Dr. Carlos Avila

BACKGROUND: Ebonyi State is located in the south-east region of Nigeria, with a population of 3.2 million. Annual government health funding in Ebonyi State has averaged US$6.3 million over the last 5 years. Poor heath indices in the State are a result of health system gaps including inadequate financing. As part of strategies to reduce maternal, infant and under-5 mortalities, the State conducted a fiscal space analysis in 2019. The study identified potential pathways to mobilize up to US$ 25.1 million in annual resources for health, accruing from national, state, and local government sources. However, the economic impact of Covid-19 pandemic has made it imperative to review the assumptions and update the fiscal space projections to align with the current contexts.

METHODOLOGY: The Nigeria USAID-Integrated Health Program supported Ebonyi State's Ministry of Health to review and update the national GDP growth and revenue forecasts based on International Monetary Fund projections. With assumptions that GDP growth in Ebonyi State will be impacted in the same proportion as the national average. The State's revenue figures were adjusted to reflect the contraction in GDP and increased unemployment. The Covid-19 funding shocks were compared to our previously estimated baseline scenario of conservative and steady economic growth. The previous prediction of a state health earmarked budget commencing in 2020 was delayed to 2021 to account for dwindling state revenues. Expected private sector contributions to health were downgraded to baseline scenarios.

RESULTS: The updated fiscal space projections for Ebonyi State show that US$111.6 million, 20% less than the original US$138.8 million, could be available from 2021 to 2024. The results are based on projections of a 4.3% contraction in national GDP in 2020 and an increase to 2.5% annual growth from 2022 onwards. In fact, 66% (US$18 million) of the reduction in fiscal space is attributable to federal level impacts. The fiscal space analysis also identified cost saving strategies of public health resources in Ebonyi State. Implementing efficiency measures in the areas of human resources and procurement of medicines are critical to mitigate the impacts of Covid-19. If pursued strategically, these two strategies could account for up to US$10.5 million in repurposed resources over the next 4 years.

CONCLUSION: Fiscal space projections are an important tool for planning, funding predictability, and sustainability of health programs. However, it must be continuously updated and analyzed in line with economic dynamics and contextual policies. Given the levels of unemployment and poverty, the economic downturn will have lasting effects at the state level. The analysis demonstrates that increased efficiency in the execution of health spending is imperative for state governments in Nigeria as they grapple with the after-effects of Covid-19. Recovering from the Covid-19 pandemic in Nigeria will require robust investments in health in order to foster economic growth.

A Review of Health Financing Policy Responses to COVID 19 in the South East Asia Region

PRESENTER: **Thomas Gadsden**, The George Institute for Global Health

AUTHORS: Belinda Ford, Hui Wang, Valeria De Oliveira Cruz, Tsolmongerel Tsilaajav, Stephen Jan

Background:

COVID-19 imposed unprecedented financing requirements on countries to rapidly implement effective prevention, control and response measures while dealing with severe economic contraction. The challenges were particularly acute for the 11 countries in the WHO South East Asia Region (SEAR), home to over a quarter of the world's population, and with the lowest average level of public expenditure on health of all WHO Regions.

Aim:

To provide a comprehensive overview of the immediate health financing policy arrangements made by SEAR countries in response to the COVID-19 pandemic, in the initial six months of the outbreak from March to August 31, 2020.

Methods:

Information was collected through three channels: (1) responses collected by two WHO surveys, one on strategic purchasing and one on Public Financial Management; (PFM) (2) a review of peer-reviewed and publicly available information and; (3) an online survey of WHO country

office health financing focal points and two government representatives.

Information on the following five key domains was prioritised: financial protection measures against COVID-19 testing and treatment, broader social protection or assistance programmes, resource generation and allocation, strategic purchasing and/or PFM measures and benefit packages adjustments.

Findings

Free COVID-19 testing in public facilities was adopted by all SEAR countries except one (Bangladesh), yet eligibility by population group and risk status varied and changed over time. The private sector was a major party in the national response in several countries, but limited regulatory frameworks meant arbitrary pricing of COVID-19 tests and treatment was common, and price ceilings were needed as a control mechanism.

Unconditional cash transfer schemes were the most common form of social assistance, ranging from generous (Bhutan, Timor Leste) to small schemes, of limited duration (Sri Lanka) and, occasionally, built upon existing programs which were often inefficient in terms of eligibility and targeting (Bangladesh).

While some countries received substantial external funding (Bangladesh, India, Myanmar), others (Thailand) relied on extensive reallocation of domestic budget and in Timor Leste such reallocation was almost exclusively derived from a national wealth fund. In many cases, budget allocations appeared to prioritise economic stimulus packages and fiscal relief measures as opposed to the health sector and social protection schemes.

PFM adjustments were common, including the development of electronic payment systems to accelerate funding disbursements, reducing virement restrictions to rapidly reallocate domestic budget, and relaxing approval processes for appropriations.

Conclusion

The urgency for action in these early stages of the pandemic may have helped break-down institutional barriers to countries' paths to universal health coverage. The accelerated adoption of digital technologies, streamlined procurement systems, public-private partnerships, and increased investment in health security may leave an important legacy that highlights the political commitment needed to prioritise policies that promote UHC.

6:30 AM –7:30 AM THURSDAY [Specific Populations]

ECONOMICS OF GENOMICS AND PRECISION MEDICINE SIG SESSION: Evaluating Human and Pathogen Genomics

MODERATOR: **Zanfina Ademi**, Monash University

Early Cost-Effectiveness of Whole Genome Sequencing As Clinical Diagnostic for Patients with Inoperable Stage IIIB,C/IV Non-Squamous Non-Small Cell Lung Cancer

PRESENTER: **Mr. Martijn Simons**, MUMC+
AUTHORS: Valesca Retel, Bram Ramaekers, Rogier Butter, Joanne M. Mankor, Marthe S. Paats, Joachim G.J.V. Aerts, Zakile A. Mfumbilwa, Paul Roepman, Veerle M.H. Coupé, Carin A. Uyl-de Groot, Wim H. van Harten, Manuela A. Joore

Abstract

Background: Advanced non-small cell lung cancer (NSCLC) is characterised for harbouring many genetic aberrations that can be targeted with systemic treatments. Currently used molecular diagnostics are heterogeneous and targeted to a limited range of genetic aberrations. Whole genome sequencing (WGS) can detect all these (and possibly new) molecular targets, simultaneously. However, its added clinical value and cost-effectiveness as molecular diagnostic are not yet clear. The objective is to determine the early cost-effectiveness of using WGS in diagnostic strategies versus currently used molecular diagnostics in patients with inoperable stage IIIB,C/IV non-squamous NSCLC, from a Dutch healthcare perspective.

Methods: A probabilistic decision analytic model was created. A decision tree represented the diagnostic process and treatment selection, and a cohort state transition model (STM) disease progression. The STM had four health states: no progression, progression first line, progression second line, and death. Transitions of patients between the health states were modelled using one-month cycle lengths. Three diagnostic strategies were modelled: A, optimal standard of care (SoC); B, WGS; and C, SoC followed by WGS. A societal perspective was adopted, and the model had a lifetime time horizon. Treatment effectiveness was based on a systematic review and modelled using parametric survival models. The incremental cost-effectiveness ratio (ICER) and net monetary benefit (iNMB) were calculated, and sensitivity analyses were performed. The potential cost-effectiveness of WGS was explored with threshold analyses, using a willingness to pay (WTP) threshold of €80,000 per quality adjusted life year (QALY), as advised for this patient population in the Netherlands.

Results: The discounted total costs and QALYs per patient were: €145,590 and 1.236 for strategy A, €147,129 and 1.238 for strategy B, and €146,643 and 1.234 for strategy C. Strategy B and C were not cost-effective compared to strategy A (ICER A versus B: €659,045/QALY; ICER A versus C: *dominated*). Results of the deterministic sensitivity analysis showed that univariate parameter uncertainty had only a minor influence on the estimated iNMB. The cost of WGS and cost of SoC had the most influence but none changed the conclusion of the cost-effectiveness analysis. Probabilistic sensitivity analysis showed that strategy B and C had a 2.0% and 0.0% chance to become cost-effective compared to strategy A, respectively, considering a WTP threshold of €80,000 per QALY. Threshold analysis showed that if WGS costs €2,000, it needs to identify a proportion of 2.7% of patients with actionable targets to become cost-effective (assuming that treating these additional patients costs €10,000 per month). Increasing the treatment effect on overall survival and progression free survival of the targeted therapies for treating these additional patients, decreased the probability of cost-effectiveness if treatment costs were above €4,069 per month.

Conclusions: Our analysis shows the potential early cost-effectiveness of WGS compared to optimal SoC if the cost decreases and more patients with actionable targets are detected. This cost-effectiveness model can be used iteratively to incorporate new findings in the future, to support ongoing decision making regarding the position of WGS in this quickly evolving field.

Cost-Effectiveness Analysis of Whole Genome Sequencing during an Outbreak of Carbapenem-Resistant *Acinetobacter Baumannii*

PRESENTER: **Thomas Michael Elliott**, QIMR Berghofer
AUTHOR: Louisa G Gordon

Background:

Carbapenem-resistant *Acinetobacter baumannii (CRAB)* are a frequent cause of hospital outbreaks with infection rates 2- to 5-fold higher in intensive care units. Whole genome sequencing (WGS) provides greater precision to identify bacteria compared with conventional typing methods. WGS is first cultured from a patient sample and can be used to detect outbreaks and reconstruct transmission routes. WGS shotgun metagenomics (SMg) sequences the entire genetic content straight from the sample. Since time to diagnosis is not always shortened with SMg, the diagnostic advantages lie in the ability to detect unsuspected, uncultivatable, or very slow-growing organisms, which produce negative results with standard assays. A frequent challenge with SMg, the overwhelming amount of human DNA in patient samples, is not an issue when used on environmental samples. There is a lack of evidence for cost-effectiveness of WGS or SMg in outbreak management. We evaluated

the clinical and economic effects of early use of WGS on patient samples and SMg on environmental samples in a large metropolitan hospital setting.

Methods:

Using the modelling software, AnyLogic©, we built a hybrid agent-based and discrete-event simulation model to examine pathogen transmission, environmental contamination, associated hospital costs and quality-adjusted life years (QALYs) during a 32-month outbreak of CRAB. Over three periods, active transmission of 17, 8 and 11 Subtype1050 CRAB cases were identified between May to August 2016, September 2016 to August 2017 and May to August 2018, respectively. Environmental contamination was a major contributor to continued spread of CRAB. Model parameters were determined using three years of microbiology surveillance data and hospital admission data (April 2016 to January 2019), two years of genome sequencing results (December 2017 to December 2019), local clinical knowledge and published literature. Model outcomes were aggregated from events that emerged from the interacting processes of 'patient flow dynamics', 'pathogen transmission dynamics', and 'outbreak control team decisions'. The model was calibrated to the actual pathogen spread within the intensive care and burns units (Scenario 1) and compared with early use of WGS (Scenario 2) and early use of WGS and SMG (Scenario 3) to determine their respective cost effectiveness. Sensitivity analyses were performed to address model uncertainty.

Results:

Scenario 2, compared with Scenario 1, on average resulted in 12 fewer patients with CRAB, 63 additional QALYs and AU$65,952 in hospital cost savings. Scenario 3, compared with Scenario 1, resulted in 17 fewer patients with CRAB, 79 additional QALYs and AU$96,182 in hospital cost savings. The likelihood that Scenario 2 and Scenario 3 were cost-effective at a willingness-to-pay threshold of AU$50,000 per QALY gained was 59% and 61%, respectively. SMg and WGS were relatively small fractions of total hospital costs (~<2%). When plausible alternative values for critical parameters were used in the model, hospital cost savings and increases in QALYs were retained.

Conclusions:

The use of WGS and SMg in infection control processes were predicted to produce favourable economic and clinical outcomes, by decreasing hospital costs and increasing patient QALYs.

Budget Impact Analysis of Routinely Using Whole-Genomic Sequencing of Six Multidrug-Resistant Bacterial Pathogens in Queensland, Australia

PRESENTER: **Thomas Michael Elliott**, QIMR Berghofer

AUTHOR: Louisa G Gordon

Introduction:

Healthcare-associated infections (HAIs) are the most common complications in hospitalised patients in Australia. The associated economic burden is enormous resulting in longer hospital stays, higher treatment costs and in severe cases, intensive care unit stays and bed closures. Whole-genome sequencing (WGS) of pathogens can identify genetically related isolates, confirm or refute suspected related cases of infectious pathogens, discriminate between different strains, and classify novel pathogens. Currently, usual laboratory tests to confirm infectious pathogens do not provide this granular information on different strains. The purpose of this study was to undertake a 5-year budget impact analysis of WGS surveillance using an epidemiological approach. We predicted the effects of routine use of WGS of bacterial pathogens on healthcare costs and compared with the corresponding effects of standard of care.

Methods:

The budget impact analysis compared WGS surveillance of six common multidrug-resistant organisms (MRO) (methicillin resistant *Staphylococcus aureus*, extended spectrum β-lactamase producing (ESBL) *Escherichia coli*, vancomycin-resistant *Enterococcus faecium*, ESBL-producing *Klebisella pneumoniae*, carbapenemase-producing *Enterobacter specie* and carbapenem-resistant *Acinetobacter baumannii*) with standard of care or routine microbiology testing. Parameters associated with WGS-surveillance and detection of clusters were estimated from 1,783 sequenced isolates from 27 hospitals across Queensland (between December 2017 and December 2019). Clustering was evident in all six pathogens and isolates within these clusters demonstrated a high probability that pathogen transmission occurred between patients in the hospital. Other model inputs were derived from hospitalisation data, epidemiological and costing reports, and included multidrug resistance rates and their trends. Expected hospital costs, counts of patient infections and deaths were calculated annually across five years from the base year 2020. Sensitivity analyses were performed to address parameter uncertainty

Results:

In 2021, 97,539 patients are expected to be infected or colonised with one of six MRO with standard of care testing. A strategy of WGS surveillance and earlier infection control measures could avoid 36,726 infected or colonised patients and avoid 650 deaths. Total costs under standard of care were AU$170.8 million in 2021. WGS surveillance cost an additional AU$26.8 million but was offset by fewer costs for cleaning, nursing, personal protective equipment, shorter hospital stays and antimicrobials to produce overall cost savings of AU$30.9 million in Year 1. Sensitivity analyses showed cost savings remained when input values were varied at 95% confidence limits.

Conclusions:

Compared with standard of care, WGS surveillance at a statewide level could prevent substantial numbers of hospital patients infected with MROs, related deaths and save healthcare costs. Primary prevention through routine use of WGS is an investment priority for the control of serious hospital-associated infections.

6:30 AM –7:30 AM THURSDAY [Economic Evaluation Of Health And Care Interventions]

Ageing and Chronic Conditions

MODERATOR: **Rachael Morton**, University of Sydney

Valuation of Informal Care Provided to People Living with Dementia: A Systematic Literature Review

PRESENTER: **Lidia Engel**, Deakin University

AUTHORS: Maja Ajdukovic, Jessica Bucholc, Nikki McCaffrey

Objectives: Informal care constitutes the main cost driver in dementia. However, the measurement and valuation of informal care remains methodologically challenging. The objectives of this review were to identify the methods used to value informal care provided to people living with dementia and to estimate the average hourly unit cost by valuation method.

Methods: A literature search in Medline Complete, CINAHL, PsycInfo, EconLit, EMBASE and NHS EED was undertaken. Following the screening of title, abstract and full text, characteristics of eligible studies were extracted systematically and analysed descriptively. The corresponding hourly cost estimates were converted into 2018 US dollars based on Purchasing Power Parities for Gross Domestic Product.

Results: A total number of 95 papers were included in this review from 2262 post-deduplication records. Three main valuation methodologies were identified: the proxy-good (n=44) and opportunity cost approaches (n=31), and stated-preference based on willingness to pay (n=3), with twelve studies using multiple methods and five studies not specifying the valuation method. The amount of informal care increased as the condition of dementia progressed, which was reflected in the cost of informal care. The average hourly unit cost used to value informal care was

$15.83 (SD=10.69). While the unit cost was around $14 per hour when using the opportunity cost or stated-preference methods, the highest unit cost was obtained when using the replacement cost method ($17.29, SD=11.38).

Conclusion: While costs of informal care should be considered when undertaking an economic evaluation or estimating the overall costs of dementia from a policy and priority-setting perceptive, further research into applying consist approaches to valuation is warranted.

Economic Evaluation of Collaborative Orthogeriatric Care for Patients with Hip Fracture in Germany: A Retrospective Cohort Study Using Health and Long-Term Care Insurance Claims Data

PRESENTER: **Claudia Schulz**, University Medical Center Hamburg-Eppendorf

AUTHORS: Dr. Christian Brettschneider, Dr. Hans-Helmut Koenig

Existing evidence suggests benefits of collaborative orthogeriatric care (COC) for geriatric hip fracture patients. Yet, COC may comprise different components, and evidence on cost-effectiveness is limited and based on rather small datasets. The aim of our study was to conduct an economic evaluation of the German COC for hip fracture patients compared to usual care. In Germany, COC due to a hip fracture is provided as a hospital treatment by a multidisciplinary team headed by a geriatrician and delivered on an orthopaedic or geriatric ward, including comprehensive geriatric assessments and inpatient rehabilitation starting few days after surgery.

This retrospective cohort study was based on German health and long-term care insurance claims data for the years 2012-2015. Patients were selected when aged 80 years or older, sustained a hip fracture in 2014 and treated in a hospital providing COC (intervention group) or usual care (control group). Health care costs from both payer and societal perspective, mortality, life years and quality-adjusted life years (QALYs) gained were investigated within one year follow-up. QALYs were estimated based on care dependency after hip fracture in terms of German care level. Due to the lack of randomization, we used entropy balancing to reweigh patient and hospital characteristics between groups during the two years before fracture. Weighted gamma, logistic and two-part models were applied. We calculated incremental cost-effectiveness ratios (ICER) and employed the net-benefit approach.

14,005 patients were treated in COC, and 10,512 in other hospitals. Total average health care costs per patient were higher in the COC group: EUR 951.72 ($p<.001$) from a payer perspective, and EUR 1,275.35 ($p<.001$) from societal perspective. Costs were mainly driven by inpatient treatment and long term care. Mortality was lower in the COC (33.10%) than in the control group (37.27%). The ICER equalled 22,910.20 EUR/life years gained or 43,592.46 EUR/QALY from a payer, and 30,701.22EUR/life years gained or 58,416.86 EUR/QALY from a societal perspective. The probability for cost-effectiveness would be 95% if the society's willingness-to-pay (WTP) was at least 35,000 EUR/ life years gained or 65,000 EUR/QALY from a payer, and 40,000 EUR/ life years gained or 90,000 EUR/QALY from a societal perspective.

Survival and QALYs can be improved if patients are treated in hospitals providing COC, compared to hospitals offering treatment in traditional orthopaedic trauma wards. Opposite to former studies, costs were found to increase due to COC, mainly driven by inpatient and long-term care. The cost-effectiveness of COC compared to usual care depends on the society's WTP. The ICER is likely to improve with a follow-up period longer than one year.

Cost-Effectiveness Analysis from a Randomized Controlled Trial of Tailored Exercise Prescription for Women with Breast Cancer with 8-Year Follow up

PRESENTER: **Louisa Gordon**, QIMR Berghofer Medical Research Institute

AUTHOR: Sandi Hayes

Background: Physical activity is advocated by cancer organizations to reduce the impacts of symptoms and side-effects from cancer and its treatment. Evidence is emerging that physical activity also reduces breast cancer recurrence and mortality, and all-cause mortality. For women with breast cancer who have had chemotherapy or adjuvant radiotherapy, exercise can counteract the late effects of cardiotoxicity caused by damage to the chest and heart. Despite the mounting evidence on the health benefits of exercise interventions for breast cancer, relatively little is known about their economic value to inform decisions about wider uptake into routine care. The purpose of this study was to undertake a cost-effectiveness analysis using long-term 8-year follow-up data and take a broad societal perspective.

Methods: We undertook a Markov cohort model and modelled women with early stage breast cancer over their remaining lifetime. The measures of benefit used was quality-adjusted life years (QALYs) and life years. Costs and effects were aggregated in yearly cycles and compared across the exercise intervention and usual care groups. Data inputs were obtained from the 8-year *Exercise for Health* randomized controlled trial, supplemented with epidemiological, quality of life and healthcare cost studies. Outcomes were calculated from 5000 Monte Carlo simulations, and one-way and probabilistic sensitivity analyses.

Results: Over the cohort's remaining life, the incremental cost for the exercise versus usual care groups was $7,409 and QALYs gained were 0.35 resulting in an incremental cost per QALY ratio of AU$21,247 (95% Uncertainty Interval (UI): Dominant, AU$31,398). The likelihood that the exercise intervention was cost-effective at acceptable levels was 93.0%. The incremental cost per life year gained was AU$8,894 (95% UI Dominant, AU$11,769) with a 99.4% probability of being cost effective. Findings were most sensitive to the probability of recurrence in the exercise and usual care groups, followed by out-of-pocket expenses and the model starting age. Specifically, when the probability of recurrence in the exercise group was high (0.0125), the intervention would no longer be considered cost-effective.

Conclusion: This exercise intervention for women after early-stage breast cancer is cost-effective in the Australian healthcare setting and would be a sound investment of healthcare resources. Investing in prevention through prescribed regular exercise in this population should be a priority for cancer service providers.

Impact of COVID-19 Related Unemployment on Increased Cardiovascular Disease in a High-Income Country: Modelling Health Loss, Health Cost Burden and Health Equity

PRESENTER: **Nhung Nghiem**, University of Otago

AUTHOR: Nick Wilson

Background: Cardiovascular disease (CVD) is a leading cause of health loss and health sector economic burdens in high-income countries. Unemployment is associated with increased risk of CVD, and so there is concern that the economic downturn associated with the Covid-19 pandemic will increase the CVD burden.

Aims: This modeling study aimed to quantify health loss, health cost burden and health inequities among people with CVD due to additional unemployment caused by Covid-19 pandemic-related economic disruption in one high-income country: New Zealand (NZ).

Methods: We adapted an established and validated multi-state life-table model for CVD in the national NZ population. We modeled indirect effects (ie, higher CVD incidence due to high unemployment rates) for various scenarios of pandemic-related unemployment projections, for people aged 35-64 years by sex and ethnicity. This includes various scenarios, depending on the level of border restrictions and export services such as international tourism and education: (1) border restrictions easing in July 2021, (2) early recovery in export services, (3) extended border control, and (4) resurgence in community transmission. The unemployment rate was projected to vary between 4.8% and 9.0% over the 2020-2024 period. This equates to a relative increase of 20% to 125% in the unemployment rate due to the pandemic. The timeline for Covid-19 impact was for five years as per the NZ Treasury's projections, but a lifetime horizon was used for measuring benefits and costs (a five-year horizon was also implemented in scenario analysis).

Results: We estimated the CVD-related health loss in NZ to range from 23,300 to 36,900 QALYs (quality-adjusted life years) for the different unemployment scenarios. For the base case (best-estimate) scenario, health inequities for Māori (Indigenous population) were 3.7 times greater (49.9 QALYs per 1000 people) compared to non-Māori (13.5 QALYs per 1000 people). Māori men suffered the most health loss per capita (95.9 QALYs per 1000 people); however, the worst inequity impacts between Māori and non-Māori were seen in women aged 45-54 years across all scenarios (six fold difference). Inequities were exacerbated much more than the sum of existing inequities in CVD burden and

unemployment, ie, in some groups, Māori's CVD burden was increased to six times higher than that of non-Māori (compared to a double unemployment rate or CVD burden). The additional health costs due to higher CVD burden were NZ$276m to 458m in 2011 value (NZ$303m to 503m or US$209m to 346m in 2019 value) for the various unemployment scenarios.

Conclusions and policy implications: Unemployment due to the Covid-19 pandemic indirectly is likely to cause significant health loss and health costs from CVD in NZ. Furthermore, this burden exacerbates the health inequities in CVD for Māori due to higher background risks of CVD, and higher unemployment rates. Prevention measures should be considered by governments to reduce this risk, including job creation programs and measures directed towards CVD (eg, enhanced progress towards a smokefree country and reducing the hazardous food environment).

Keywords: CVD, unemployment, economic recession, Covid-19, New Zealand, health inequities, QALYs

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6:30 AM –7:30 AM THURSDAY [Special Sessions]

Student 2020 and 2021 Prize Winning Papers 2

MODERATOR: **Bruce Hollingsworth**, Lancaster University

Altruism Born of Suffering? The Impact of an Adverse Health Shock on Pro-Social Behaviour

PRESENTER: **Elaine De Gruyter**, Centre for Health Economics, Monash University

'Altruism born of suffering' (ABS) predicts that, following an adverse life event such as a health shock, individuals may become motivated to help others and act pro-socially. However, despite anecdotal support this has not been examined systematically. Using data from the United States Panel Study of Income Dynamics, we find that an adverse health shock does not lead to a general increase in pro-social behaviour; it neither causes people to start giving, nor does it spark an increase in donations across charitable causes. Instead, ABS is akin to a specific shock that affects giving to health charities. We find a significant increase in the probability of giving to health charities, with no change for other charity types. Accompanying this is an increase in amounts given to health charities, which comes at the expense of non-health, non-religious charities. The impact is greatest in the year after the health shock, attenuating thereafter.

Increase in Suicide Following an Initial Decline during the COVID-19 Pandemic in Japan

PRESENTER: **Takanao Tanaka**, Hong Kong University of Science and Technology

AUTHOR: Shohei Okamoto

There is increasing concern that the coronavirus disease 2019 (COVID-19) pandemic could harm psychological health and exacerbate suicide risk. Here, based on month-level records of suicides covering the entire Japanese population in 1,848 administrative units, we assessed whether suicide mortality changed during the pandemic. Using difference-in-difference estimation, we found that monthly suicide rates declined by 14% during the first 5 months of the pandemic (February to June 2020). This could be due to a number of complex reasons, including the government's generous subsidies, reduced working hours and school closure. By contrast, monthly suicide rates increased by 16% during the second wave (July to October 2020), with a larger increase among females (37%) and children and adolescents (49%). Although adverse impacts of the COVID-19 pandemic may remain in the long term, its modifiers (such as government subsidies) may not be sustained. Thus, effective suicide prevention— particularly among vulnerable populations—should be an important public health consideration.

Small Scale Rural Water Supply, Typhoid Eradication, and Human Capital Development

PRESENTER: **Yangkeun Yun**, UCLA

Small-scale water purification facilities are economically viable for developing countries with limited capital and skills and with a high proportion of rural population to supply safe drinking water. However, their effectiveness has been under-studied. Using the case of Korea in the 1960s, this study investigates the effects of small-scale water supply interventions on population health and human capital formation in the long term. By exploiting the timing and geographic variations in the installation of small-scale water facilities with a difference-in-differences approach, we estimate that the intervention substantially reduced the incidence of typhoid fever. Comparing the later educational attainments of cohorts from the Korean population censuses, we show that eliminating early-life exposure to typhoid fever was beneficial to human capital formation.

6:30 AM –7:30 AM THURSDAY [Specific Populations]

Early Life Shocks and Health Outcomes

MODERATOR: **Lisa Gold**, Deakin University

In Utero Weather Shocks and Birthweight: Evidence from Sierra Leone

PRESENTER: **Olukorede Abiona**, Centre for Health Economics Research and Evaluation (CHERE), University of Technology, Sydney (UTS)

Background: The body of literature on the impacts of weather shocks on birth weight excludes empirical evidence from Sub-Sahara Africa (SSA). Studies within the literature focus on pathway relating to the unique type of weather shocks adopted. The body of evidence is yet to address the interconnected nature of weather events on birth weight despite clarity regarding interdependence of empirical findings across studies. These gaps create important barriers for providing effective policy roadmap aiming to tackle the adverse effects of climate change in SSA.

Aim: The main objective of this paper is to provide evidence that extends the body of literature on the impacts of extreme weather shocks on birth outcomes in SSA. In the paper, we examine pre-determined weather shocks using styled contexts relating to birth outcomes. This way, the paper addresses both deficiencies in the research context and policy framework for SSA.

Data and Methods: We use two rounds of survey from the Demographic Health Surveys (DHS) for Sierra Leone focussing on rural households for the birth weight data for years 2008 and 2013, respectively. We link the survey data to 0.5 by 0.5 gridded precipitation and temperature data extracted from available weather stations within the University of Delaware (UDEL) weather data archive for years 1900 – 2017. This approach provides precise measures of weather events across districts over time. We employ Ordinary Least Square (OLS) and panel regression models to compare foetus exposed to weather shock to those not exposed using district level variation of shocks – reference precipitation and temperature to the norm. We use both birth weight and low birth weight indicator as outcome variables. Relying on the exogenous spatial variation of rainfall and temperature patterns for our identification strategy, we benchmark the diverse shock pathways by adjusting the reference point to capture maternal nutrition or food security, water scarcity, heatwaves, disease and infrastructural pathways respectively. To uncover further potential heterogeneity, we examine whether mothers who attend the antenatal care early are protected from the impacts of the weather events.

Results: Our findings uncover an interplay of pathways relating to the impact of extreme weather events on birthweight. We identify potential pathways such as maternal nutrition or food security, water scarcity and heatwaves, but could not establish results in support of the disease or infrastructural pathway. In particular, the effect of prenatal exposure to heatwaves persists across the three trimesters within gestation period. The heterogenous analysis shows that the established impacts are driven by births from pregnant women with none or late antenatal care visits.

Conclusions: The results in this paper provide an extensive evidence for important policy framework required in consideration of intervention programs targeting pregnant women in SSA. This paper also provides a unique context on weather and birth outcomes for a post-conflict setting using Sierra Leone that could be extrapolated to comparable fragile states. Apart from closing the existing regional gap for policy intervention purposes, this paper strengthens the methodology by utilising the local weather parameters associated with rural households.

War and Health: Long-Term Effects of Prenatal Exposure to Violence on Human Capital Formation

PRESENTER: **Seoni Han**, The Graduate Institute Geneva

Inequality at birth may persist throughout lifetime. This paper examines the impacts of an adverse shock in fetal development on subsequent human capital formation. We exploit temporal variations in prenatal exposure to violence using the Rwandan genocide in 1994 as a natural experiment. Prenatal exposure to the genocide is associated with selective mortality at birth or during early life in the short run, and human capital formation in the long run. The novelty of this paper is in its attempt to disentangle true scarring effects from effects due to selective mortality. Using a decomposition method, we compare the genocide and other cohorts by breaking down into the component resulting from difference in the characteristics of the two groups and the component from the outcome structure. The result confirms that the long term effect of in-utero shock would be biased if selective mortality is not adequately addressed.

The paper first investigates whether intrauterine exposure to violence has long term detrimental effects on education and health by comparing the cohort who were in utero during the genocide and other cohorts who were in gestation before and after the atrocity. We then examine selective mortality at birth or during early life, using incidence of stillbirth and infant death. This paper additionally estimates the effects of the exposure to violence in different stages of gestation to find when is the most critical period for fetal development. Next, we present a Montecarlo simulation to explain a potential bias in a standard estimation of scarring effects when selective mortality is not considered. Finally, we estimate the possible size of the bias using the decomposition method suggested by DiNardo et al. (1996).

The data used in this study are the individual surveys for women and men, and birth records from the Demographic Health Survey for Rwanda in 2010 and 2014. We restrict the observations to individuals who were born between 1991 and 1997. We first find that the completion rate of primary schooling is lower for the individuals exposed to genocide in utero. The individuals in the cohort with prenatal exposure to the genocide are shorter than their counterparts. The result on selective mortality shows that fetal loss and infant death of the genocide cohort is higher than those of other cohorts. The first trimester is most critical in the selection at birth or during early life. The result provides the suggestive evidence that detrimental effects of exposure to violence are expected to be bigger if early pregnancy loss is properly addressed. The Montecarlo simulation confirms that the observable effects of the adverse shock on fetus based on fetal origin hypothesis would be biased in a standard estimation if a substantial size of selective mortality causes a sample selection. The decomposition of explained and unexplained effects of exposure to violence in gestation presents that true scarring effects are possibly bigger than simply comparison of the two groups.

Terrorist Attacks, Islamophobia and Newborns' Health

PRESENTER: **Grace Armijos Bravo**, University of Barcelona

AUTHOR: Judit Vall Castello

Islamophobia, which is defined as an unfounded rejection against the Muslim population, has increased in the last years across countries, in part, due to terrorist attacks perpetrated by jihadist groups. This discrimination and stigma are known to be a source of stress which is particularly problematic for pregnant Muslim women and the health of their in-utero babies. There is vast (medical) literature showing that intrauterine exposure to stress has a negative influence on health at birth and this, in turn, has been linked to worse adulthood outcomes in terms of health, education and earnings.

To see whether islamophobia is affecting health at birth, we exploit the exogenous source of stress coming from the 2017 Catalonia attacks (in Spain), and assess how jihadist terrorist attacks may affect the health of newborns whose mothers have the same country of origin as those who perpetrate the attacks and live in the affected cities. For this, we use a difference-in-differences-in-differences model, comparing newborns whose mother's country of origin is a Muslim one and whose municipality of residence is one of the affected cities to other newborns, before and after the 2017 attacks.

We find that intrauterine exposure to stress might be a channel that may potentially affect health at birth outcomes. In particular, we find an increase in the probability of having a low-birth-weight newborn by 1.54 percentage points, an increase in the share of complications and female newborns by 1.42 and 2.38 percentage points respectively. In addition, being exposed during the first trimester of gestation is linked to detrimental health at birth outcomes although we also find negative effects on the second and third trimesters. In terms of mechanisms behind the effect, we find an increase in the rejection against Muslims by 5.46 percentage points in the affected locations compared to non-affected, additionally, we also see an increase in reported hate crimes after the attacks. Finally, we also add evidence supporting increased levels of stress as well as stress-induced behavioral responses, in the group of women of interest, associated to the attacks.

The main conclusion is that one channel that might be affecting these newborns is the stress their mothers face as a consequence of increased Islamophobia. Our results are of high policy relevance to encourage future actions towards a more inclusive society, fighting against discrimination towards a group of individuals that not only has a great presence in Spain, 4% of the total population, but also across other European countries as well as in The United States of America.

8:00 AM –9:00 AM THURSDAY [Specific Populations]

ORGANIZED SESSION: Child Overweight, Food Choices and the Nutrition Transition

SESSION CHAIR: **Nam Pham**, University of Economics Ho Chi Minh City

ORGANIZER: **Matthias Rieger**, Erasmus Universiteit Rotterdam

DISCUSSANT: **Marcos Dominguez Viera**, Wageningen University; **Margarita de Vries Mecheva**, Erasmus Universiteit Rotterdam; **Elan Satriawan**, Gadjah Mada University, Yogyakarta; **Marrit van den Berg**, Wageningen University and research

The Role of Intergenerational Childcare Arrangements on Parental Time Investments and Child Obesity

PRESENTER: **Juan Carlos Caro**, University of Luxembourg

AUTHORS: Marcela Parada, Jere Behrman

During early childhood, a large fraction of families share child caregiving tasks across households and generations. While intergenerational childcare arrangements can positively affect a mother's employment and earnings, little is known about the impact on child skill development and health. Different caregiving teams and strategies could lead to differences in total time invested in fostering skills. Similarly, available resources and parental styles, beliefs, and preferences influence the quality of investments, particularly for children at pre-school ages. For countries in late stages of the nutritional transition across the world, the nature of parental investments (including basic care) may explain the widespread rise in childhood obesity in recent years.

We estimate a dynamic model that captures household behavior to understand how caregiving teams' simultaneous choices and the demand for parental time investments influence childhood nutritional health and socio-emotional development during pre-school ages. Primary caregivers make labor market supply decisions, coordinate the caregiving teams, and allocate time investments (e.g. stimulation and physical activity). We use a novel national administrative data from nearly all children attending public-funded schools in Chile (nearly 200,000 First Grade students). Our approach unveils how different caregiving arrangements across extended families can lead to increased risk of obesity and behavioral difficulties for some children living in otherwise similar environments. Moreover, we distinguish between single versus two-parent families and also consider their beliefs regarding parenting styles. The results are particularly informative for helping to tailor scalable parental training programs focused on early stimulation and nutrition.

Information Provision with Goal Setting and Soft Commitment Can Mitigate Child Overweight in the Global South

PRESENTER: **Dr. Matthias Rieger**, Erasmus Universiteit Rotterdam

AUTHORS: Nam Pham, Brandon J Restrepo, Natascha Wagner

Childhood overweight is a surging and understudied health problem in developing countries. Since parents play a major role in health behaviors and outcomes of young children, we test whether updating parental information sets combined with healthy nudges may be a cost-effective prevention tool among overweight primary schoolchildren in Ho Chi Minh City, Vietnam. Parents were randomly offered a healthy lifestyle conversation that led to goal setting with soft commitment. After 6 months, the intervention resulted in reductions in children's body fat percentage, waist circumference, and overweight prevalence. After 22 months, we find persistent anthropometric benefits for girls. The anthropometric improvements operate through two primary mechanisms: parents updating own perceptions about the healthiness of their children's diet quality and improving the quality of their children's diets. In a cost-benefit analysis, we document a sizeable net benefit of our intervention among girls.

Sweet or Not: Nudging Towards Healthier Food Choice for Children Using Information and Cognitive Dissonance

PRESENTER: **Trang Nguyen**, Wageningen University and Research

AUTHORS: Alan de Brauw, Marrit van den Berg

Leveraging cognitive dissonance can be useful to nudge children towards healthier food choices such as beverages with less sugar. We conducted a field experiment in peri-urban Viet Nam to evaluate the effects of information and cognitive dissonance arousal on children's food choice. Over 1200 primary school children were randomly assigned into three groups: control, health information, and health information plus hypocrisy inducement – a way to raise cognitive dissonance. We found that health information provision on its own was effective in improving children's food choice, raising the likelihood of selecting milk with less sugar by around 30% compared with the control group. The treatment effects declined with the delay between the treatment and behavioral choice. Contrary to existing literature on cognitive dissonance and youngsters' behaviour, hypocrisy inducement did not have additional contribution to healthier food choice in our sample. We discussed the practical implications of our findings for short-term intervention field studies.

Snacks, Nudges and Asymmetric Peer Effects: Evidence from Food Choice Experiments with Children in Indonesia

PRESENTER: **Robert Sparrow**, Erasmus University Rotterdam

AUTHORS: Margarita de Vries Mecheva, Dr. Matthias Rieger, Erfi Prafiantini, Rina Agustina

Indonesia is seeing increasing consumption of processed foods and falling intakes of fruits and vegetables. This nutrition transition contributes to childhood overweight. We run a mechanism experiment in the field to inform policy interventions that aim to prevent childhood overweight via improving snacking behavior. Children participated in a snack choice task that is predictive of overweight at baseline. We expose some children to emoji labels encouraging healthy snacks, while others observe healthy or unhealthy snacking by peers. While emoji labels moderately promote the healthy snack, the adverse effect of observing a peer eating the unhealthy snack is very large. The effect associated with observing a healthy peer is insignificant. Additionally, cross-randomized blocks of children were shown an educational video about healthy diets to study the interaction of information provision and nudging. The educational video improves healthy choices but does not magnify the modest effect of the policy nudge and cannot counter the strong negative peer effect. The pronounced asymmetric peer and modest nudging effects lend support to broader paternalistic measures rather than those focused on individual's actions and behavioral deficiencies in countries undergoing a nutrition transition.

8:00 AM –9:00 AM THURSDAY [Economic Evaluation Of Health And Care Interventions]

Costs and Cost-Effectiveness in Cancer

MODERATOR: **Tracey Sach**, University of East Anglia

Incorporating False Positives and Incidental Findings in a Cost-Effectiveness Modelling of Routine PET/CT Surveillance to Detect Distant Recurrence in Resected Stage III Melanoma

PRESENTER: **Mbathio Dieng**, University of Sydney

AUTHORS: Sally Lord, Robin Turner, Omgo Nieweg, Alexander M Menzies, Robyn Saw, Andrew J Einstein, John Thompson, Rachael Morton

Background: Clinical practice guidelines differ in their recommendations for duration and frequency of post-cancer surveillance imaging, leading to substantial differences in healthcare costs with unsubstantiated clinical benefits.

Objective: To estimate the cost-effectiveness of four surveillance frequencies using whole body positron emission tomography (PET) with computed tomography (CT) (PET/CT) in a follow-up protocol for adults with resected stage III melanoma.

Methods: A decision analysis model was constructed to estimate the costs of follow-up with PET/CT performed 3-4 monthly, 6-monthly, 12-monthly and no surveillance imaging. The primary outcome was the cost per distant recurrence appropriately diagnosed and treated. Distant recurrence appropriately diagnosed was calculated as the difference between true positives and false negatives. The secondary outcome evaluated the cost per diagnostic error avoided. Diagnosis error avoided was defined as the difference between true negatives and false positives.

We used the Australian health system perspective and assumed a time horizon of 5-years. The base case analysis used data collected from a cohort of 818 adults with resected stage IIIA to IIID melanoma under surveillance for disease recurrence at Melanoma Institute Australia.

Healthcare use associated with false positive and incidental findings, as well as subsequent clinical management as a result of imaging was included. Probabilities for each branch of the decision tree were based on the hazard rates for distant melanoma recurrence in our cohort, and the reported sensitivity and specificity of PET/CT. The direct costs associated with the four surveillance strategies including the costs of imaging, procedures and clinical follow-up visits were estimated from the Australian Medical Benefits Schedule.

Results: In the base case, at 5 years, the 12-monthly PET/CT strategy incurred a total cost of AUD$54,274 per patient versus $80,003 for 6-monthly, $88,387 for the 3-monthly imaging and $51,527 for no surveillance imaging. When compared with no routine imaging, 12-monthly PET/CT imaging was associated with a 4% increase in appropriately diagnosed and treated distant disease, 0.5% increase for 6-monthly imaging and 1% increase for 3-monthly imaging. The incremental cost-effectiveness ratio (ICER) of 12-monthly PET/CT surveillance imaging was $66,883 per each additional distant recurrence appropriately diagnosed and treated when compared with no surveillance imaging. For the outcome of cost per diagnostic error avoided, the no surveillance imaging strategy was less costly and more effective with a 5-year cost of $2,014 and a corresponding probability of diagnostic error avoided of 0.87 compared with a total cost of $9,175 and a corresponding probability of diagnostic error avoided of 0.85 for 12-monthly imaging. Sensitivity analyses demonstrated the optimal follow-up strategy was influenced by diagnostic test performance and the rate of distant recurrence.

Conclusion: 12-monthly surveillance imaging was observed to be the most cost-effective follow-up strategy for accurately diagnosing and treating distant recurrence in resected stage III melanoma patients. However, it is not known whether this strategy with an ICER that exceeds $50,000 per unit of health benefit, would be considered good value for money.

Hospitalisation Costs of Primary Liver Cancer in Australia: Evidence from a Data-Linkage Study

PRESENTER: **Anh Le Tuan Nguyen**, Menzies Institute for Medical Research, University of Tasmania

AUTHORS: Kwang Chien Yee, Julie A Campbell, Andrew J Palmer, Leigh Blizzard, Barbara de Graaff

BACKGROUND: Primary liver cancer (PLC) has placed not only an increasing disease burden on societies but also a substantial economic burden to healthcare systems worldwide. To date, studies on PLC in Australia have mostly focused on the health burden but not the economic burden of the disease. Therefore, this study aimed to address this gap by estimating public hospital costs associated with PLC in the first and second years following diagnosis.

METHODS: This study used linked administrative data from four sources: Victorian Cancer Registry, Victorian Public Hospital Admissions, Victorian Public Hospital Emergency Department (ED) Presentations and the Victorian Death Index. Cases were identified as any patient diagnosed with PLC in Victoria, Australia from 01/01/2008 to 31/12/2015. The health system perspective was adopted to estimate the direct healthcare costs associated with PLC, based on inpatient and ED costs. The inpatient costs were calculated by two methods: average Australia Refined Diagnosis Related Group (AR-DRG) cost and Victorian-specific Weighted Inlier Equivalent Separation (WIES), which is the AR-DRG separation that is adjusted for length of hospital stay. The ED costs were estimated using the Urgency Disposition Group, which is determined by the type of visit, triage category and separation mode. Costs were estimated for the first 12 months and 12 to 24 months after the PLC diagnosis and expressed in 2017 Australian dollars. The costs estimated for Victoria using AR-DRG method were then extrapolated nationally using the number of people diagnosed with PLC in Australia in 2017 and first-year survival rate of the study cohort. The Generalised Linear Mixed Model with Gamma distribution and Log Link function was used to explore the relationship between costs and the sociodemographic and clinical characteristics of the patients.

RESULTS: 3,647 PLC cases were diagnosed during the study period, of which 3,350 cases were included in the cost estimation. For the first 12 months after PLC notification, the annual per patient costs in Victoria using the AR-DRG and WIES method were $62,679 and $33,299, respectively. The annual per patient ED cost was $2,051. For the subsequent 12 to 24 months, the annual per patient costs using the AR-DRG and WIES method was $46,869 and $26,349, respectively. For ED presentations, the annual per patient cost was $1,919. Regarding the cost extrapolation to Australia, for the first 12 months after notification, the total admission and ED costs were $132.6 million and $4.3 million, respectively (total $137 million). For the period from 12 to 24 months, the total extrapolated cost was $42.6 million, of which $40.9 million was for inpatient admissions and $1.7 million was for ED presentations. Higher costs were mostly associated with male sex, hepatocellular carcinoma, metropolitan hospitals, Asian birth region and longer hospital stays.

CONCLUSION: This study reports the public hospital admission and ED costs associated with PLC and the substantial economic burden this type of cancer has placed on the Australian Health System.

Healthcare Costs of Cancer Survivors over Time: Results from a Large Population Data Linkage Project in Queensland, Australia

PRESENTER: **Katharina Merollini**, University of the Sunshine Coast

AUTHORS: Louisa Gordon, Joanne Aitken, Michael G Kimlin

Background

Globally, the number of cancer survivors has exceeded 32 million, with over one million of these in Australia. A trend of increasing cancer incidence, medical innovations and extended survival places growing pressure on healthcare systems around the world. One in two Australians will be diagnosed with cancer during their lifetime with expected overall 5-year survival for invasive cancers now at 68%. More than 50% of cancer survivors suffer late effects, such as physical (pulmonary, cognitive and cardiac effects, subsequent malignant neoplasms) and psychosocial effects (depression, anxiety and fear of recurrence) that are likely to require ongoing healthcare, but the economic burden of survivorship care is unclear. To our knowledge, no other Australian study has estimated long-term healthcare costs of cancer patients on a population level. The aim of this research is to quantify direct costs of long-term health service use from the date of diagnosis.

Methods

We retrospectively linked six routinely collected, administrative healthcare databases to capture the whole journey of health service contact (Queensland Cancer Register, Medicare Benefits Schedule, Pharmaceutical Benefit Schedule, Queensland Hospital Admitted Patient Data Collection, Emergency Department Information System, National Hospital Cost Data Collection). All residents of the state of Queensland, Australia, diagnosed with a first primary malignancy from 1997–2015 formed the cohort. State and national healthcare databases were linked with state-based Cancer Registry records to capture all health service use and healthcare costs for up to 20 years (or death, if this occurs first), starting from the date of cancer diagnosis until December 2016 where available. Overall costs are defined as the product from each individual cost component, consisting of pharmaceuticals, medical & allied health services, hospital admissions, emergency presentations and healthcare purchasing data. We used a bottom-up costing approach which allows for total cost calculations per patient and subgroup.

Results

Preliminary analyses show that a total of 368,426 people were diagnosed with a first primary malignancy during the study time frame. Mean age at diagnosis was 60.6 years (SD 15.4). The most common types of cancer across all diagnosis years were prostate (14.8%), melanoma (14.1%), breast (12.7%), colorectal (12.2%) and lung cancers (8.6%). Cancer diagnoses increased steadily over time from 4.1% in 1997 to 6.5% in 2015. The overall health service use and distribution of associated costs for this study cohort was detailed by type of cancer, cost components, time since diagnosis, age and gender.

Conclusion

This project improves the understanding of lifetime health effects faced by cancer survivors and estimates ongoing healthcare costs. Results inform economic evaluations and policy and facilitate future planning for the allocation of healthcare resources according to the burden of disease.

Methods for Adapting and Calibrating a Swedish Cost-Effectiveness Model to Compare Prostate Cancer Screening Strategies in a UK Setting

PRESENTER: **Edna Keeney**, University of Bristol

Background

The reliability of screening cost-effectiveness models' predictions depends on estimates of unobservable natural history parameters. Calibration identifies appropriate values of unobservable parameters by matching model output to observed data. This research illustrates methods for adapting and calibrating a Swedish prostate cancer screening model to UK data from the Cluster Randomized Trial of Prostate Specific Antigen (PSA) Testing for Prostate Cancer (CAP) and provides recommendations for practice.

Methods

The Swedish prostate cancer model was adapted to reflect test uptake in the CAP systematic screening trial by age group. This involved a change from modelling a single age to a multi-age cohort as the CAP trial involved a one-off screen in men of varying ages between 50 and 69. Background testing was estimated given changes in incidence based on data from the Office of National Statistics. Re-testing was estimated using a Weibull cure model stratified by age group and PSA value at previous PSA test, based on data from the Clinical Practice Research Database. Adapting the model to reflect UK testing enabled targeted calibration to observed UK incidence rates from the CAP trial using a log Poisson likelihood and the bound optimization by quadratic approximation (BOBYQA) algorithm. BOBYQA uses finite differences to calculate the derivatives of the optimization target and guide exploration of the sample space. This is more efficient than random exploration via e.g. the Metropolis Hastings algorithm. The likelihood compared observed and expected rates by age, year, and grade at diagnosis. Methods explored to improve the calibration included down-weighting data in the likelihood for which model predictions were more accurate, calibrating to different sets of model parameters, removing the impact of background testing, using increased simulations and different optimization algorithms.

Results

Overall, calibration improved the model's predictions. For example, compared to a true cumulative incidence of prostate cancer after 10 years of 0.042 (95% CI 0.041-0.043) in the study arm of the trial, the model predicted 0.037 (0.036 – 0.039). After calibration this had increased to 0.040 (0.039 – 0.042). Similarly, compared to a true incidence at year 14 of 0.058 (0.056 – 0.06) in the control arm, the calibration improved the model's predictions from 0.046 (0.043 – 0.049) to 0.051 (0.047 – 0.054). In men aged 55-59 the calibration improved the incidence of cancers with Gleason grade ≥8 at year 14 of the study from 0.002 (0.001 – 0.004) to 0.012 (0.010 – 0.114) compared to a true rate of 0.009 (0.007 – 0.011). The calibration did not improve model predictions to the same degree for men with low grade prostate cancer diagnosed towards the beginning of the trial. Methods explored to rectify this had little impact.

Conclusion

Although calibration is a complex process, with many possible methods, it is key to establishing the credibility of modelling results. This work demonstrates an application of the BOBYQA calibration method to calibrate a Swedish model to UK data with mixed results. Further work could explore whether the use of the Metropolis Hastings or approximate Bayesian computations would improve the calibration.

8:00 AM –9:00 AM THURSDAY [Evaluation Of Policy, Programs And Health System Performance]

Measuring Impact on Efficiency and Inequalities

MODERATOR: **Piya Hanvoravongchai**, CMB Foundation

Impact of Community-Based Discharge Support Programme on Hospital Readmission and Emergency Care Attendance Among Home-Dwelling Elders: A Regression Discontinuity Analysis in Hong Kong

PRESENTER: **Ms. Yushan WU**, JC School of Public Health and Primary Care, The Chinese University of Hong Kong

AUTHORS: Eng-kiong Yeoh, Hong Fung, Ka-Chun Chong, Shi Zhao

Introduction:

Community service is playing an increasingly important role in supporting home dwelling elders after hospital discharge as a strategy to reduce readmission. However, evidence regarding the effectiveness of community support services has been limited and inconclusive. In Hong Kong, every older patient aged 60 years and above admitted to public hospitals will be scored for their risk of readmission. The score ranges from 0 to 1; the higher score the higher risk of readmission. Elder patients aged 65 years and above and with readmission risk score above 0.17 will be assigned to Community Health Call Centre (CHCC), provide the services over the phone including medical condition assessment, provision of disease management advices and proper referral arrangement if necessary. This study is to estimate the causal impact of the telephone-based community discharge support program on emergency hospital readmission and emergency department attendance at three months of discharge among high-risk elders.

Methods:

We used regression discontinuity design (RDD) to examine the causal impact of the programme, by comparing the health outcomes of patients with risk score just above and below the 0.17 threshold. We used data from public hospital administrative dataset. All the patients aged 65 years old and above hospitalized during 2009-2014 were included. The main outcome variables include unplanned readmission and emergency department visits at three months of discharge, as a proxy of health outcomes of patients after discharge. We also investigate the outcomes at one months of discharge. The discontinuity in outcomes were measured by local-linear model.

Results:

A total of 2,219,645 hospitalizations (46% women and 54% men; mean [SD] age, 76.6 [7.5] years) were discharged with 29.9% visiting ED and 20.2% having unplanned readmission at three months of discharge. The telephone-based post-discharge intervention was associated with lower chance of three-month ED visits (adjusted difference, 3.15%; 95% CI, 6.92% to 0.00%; P=.035). The observed association between the intervention and changes in ED visits was not significant at 30 days of discharge. No evidence was found that intervention was associated with changes in unplanned readmission at three months or 30 days. The results vary by age groups and diagnosis groups.

Conclusion:

The large-scale telephone-based discharge support programme in Hong Kong was associated with lower rate of ED visits but not with changes in unplanned readmission among high-risk elderly patients. Further research is warranted to assess which patient populations benefit most from TFU.

A Fair Share of the Pie: The Distributional Impact of Different Alternatives to Finance Residential Care for Older People in Austria

PRESENTER: **Ricardo Rodrigues**, European Centre for Social Welfare Policy Research

AUTHORS: Cassandra Simmons, Tamara Premrov, Kai Leichsenring

Objectives:

As in other European countries, users of residential care in Austria were required to pay a contribution to the costs of care based on both their income and assets. The asset contribution to the costs of care – denominated *Pflegeregress* – has been abolished in January 2018. There is currently no empirical evidence on the distributional effect of this measure and possible financing alternatives across the income and wealth distribution. This study aims to answer the following research question: Considering budgetary neutral and other alternatives to *Pflegeregress*, what would be the distributional impact of each alternative and what could explain the differences between different scenarios? Possible alternative scenarios include earmarked inheritance tax, lifetime limits on asset contributions or a mandatory public insurance.

Methods

The study uses a combination of administrative data on users of care allowance, residential care users, mortality tables and a representative survey of older Austrians (SHARE data). Based on this data, we estimate a micro-simulation model to estimate the out-of-pocket payments borne by individuals of different income and wealth quintiles under different scenarios. The distributional impact is then assessed through the estimation of different equity measures (e.g. Lorenz curves and inequity indices).

Results

Results show that the *Pflegeregress* was moderately regressive when in place and that its abolishment entailed a moderate re-distribution from the richer income quintiles to the less affluent ones. Most of the redistribution between quintiles under the *Pflegeregress* occurred through the asset contributions as a disproportionate share of these fell on lower income individuals with assets. This is explained by the better health and capacity to age in place of wealthier individuals, particularly those in the highest income/wealth quintiles. The introduction of an earmarked inheritance tax, higher income tax rate or social insurance for residential care (all budgetary neutral alternatives to the *Pflegeregress*) would entail a greater degree of re-distribution across the income and wealth distribution. This re-distribution is however, sensible to the parameters of the inheritance tax (marginal tax and exemption levels).

Discussion

The abolishment of the Pflegeregress seems to have entailed only a limited re-distributional impact. However limited, the re-distributional impact of the abolishment itself was pro-poor. Asset-based contributions to residential care may be limited in their targeting due to the concentration of users among lower income individuals and differences between the income and wealth distribution among older people. This may change however, in view of behavioural responses to the abolishment of the asset contribution.

Results-Based Financing in Zimbabwe: Impact on Equality of Access in Maternal and Child Health across Socioeconomic Gradients

PRESENTER: **Marshall Makate**, Curtin University

AUTHOR: Nyasha Mahonye

Background and motivation

Results-based financing (RBF) program evaluations in sub-Saharan Africa have concentrated on quantifying the impact of such programs on maternal and child health outcomes, worker satisfaction and quality of care. Very few studies have considered assessing the effectiveness of these programs from a distributive perspective. This study uses nationally representative data from the Zimbabwe demographic and health survey complemented with geographic location data to investigate the impact of the RBF program on equality of selected maternal and child health outcomes and access across the socioeconomic gradient. Our specific focus is on whether the RBF program has improved health equity and access especially among the vulnerable groups of the population.

The RBF program in Zimbabwe was initially launched in July of 2011 in two districts and later expanded to other districts in 2012. The program covers all health facilities in these districts and consisted of three main aspects including (a) results-based contracting; (b) management and capacity building; and (c) monitoring of the program. The general structure of the program remained the same across all districts.

Data and methods

This study uses nationally representative data from the Zimbabwe demographic and health survey (DHS 1999, 2005, 2010, 2015) complemented with geographic location data. As a first step in the empirical analysis, we conduct a propensity score matching to create suitable comparison group of non-RBF districts. As a second step, we calculate health inequality using the concentration index for each district using the matched data. The third step involves estimating a difference-in-differences model to estimate impact of the RBF program on the equality of maternal and child health outcomes across the socioeconomic gradient by comparing the changes in concentration indices between 2010 and 2015 in RBF and non-RBF districts for twelve indicators of access to maternal health care and nine indicators of child health outcomes. We have also conducted a parallel trends assumption check and have conducted sensitivity analysis of the results by using absolute measures of inequality.

Results

The results show that the RBF program was associated with greater and significant improvements in equity related to the frequency of prenatal care (four or more prenatal care visits), family planning, overall quality of prenatal care and some components of prenatal care (blood pressure check, iron tablets and tetanus toxoid vaccinations), child full immunizations, and treatment for fever occurring in the two weeks before the survey. The RBF program did not appear to ameliorate wealth-related inequality in terms of child low birth weight, neonatal mortality, stunting, diarrhoea prevalence, treatment for diarrhoea, and fever prevalence when inequalities.

Conclusion

From a policy perspective, the results have important implications for public health policies geared towards improving access to maternal and child health care services in developing countries. Our analysis reveals that RBF programs do not necessarily eliminate wealth-related inequality in maternal and child health outcomes in Zimbabwe but are certainly a useful complement to equity-enhancing policies in the country.

Impact of Health Expenditure Age-Adjustment on Efficiency Rankings: An Analysis of European Union Health Systems' Efficiency

PRESENTER: **João Vasco Santos**, FMUP/CINTESIS/ARSN

AUTHORS: Júlio Souza, Alberto Freitas

Background: Efficiency is one of the main dimensions of health system performance, with an increasing importance with financial crises, technological innovation or an ageing population. Despite its potential impact on health systems' performance, age is usually not taken into account in non-parametric frontier efficiency analyses. Rather, it is mainly considered as an environmental variable to explain inefficiency among countries. Therefore, we aimed to assess the impact of adjusting health expenditure for age on health system efficiency rankings among European Union countries (EU-28).

Methods: We performed a cross-sectional efficiency study for EU-28 countries, in 2016. We computed output-input ratios and compared the estimates with the optimal ratio, as we considered models with a single input and a single output. For each one of the four models, life expectancy (LE) (models 1 and 2, i.e. with and without age-adjustment) or healthy life expectancy (HALE) (models 3 and 4) were considered as outputs. Health expenditure per capita (US$, PPP) was the only input considered. Using a case-mix similar approach, considering the estimates for health expenditure by age group in the EU-28, the age structure of each country and the whole EU-28 as the case-mix equal to one, we adjusted health expenditure for age. Correlation and ranking differences between models with and without age-adjustment were compared using Spearman rank's correlation and Wilcoxon signed ranked tests, respectively.

Results: Between models 1 and 2 (LE as output), Spearman's rho was 0.984 (95% CI 0.919–0.999), while between models 3 and 4 (HALE as output) was 0.986 (95% CI 0.939–0.999). However, statistically significant differences of efficiency scores' rankings were found between models with and without age-adjustment for expenditure (models 1 and 2 – p-value = 0.014; models 3 and 4 – p-value = 0.014). In fact, and for example, after age-adjustment of health expenditure, Germany changes from the last position in both models to the 22th position in the model using LE as output and to the 23rd using HALE as output.

Conclusion: Although age structure is not usually taken into account in health systems' efficiency analyses, it seems that it should be more often considered. In fact, there was a high Spearman's rank correlation between models with and without health expenditures' adjustment for age, as expected. However, when comparing the rankings between models, there were significantly differences, meaning an important impact of health expenditure age-adjustment on efficiency rankings. Thus, to account for age structure in health system efficiency analysis must be considered in order to draw conclusions concerning this health system performance dimension.

8:00 AM –9:00 AM THURSDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: Quantifying the Current and Future Consequences of Antimicrobial Resistance: Addressing Evidence Gaps

SESSION CHAIR: **Matthew Taylor**, YHEC

ORGANIZER: **Joel Maxwell Russell**, York Health Economics Consortium

DISCUSSANT: **Laurence Roope**, University of Oxford

Determining the Health-Related Quality of Life Impact of Antibiotic-Resistance: A Systematic Literature Review and Conceptual Model

PRESENTER: **Nichola Naylor**, London Schol of Hygiene & Tropical Medicine

AUTHORS: Frank Sandmann, Rifat Atun, Julie V Robotham

Background: Antibiotic resistance (AbR) is recognised as a growing threat worldwide. To efficiently tackle this threat, policy-makers need to understand the cost and health impact of AbR and associated mitigation policies. Much research has been undertaken to improve understanding of the cost impact associated with drug resistant infections. However, little theoretical discussion or empirical investigation has taken place with regards to the health-related quality of life (HRQoL) impact of AbR. Robust utility estimates are needed for the denominator of any cost-utility analyses of AbR-related interventions. We therefore aimed to (i) systematically review existing HRQoL estimates for AbR and (ii) create a conceptual model for estimating the HRQoL impact of AbR.

Results: Out of 5,239 records we reviewed 635 full-texts and included 16 studies, giving 23 HRQoL impact estimates. The majority of studies stated or assumed AbR to have a negative impact on HRQoL (15/23), though only 4 of these stated statistical significance. Quality of life decrements for multi-drug resistance (across different syndromes and settings) were estimated at a 4.4% reduction in total EQ-5D scores and a 7.2% reduction in total SF-6D scores. However, based on our GRADE assessment, we found there was a low grade of evidence to suggest negative, significant impacts relating to quality-adjusted life years (number of studies (n)=6), disability-adjusted life years (n=2), generic HRQoL instrument estimates (n=3) and syndrome specific instruments (n=5).

AbR has the potential to impact all of the factors highlighted by the Wilson and Clearly framework, based on the wider AbR literature. Our conceptual model divides the potential population into 3 categories; (i) 'Patients with infection-related syndromes', (ii) 'Patients with non-infection-related syndromes' and (iii) 'Public (no current syndromes)'. Examples of potential influences on HRQoL discussed are sequelae from 'harsher' treatment for groups (i) and (ii) and loss of utility-in-anticipation for group (iii).

Conclusions: There is an urgent need for more robustly measuring the HRQoL impact of AbR to avoid flawed decision making and to better understand the impact of AbR. This research shows that not only should direct mortality impacts and prolonged durations of disutility from excess length of illness of AbR be considered in future evaluations, but that capturing the wider impact of AbR in patients and society is imperative. It is also recommended that future primary-research use disease specific and generic instruments, which is in line with general best practice for health outcomes research, but currently missing from the literature.

Evidence Gaps Associated with the Estimation of Clinical and Economic Outcomes of Rising Antimicrobial Resistance in Common Surgical Procedures

PRESENTER: **Joel Maxwell Russell**, York Health Economics Consortium

AUTHORS: Heather Davies, Angel Varghese, Stuart Mealing, Hayden Holmes, Beth Woods, Marta Ferreira Oliveira Soares, Mark Sculpher, Stephanie Evans, Ruth Puig-Peiro, Annalisa Belloni, Julie V Robotham

Objectives:

Attempts to determine the relationship between antimicrobial resistance (AMR) rates and surgical site infections (SSI) have been limited. A decision-analytic model was built to estimate the clinical and economic outcomes of rising AMR on SSI rates. This work outlines the specific data limitations that prevented the conceptual model from being fully utilised. Where data were not available we outline how this was mitigated when building the 'hard' model.

Methods:

We designed a decision-analytic model to quantify the potential clinical and economic outcomes, currently and over time, arising from SSIs caused by AMR in defined surgical procedures. Case studies of elective bowel cancer resections and emergency hip fracture surgery (repair of neck of femur) were chosen. We identified several theoretical pathways through which AMR impacts the clinical and economic outcomes of surgery. We developed a conceptual model structure that would allow for the full range of identified pathways to be explicitly parameterised in both models. When data limitations were identified, we modified the conceptual model and developed a 'hard' model that would best incorporate the available data. A structured expert elicitation exercise was developed to generate data for key evidence gaps.

Results:

We identified several key areas where data for parameterising the conceptual models were unsatisfactory or unpublished. Firstly, estimating a causal effect of AMR on SSI rates was underpinned using several assumptions. This approach was abandoned in favour of direct elicitation of SSIs caused by AMR from clinical experts. Secondly, the mortality risk for SSIs in published literature exhibited survivorship bias, or mortality from individuals with an SSI was not deemed causal when compared to mortality in the non-SSI groups. Published mortality data was abandoned in favour of direct elicitation of SSI and non-SSI mortality from clinical experts, whilst controlling for causality. Thirdly, heterogeneity in effectiveness data for antibiotics and salvage procedures, dependent on positioning in the clinical pathway, were not available. Success rates of iterative treatment lines were collapsed into a single input of 'chronic infection' resulting from failed antibiotics or failed salvage procedures. Average chronic infection rates were pathogen specific, and were not published for the required pathogens. Chronic infection rates and percentage of patients requiring salvage procedures were directly elicited by clinical experts. Fourthly, where required outcomes were available, longitudinal data were not estimated. Clinical experts were therefore asked to elicit key parameter values at five, ten and twenty years from now (2020). These time points were used to generate scenario analyses in the model.

Conclusions:

Operationalising the conceptual model framework in these two surgical contexts highlighted a paucity of data on a number of key parameters. The conceptual decision-analytic model was amended to form the 'hard' model, accounting for the paucity in clinical data. Where key parameters were unidentified, parameter values were estimated using structured expert elicitation. This work highlights where several evidence gaps associated with AMR could be addressed by future research. Further, this work highlights the general importance of structured expert elicitation to fill key omissions in clinical evidence.

Eliciting Expert Judgements on the Rise of Antimicrobial Resistance in Common Surgical Procedures and Its Consequences

PRESENTER: **Marta Ferreira Oliveira Soares**, Centre for Health Economics University of York

AUTHORS: Beth Woods, Joel Maxwell Russell, Heather Davies, Angel Varghese, Stuart Mealing, Hayden Holmes, Mark Sculpher, Stephanie Evans, Ruth Puig-Peiro, Annalisa Belloni, Julie V Robotham

Objectives:

Policy is committed to tackling future rises in antimicrobial resistance (AMR) rates. To better inform policy actions, explicit attempts to quantify the consequences of future increases in AMR are important. Given the nature of the problem, however, there is often a lack of empirical data to evidence such evaluations. Here, expert judgement can play an important role, particularly when formal elicitation methods are used allowing for uncertainty in knowledge to be described and ensuring that the biases and heuristics associated with this type of evidence are minimised. We here present the design, conduct and results of an applied elicitation exercise aimed at quantifying the consequences of rising AMR rates in common surgical procedures.

Methods:

A formal exercise was designed and conducted to elicit judgements over a number of quantities required to inform a decision-analytic model. The model intended to quantify the potential clinical and economic outcomes, currently and over time, arising from SSIs caused by AMR in elective

bowel cancer resections and emergency hip fracture surgery (repair of neck of femur). The quantities of interest for the elicitation, for example how increases in AMR affect the incidence of SSIs, were defined based on the model needs, and attempted to reflect quantities that were observable to the experts. We used individual elicitation, conducted over video conference. For each quantity, the mode was elicited (value the expert believed the most) and, to describe uncertainty in knowledge, the two bounds of the 80% credible interval, CrI, were also elicited. Pooling was mathematical and assumed equal weighting across experts.

Results:

A total of 24 quantities were defined for the elicitation. A comprehensive training package was tailored to introduce experts to the task, train them on methods of elicitation, and explain the quantities elicited. Important concepts underlying the quantities of interest were also covered, such as the causal effect of AMR on SSI rates. Six experts (two colorectal and four orthopaedic surgeons) completed the exercise. There was variability across experts, which contributed to uncertainty in the final pooled distributions. For example, the individual experts' best guess for the current 90-day mortality in emergency hip fracture surgery patients with an SSI was between 20% (80^{th} CrI between 5% and 30%) and 50% (80^{th} CrI between 30% and 60%), which resulted in a pooled distribution with a mode of 35% (80^{th} CrI between 20% and 56%). There were also important differences in the elicited quantities between the two surgery types. For example, the pooled distribution representing SSI mortality for elective bowel cancer resections showed a mode of 8% and an 80^{th} credible interval between 4% and 27%.

Conclusions:

The work presented here illustrates that it is feasible to elicit quantitative expert judgements on the rising rates of AMR and its consequences. However, due to the uncertain nature of the quantities elicited, high levels of uncertainty in knowledge are reflected in the pooled distributions summarising the group's judgement.

8:00 AM –9:00 AM THURSDAY [Demand And Utilization Of Health Services]

Demand and Utilisation of Reproductive and Infant Health Services

MODERATOR: **Jane Greve**, VIVE - The Danish Center for Social Science and Research

Long-Term Health Service Utilisation and Cost after Assisted Reproductive Technologies: A Record Linkage Study for England

PRESENTER: **Xinyang Hua**, University of Melbourne

AUTHORS: Claire Carson, Maria Quigley, Jenny Kurinczuk, Oliver Rivero-Arias

Background: Despite the growing use of assisted reproductive technologies (ART) worldwide, there is limited research on the long-term health service utilisation and cost for babies born with ART treatment.

Methods: Babies born 1991-2009, and their mothers, who were registered at general practitioners (GP) practices in England, were identified through the Clinical Practice Research Datalink (CPRD) mother-baby dataset. Two groups of babies were identified through the CPRD records: comparison group (no evidence of consultations, investigations or treatment for fertility problems in the primary care record), ART group (records in mother's GP notes of referral for ART or record in child's notes reflecting ART history). Primary care cost was calculated as the sum of cost for consultations, tests, referrals to outpatient hospital cares, and prescriptions. The Hospital Episode Statistics (HES) data was linked to the CPRD and used to estimate hospital admission cost.

Based on the service or admission dates, costs were aggregated into half year intervals. Linear regressions were conducted in each time interval to compare the cost in the 2 groups after controlling for mother and children characteristics (mum's delivery age, smoking, socioeconomic deprivation, baby's year of birth, sex, preterm/low birth weight, multiple birth). The adjusted costs were further aggregated into 1^{st}, 2^{nd}, 3-5 and 6-10 year cost and compared between the comparison and the ART group. Inverse probability weights were generated using Cox model and applied in the linear regressions to adjust for potential bias caused by attrition due to relocation in the CPRD data. Bootstrapping method were used to generate confidence intervals.

Results: A total of 418,037 babies born without fertility problems and 6,473 babies born with ART were included in the study, of which 276,508 and 4,608 had a valid linkage to HES data, respectively. Compare to babies born without fertility problems, babies in the ART group had significantly higher cost for primary care services in the 1^{st} year (£446 (95CI 444-447) vs £529 (95 CI 517-540)), 2^{nd} year (£274 (95CI 273-275) vs £342 95CI (332-351)), 3-5 year (£550 (95CI 547-553) vs £669 (95CI 649-688)), as well as 6-10 year (£619 (95CI 614-624) vs £756 (95CI 712-804)) after birth. As for hospital admission cost, the differences were only observed in the first year after birth (£1,094 (95CI 1,077-1,112) vs £1,381 (95CI 1,203-1,588) among single birth babies, £3,307 (95CI 3,130-3,501) vs £4,240 (95CI 3,688-4,931) among multiple birth babies)

Conclusion: Compare to babies born without fertility problems, babies born with ART had a higher utilization and cost on primary care services from birth to up to 10 years old, and a higher cost on hospital admission only in the first year after birth. The difference on long-term health services use and costs may be driven by parental health seeking behaviours instead of real differences on health outcomes.

Do the Guidelines Apply to Me? Patient Information and Expert Agency in Prenatal Diagnostics.

PRESENTER: **Nis Lydiksen Lydi**, VIVE

AUTHORS: Jane Greve, Søren Rud Kristensen

Background: Patients who are themselves experts have been found to receive care that is systematically different from care provided to non-expert patients. However, the current literature has been unable to ascertain whether the differences are due to expert patients sending less noisy signals about their preferences or health state than non-experts (statistical discrimination theory) or whether experts use their informational advantage to demand better care than non-expert patients (agency discrimination theory).

Aim: We investigate the extent to which care provided to medically trained mothers is more likely to bypass clinical guidelines intended to ration access to prenatal diagnostic testing (PDT) compared to not medically trained mothers. Moreover, we examine whether a change in guidelines affected the differences in care offered to expert and non-expert patients.

Methods: We use a differences-in-discontinuities design to estimate the difference in the use of pre-natal testing between expert and non-expert patients on the margin of a guideline threshold. We measure baseline preferences as the difference above the threshold, where all patients are offered PDT. Controlling for this baseline difference in preferences, we estimate expert "overuse" as the difference in the differences above and below the threshold. Prior to 2004 the threshold was age based (35 years) and after 2004 risk based (risk >1:300). We use exact matching to compare mothers with similar levels of education and income levels.

Data: Linked Danish administrative data on the use of PDT, patients age, gender, ethnicity education and family income from 51,204 mothers aged 33-37 giving birth from 1996 through 2002 and 23,211 mothers giving birth from 2008 through 2018.

Results: We find a 7.4 percentage points overuse difference when the age-based threshold applied. Overall, 70 percent \% of the difference in PDT is due to expert "overuse". Experts and non-expert patients have similar test-rates above the threshold, indicating that the differences below the threshold are not driven by differences in preferences. After the risk-based threshold was introduced, the difference in PDT almost disappears.

Conclusion: Expert mothers circumvent clinical guidelines intended to ration prenatal diagnostic testing indicating that the difference between experts and non-experts are due to agency discrimination.

Impacts of Health Insurance on the Reduction of Infant Mortality in a Developing Country: Evidence from India

PRESENTER: **Anaka Aiyar**, University of Nevada, Reno

AUTHOR: Naveen Sunder

We estimate the causal impact of health insurance provision on reproductive health services and child mortality in India. Life saving reproductive and child health care services are available for free in the public health system. Yet 1.5 million Indian children did not live to celebrate their first birthday between 2010 and 2016. In this paper, we use a unique administrative dataset on the staggered rollout of a national-level health insurance program implemented to increase affordability of health care, for low-income families, in India. Using a difference in differences (and event study) approach we find robust evidence that access to health insurance, within a district, reduces infant mortality by 1.8 per 1000 live births, with a majority of the effects being concentrated in the first two years of a child's life. This translates into a mortality decline of around 5 percent. Thus, exposure to the program saved an additional 35,000 Indian children annually between 2010 & 2016. We propose that this effect is in part driven by greater convenience & affordability of critical & complementary health care services. Post-birth health investments (like post-natal care for mothers and child immunization) increase after exposure to the program. We also see that girls and infants in poor households benefit more. We propose that insurance releases intra- and inter-household affordability constraints that drive inequities in health care access, especially for women and children, in similar contexts. In summary, we find that when implemented at-scale, relatively cheap health insurance has the potential to enable greater access to health services even in countries where health systems provide free health care. This increase in access drives health improvements in child health.

Does Increased Operational Governance Reduce Payments for Free Healthcare Services? the Case of Deliveries in Tanzanian Government Health Facilities

PRESENTER: **Igor Francetic**, The University of Manchester

User fees at point of service can represent a major barrier to access formal healthcare for low-income households, including maternal and childcare services. This problem is exacerbated when the quality of healthcare is perceived as low by potential patients. To increase access to formal care and reduce maternal mortality, Tanzania has since long exempted maternal and child health services from user fees across all government health facilities. Yet, many women still incur in direct and indirect fees when deciding to give birth in a government health facility in Tanzania. There are many potentially valid reasons for these generally undue payments, including special medicine prescriptions or treatments and transportation. Most government health facilities in Tanzania rely on locally generated fees to fund needs beyond staff salaries, for example some capital investments. These characteristics of healthcare financing generate incentives to extract informal payments for services officially offered free of charge. Governance is often mentioned as a 'blockbuster' tool to boost quality of care and curb corruption or more broadly reduce misconduct among public healthcare providers, including informal payments. However, whether facility-level governance levers can reduce user fees for exempted services in Tanzania remains a mostly unanswered empirical question.

My work aims to start filling this gap, studying the association between the likelihood of user fees for delivery in government health facilities and their monitoring arrangements (internally and involving the community), as well as the presence of quality management systems. The study builds on two large representative surveys administered by the DHS program: the 2014/2015 Service Provision Assessment survey and the 2015-16 Tanzania Demographic and Health Survey and Malaria Indicator Survey. I use georeferenced data for facilities and households clusters to match women who gave birth in government health facilities with the closest relevant health facility, focusing on the majority of cases where matching is unambiguous (i.e. there's only one plausible matched facility). I then use a range of multilevel models and sets of covariates at the level of households and health facilities to measure the association between governance indicators and likelihood of user fees. To reduce concerns about potential endogeneity due to unobserved characteristics affecting simultaneously the outcome and the variables of interest, I also propose an instrumental variables approach building on the road distance between the matched health facility and the relevant District Medical Officer headquarter, which coordinate drug supply-chains and supervision of all health facilities within the local government authority.

Preliminary results suggest that having frequent meetings with the community and a functioning quality management system in place are significantly associated with a lower probability of paying user fees for delivery at government facilities. If confirmed, these results would be consistent with a positive role of social accountability initiatives, which push healthcare providers towards higher effort through increased social pressure from their constituencies.

8:00 AM –9:00 AM THURSDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: Who Benefits the Most from Publicly Financed Health Services? Benefit Incidence Analysis from Four Lower Middle-Income Countries

SESSION CHAIR: **Wenhui Mao**, Duke Global Health Institute

DISCUSSANT: **Osondu Ogbuoji**, Duke Global Health Institute; **Justice Nonvignon**, University of Ghana; **Preeti Kumar**,

A Comparative Benefit Incidence Analysis of Three Donor-Funded Priority Public Health Services in Nigeria: HIV, Tuberculosis, and Malaria

PRESENTER: **Uchenna Ezenwaka**, Health Policy Research Group, College of Medicine, University of Nigeria Enugu Campus

AUTHORS: Wenhui Mao, Ifeyinwa Arize, Siddharth Dixit, Eric Obikeze, Osondu Ogbuoji, Obinna Onwujekwe, Uche Obi

Background: Information on the distribution of benefits of donor-funded priority public health services is essential to improve the equity of financing and provision of such healthcare services. This paper present findings from three benefit incidence analysis of donor-funded HIV, TB and malaria control services.

Methods: We conducted three surveys: exit polls from HIV (survey respondents: 212) and TB (survey respondents: 202) clinics and a household survey for malaria (survey households: 542) in six facilities/communities in Enugu State, South-East Nigeria. Data on service use and expenditures in the past one month was collected using pre-tested interviewer-administered questionnaires. The socioeconomic status (SES) was estimated using household assets in combination with asset ownership data from the Nigeria Demographic and Health Survey (NDHS) data, 2018. Benefits were valued using the cost of providing the service while the net benefit incidence was calculated by subtracting out-of-pocket (OOP) payment from the value of benefits.

Results: Among surveyed HIV/TB patients, 99.5% used ART in the past months, all surveyed TB patients used TB drugs among TB patients, and 53% of surveyed households used insecticide-treated bed nets (ITNs). All surveyed patients with TB used free TB drugs. Similarly, all surveyed HIV patients who were on antiretroviral therapy (ART) received it free of charge. However, about half patients paid OOP for GeneXpert services. Among respondents with HIV, ART services were the most use service followed by the laboratory services - CD4 count (69.8%) and then consultation (67.9%). X-ray services were the least used service by both respondents with HIV or TB. The total OOP expenditure was highest for TB services. In general, TB services had the highest monthly gross benefits at US$2,944, followed by HIV at US$2,147 and ITNs at US$415. ART had a higher gross monthly benefit of US$1,213 than TB drugs (benefit of US$846.2). The monthly gross benefit of GeneXpert service was US$1,707, higher than the monthly benefit of the CD4 count service (US$677). The net benefits indicated that the poorest SES group benefited more in both HIV and TB services while the average SES group benefited more for ITNs. The Concentration Index (CI) for HIV and TB services were -0.09 and -0.17, respectively, demonstrating the pro-poor distribution of benefit of HIV and TB services. The rural-urban comparison found that while the poor in the urban areas benefited more from TB services, the rich benefited more in the rural area for HIV services.

Conclusion: The distribution of net benefits of donor-funded HIV and TB health services were pro-poor. The poor and rural communities are at high risk for increases in OOP and catastrophic expenditure for HIV and TB services in the context of donor transition. Furthermore, benefit incidence of donor assisted ITN provision is not pro-poor and the overall service use was low. More effort is needed in getting ITNs to vulnerable groups. Likewise, developing strategies for generating sustainable domestic funding will be needed to sustain equitable access to these healthcare services.

Did the Poor Gain from India's Health Policy Interventions? Evidence from a Benefit-Incidence Analysis, 2004-2018

PRESENTER: **Sakthivel Selvaraj**

AUTHORS: Anup Karan, Wenhui Mao, Habib Farooqui, Ipchita Bharali, Preeti Kumar, Osondu Ogbuoji, Chetana Chaudhuri

Background: Health policy interventions in India were expected to improve access to health care, provide financial risk protection, and reduce inequities related to geographic and socio-economic variation in population access to health care. This study examines whether health policy interventions and accelerated health investments in India from 2005-2018 closed the gap in inequity in health care use and in access to public subsidies by different population groups. Did the poor and socio-economically vulnerable populations gain from such government initiatives compared to the rich? Was the intended objective of improving equity between different regions achieved?

Methods: Using a benefit-incidence analysis (BIA) framework, this study advances earlier evidence by highlighting estimates of health care use, concentration, and public financing by broader provider categories (public versus private) and across service levels (outpatient, inpatient, maternal, pre-and post-natal services). The period of analysis was chosen to represent policy interventions spanning 2004 (pre-policy) and 2018 (post-policy era). We present this evidence across three categories of Indian states: high-focus states, high-focus north eastern states and non-focus states. Such categorization helps to quantify the impact of policy interventions.

Results: Use of healthcare services, except outpatient care visits, accelerated significantly from 2004 to 2018. The difference in rates of use between the poorest 20% and the richest 20% declined significantly during the same period. The concentration index underlying inpatient care in the public sector fell from 0.07 in 2004 to 0.05 in 2018, implying less pro-rich distribution. The concentration index in relation to pre-natal, institutional delivery, and postnatal services in government facilities were pro-poor both in 2004 and 2018 in all three groups of states. The distribution of public subsidies underscoring curative services (inpatient and outpatient) remained pro-rich in 2004 but turned less pro-rich in 2018, measured by CIs that declined sharply across all groups of states for both outpatient services (from 0.21 in 2004 to 0.16 in 2018) and inpatient services (from 0.24 in 2004 to 0.14 in 2018). The CI for subsidies on prenatal services declined from zero in 2004 to -0.14 in 2018. For post-natal services, similar results were seen, implying the subsidies on prenatal and post-natal services were overwhelmingly received by poor. The CI underscoring subsidies for institutional delivery remained positive in 2018, but declined from 0.15 in 2004 to 0.04 in 2018.

Conclusions: Improvement in infrastructure and service provision through NHM in the public facilities appears to have benefited the poor more than the rich. Yet the poor received a relatively smaller health subsidy than the rich when using inpatient and outpatient health services. For private health care, inequality continues to persist across all healthcare services. Although the NHM is committed to broader expansion of health care services, a singular focus on maternal and child health conditions especially in poor regions of the country has yielded desired results.

Who Benefits from Donor Funding for the Vaccination Program in Ghana: A Benefit Incidence Analysis (BIA)

PRESENTER: **Isaiah Agorinya**, SwissTPH

AUTHORS: Wenhui Mao, James Akazili, Siddharth Dixit, Justice Nonvignon, Osondu Ogbuoji

Background: Ghana's National Immunization Programme (EPI) has contributed to reducing the country's child mortality rate. There have been no deaths from measles since 2003 and Ghana was certified as having eliminated maternal and neonatal tetanus in 2011. The EPI program has received funding from domestic resources and donors. However, the proportion of funding from public funds, private funds and international funds changed substantially in the past years along with Ghana's economic development and can generally be characterized as a shift from international funds to Ghana public funds. This project aimed to assess whether or not the EPI has benefited the vulnerable populations the most.

Method: A benefit-incidence analysis (BIA) was conducted using data from Ghana's seventh edition of the Living Standards Survey (GLSS 7), which was conducted in 2017. A BIA was applied to condense the distribution of benefits over the study population into a single number using the utilization rate of individual vaccines for vaccine specific benefits and then aggregating utilization across all selected vaccines for a combined benefit. We estimated the individual and aggregated vaccine benefits by (1) using the unit cost of providing each EPI service to children for free or subsidized; (2) identifying users of basic services (children under 5 years); (3) aggregating individuals into groups; (4) accounting for household spending; and (5) examining distribution of net subsidies for different population groups. Principal components analysis was used to create a socio-economic status (SES) index based on the households' assets. The measure of inequity in household healthcare payments was determined using the concentration index (CI).

Results: 96.4% of surveyed children were immunized. There were regional and SES disparities: urban areas had higher coverage for vaccine than rural areas, while the poorest households had the lowest coverage along all SES groups. The distribution of immunization services was pro-poor —the poorest quintiles used over 34% of total services while the richest only used about 11%. The rural population used a slightly higher proportion of most vaccines than the urban group. The total gross benefit from EPI was 35.78 USD for the poorest quintile and 25.23 USD for the richest. The net benefit was 34.56 USD and 24.04 USD for the poorest and richest quintiles, respectively. The gross benefit contributed by donor funds ranked from 7.87 USD to 5.55 USD across different SES groups. The CI of gross benefit for each vaccine was all negative, indicating pro-poor distribution of gross benefit. The CI of total gross benefit for all vaccines was -0.0914; after deducting the out of pocket payment, the distribution of net benefit from EPI was even more pro-poor (CI: -0.0927).

Conclusions: The distribution of benefit from EPI in Ghana was pro-poor, indicating that public financing for EPI has reached vulnerable populations. To maintain the health benefit from EPI and its contribution in promoting health, mobilizing more domestic financing to support EPI after transition from donor funds should be considered. Further improvements can be made to increase the vaccine coverage in the poorest households and in rural areas.

Equity Assessment of Childhood Immunization in Myanmar at National and Subnational Levels

PRESENTER: **Zin Mar Win**, Community Partners International

AUTHORS: Tom Traill, Zarni Lynn Kyaw, Khaing Thandar Hnin, Phway Thinzar Chit, Thazin La, Osondu Ogbuoji, Wenhui Mao

Background: Myanmar, a lower middle-income country, is a conflict affected country that is geographically and ethnically diverse. The Expanded Programme on Immunization (EPI) has played a critical role in reducing vaccine preventable diseases in Myanmar. The aim of this study is to analyze whether the government- and donor-funded EPI programme equally benefits populations of different socioeconomic status (SES) and across different geographic areas.

Methods: We conducted a benefit incidence analysis (BIA) to estimate the distribution of health benefits across different SES - wealth quintile (WI) and maternal education (ME) - and geographic areas. Secondary data related to childhood immunization was collected from the nationally representative Myanmar Demographic and Health Survey. In this study, we used basic childhood immunization coverage—BCG, measles, DPT/pentavalent, polio and full vaccination coverage (12-23 months old children who have received one dose each for BCG and measles and three doses each for DPT/pentavalent and polio)—as measurements for health care use. Unit cost per dose of different types of vaccines was obtained from the "Comprehensive Multi-Year Planning Costing and Financing Tool 2017-2021" (cMYP) developed by WHO. Vaccine delivery cost was obtained from the "Immunization Delivery Cost Catalogue" (IDCC) which was calculated to estimate immunization delivery unit cost for low- and middle-income countries. We used the concentration index (CI) to describe the distribution of benefit, and the achievement index (AI) to assess both the average level of health service utilization and the inequality of the distribution.

Results: Higher SES disproportionately benefited more from all of the four basic vaccines, BCG, measles, DPT/pentavalent and polio and from full vaccination coverage at the national level (i.e. distribution of vaccination was pro-rich). Concentration indices across wealth quintiles (CI-WI) were 0.033, 0.050, 0.120, 0.096 and 0.139 and concentration indices across maternal education (CI-ME) were 0.034, 0.037, 0.082, 0.061 and 0.073 for BCG, measles, DPT/pentavalent, polio and full vaccination coverage respectively, again showing service utilization concentrated among the higher SES. The subnational analysis showed significant heterogeneity. Generally, the benefit of EPI programme was more unequally distributed in less developed, and conflict affected states than those government-controlled areas. The highest AI can be found in the second largest city's region, Mandalay, whereas the lowest AIs were in the most conflicted-affected states.

Conclusions: Overall, wealthier and more educated households benefited more from the publicly financed EPI programme, which indicated the inequity of health service use and financing in Myanmar. The subnational analysis showed significant heterogeneity, also showing that less developed and conflict-affected regions need more attention to improve the service uptake of EPI among poor populations. Considering the upcoming donor transition, national and regional governments should better plan to maintain vaccine coverage while improving equity of vaccine services, especially in conflicted-affected regions, remote regions, and disadvantaged populations.

Keywords: immunization, Myanmar, benefit incidence analysis, equity, achievement index

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8:00 AM –9:00 AM THURSDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Inequalities and Social Gradients

MODERATOR: **Nikkil Sudharsanan**, Heidelberg Institute of Global Health

The Socioeconomic Status Gradient in Pain: A Cross-Country Analysis

PRESENTER: **Enrica Croda**, Ca' Foscari University of Venice

Chronic pain has an important impact on peoples'lives and is a fundamental dimension of wellbeing. Pain is one of the most common reasons people seek medical attention and take medications. At the individual level, it is associated with a series of negative outcomes, including depression, job loss, and limitation of daily activities. At the societal level, it imposes considerable costs on the healthcare system and the economy. IOM(2011) estimated that pain cost the US at least $560-635billion every year, much more than heart disease, cancer, or diabetes.

Our current understanding of people's pain experiences has been largely limited by data availability. Most research so far has focused on the US, where chronic pain has been deeply intertwined with the opioid crisis, but little is still known about pain in Europe.

In this paper, I investigate the existence of sex disparities in chronic pain and the extent to which chronic pain is associated with socioeconomic status(SES) in mid-life in fourteen European countries and the US. Specifically, I exploit new data from SHARE and HRS to study whether (i) sex-based differences in pain are relatively similar across countries, (ii) country-specific characteristics matter the most for people in the bottom of the income distribution, and (iii) greater use of pain medication reduces aggregate pain.

In the preliminary analysis, I find that pain is part of life for two out of five midlife individuals, with wide heterogeneity across countries. Perhaps surprisingly, pain prevalence in the US seems in line with other European countries.

In every country, more women are bothered by pain than men, with noticeable differences in the gender gap across countries.

That markers of SES are associated to health outcomes is by now quite well established. The association between SES and pain, however, has only been recently receiving attention among researchers. I first document the existence of dramatic differences in the prevalence of pain by educational attainments in Europe as well as in the US: In every country, individuals with less than high school are much more likely to be troubled by pain than those that have completed secondary education, and these two groups are more likely to report pain than those with higher educational attainments. Next, I show that the reporting of pain presents a strong gradient also according to income quintiles, across all countries. Arguably more importantly, I find more country-level variation in the lowest income quintile as well as in the lowest education group, suggesting that country-specific characteristics matter the most for people at the bottom of the income distribution.

What can explain this strong association between pain and SES and the observed disparities? A possible explanation for these differences is that lower SES persons are more likely to have worked in manual jobs, or to suffer from poor health. In the multivariate analysis, I control for such differences using controls for occupation and industry and for several dimensions of health status, and estimate probit regressions for the prevalence of pain and ordered probits for the severity of pain.

Lifetime Healthcare Expenditures across Socioeconomic Groups: Wiping out the Gradient

PRESENTER: **Mr. Alexander O.K. Marin**

National healthcare expenditures are increasing across the globe and questions the sustainability of healthcare systems. Socioeconomic health differences are seen as a source of high health costs since low socioeconomic groups generally have poorer health and spend more on healthcare than higher socioeconomic groups - the so-called *negative social gradient*. Research suggests that reducing all socioeconomic groups' mean healthcare expenditures to the level of highest socioeconomic group would decrease healthcare expenditures by 15 percentage for a sample of Londoners above age 55.

Studies of the negative social healthcare expenditure gradient typically compare socioeconomic groups' health costs within a year and do not account for mortality differences between groups. Hence, these comparisons implicitly assume identical survival probabilities for all socioeconomic group meaning that all socioeconomic groups have the same number of years to consume healthcare. However, the negative social health gradient also affects longevity, as low socioeconomic groups tend to live shorter lives. Consequently, low socioeconomic groups consume relatively high healthcare expenditures across a short lifetime whereas high socioeconomic groups spend less on health but lead longer lives on average. The adversely related cost and mortality gradients makes it unclear whether a healthcare expenditure gradient exists once we account for socioeconomic longevity differences.

In order to factor in mortality differences, others weight average hospital costs by age specific survival probability in five different socioeconomic groups and hereby estimate lifetime hospital expenditures. The study finds a ten-percentage negative lifetime hospital cost gradient for both men and women. However, data limits the analysis solely to hospital expenditures and omits other types of costs.

This paper examines the negative social healthcare expenditure gradient by estimating expected lifetime healthcare expenditures. We use extremely detailed population-wide Danish register data including a comprehensive array of health costs covering not only somatic hospital expenditures but also psychiatric hospital expenditures, costs to primary care physicians, prescription drugs, home care, home nurses and nursing homes.

We start our analysis and estimate average cost by age and socioeconomic group, which confirms the negative social healthcare expenditure gradient across all ages from 30 to 100+. Proceeding, we estimate expected lifetime healthcare expenditures by weighting average costs by survival probabilities. All socioeconomic groups have near identical lifetime spending and, using our novel test, all differences in lifetime healthcare expenditures are statistically significant. However, spending differences across genders persist and women's average lifetime spending of size $378,000 is one third larger than men's lifetime costs of size $290,000. Investigating lifetime expenditures by cost component, the lowest group has highest lifetime in- and outpatient care spending consistent with previous findings. However, due to the highest group's longer life, it spends more on home care, home nurses and nursing homes in a lifetime, which has an offsetting effect on total lifetime spending such that all socioeconomic groups have similar lifetime costs. Our results are robust to inclusion of end-of-life expenditures and socioeconomic groups defined as educational attainment.

A Cross-Country Study of Subjective Social Status: The Relative Importance of Education, Occupation, Income and 'the Silver Spoon'

PRESENTER: **Marie Hella Lindberg**, UiT The Arctic University of Norway
AUTHORS: Gang Chen, Jan Abel Olsen, Birgit Abelsen

Background and aims
In the literature on social inequalities in health, different indicators for socioeconomic position (SEP) are applied, most commonly education, occupation and income. These SEP indicators are used as proxies for measuring individuals' position in the status hierarchy, often motivated by the hypothesis that a high subjective SEP in itself is health-enhancing. Furthermore, an extensive literature has shown that past childhood circumstances (CC) affect adult health (AH). However, the many pathways through which CC determine AH are challenging to trace. If such a link exists, it may help explain one important pathway from childhood circumstances to adult health via the status generated by having grown up with a 'silver spoon'. The aims of the current paper are to i) estimate the relative importance of the three commonly used objective SEP indicators; and ii) inquire into the importance of CC in shaping subjective SEP after controlling for education, occupation and income. Given that the relative importance of these variables is expected to differ across institutional settings, we compare data from five countries.

Methods and material
We use data from an online survey of 1,400 representative respondents in each of the following countries: Australia, Canada, Norway, UK and US. Multivariate linear regression is used to assess how education, occupation and household income, and CC (childhood financial circumstances and parents' education) predict subjective SEP. We further use Shapley value decomposition to estimate and compare the relative importance of these factors across the five countries.

Results
Overall, the higher the level of the objective SEP indicator, the higher the subjective SEP. Preliminary analyses of the Australian data show that income was the strongest predictor for subjective SEP, followed by occupation and education. In Norway, occupation was the most important predictor for subjective SEP. Of the childhood variables, financial circumstances during childhood were significantly associated with subjective SEP in both countries. This association was stronger in Norway than in Australia. It was only in Norway that mother's tertiary education had a significant impact on subjective SEP.

Interpretation
Cross-country differences in the relative importance of SEP indicators can provide new insights into the measurement of SEP. Our results point to substantial differences between countries, emphasising the need to take cross-country variations into account. Interestingly, the results suggest that childhood circumstances have a lasting impact on subjective SEP, even after controlling for education, occupation and income.

8:00 AM –9:00 AM THURSDAY [Health Care Financing And Expenditures]

Addressing Hard-to-Reach Populations to Achieve UHC

MODERATOR: **Karen Grépin**, The University of Hong Kong

Assessing the Impact of Health Maintenance Organisations on Expanding Coverage of the National Health Insurance Scheme in Nigeria: Stakeholders' Perspective

PRESENTER: **Aisha Ismaila Aliyu**, National Emergency Operation Centre
AUTHORS: Prof. Shafiu Mohammed, Muhammad Saddiq, Penny Buyx

Achieving universal health coverage (UHC) for all continues to be a significant challenge in many global south countries such as Nigeria. Nigeria introduced a National Health Insurance Scheme (NHIS) to complement other sources of financing healthcare and scale up the UHC level in the country. The aim of the scheme was to improve health by providing access to adequate and affordable healthcare to all Nigerians. Yet, since the inception of the NHIS in 2005, it has failed to cover more than 5% of the population for various reasons including poor legislation and awareness. Additionally, studies have considered the role of health maintenance organizations (HMOs), who purchase services under the scheme, in expanding coverage and improving UHC in Nigeria as purchasers of services under the NHIS and managers of PHI.

This study aims to understand the barriers to expanding coverage of the NHIS in Nigeria, from stakeholders' perspectives, including; NHIS staff, HMO's, healthcare providers and NHIS enrollees. Furthermore, to explore how HMO's have contributed towards expanding coverage of the NHIS, in achieving UHC. In addition, to formulate recommendations on how to improve coverage of the NHIS in Nigeria.

The study used a qualitative method in the form of in-depth semi-structured interviews and focus-group-discussions to collect data from key stakeholders including NHIS staff, HMOs, HCPs and NHIS enrollees; on the barriers to improving coverage on the NHIS and the impact of HMOs in Nigeria. A purposive sampling method was used to recruit the study participants. Ethical approval was obtained from ScHARR and in-country ethics from Nigeria. Data was recorded using a password protected recorder and transcribed verbatim. A thematic analysis approach was used to analyze the data.

The findings revealed that the design of the scheme was the main barrier to expanding coverage of the NHIS. The poor structure of the scheme allows for loopholes in committing fraud by stakeholders. It also found that the scheme was poorly implemented by purchasers and service providers, which subsequently reflects on perceived client satisfaction. These obstacles and hindrances have direct and indirect consequences on coverage expansion.

To expand coverage of the NHIS and improve UHC in Nigeria, the structuring of the scheme should be improved, and strengthening of monitoring and evaluation. Stakeholders should be given clear and defined roles and responsibilities to improve effective implementation of the scheme, which could translate to improved service provision.

Who Are the Users of Strategic Purchasing Clinics? Findings from First Pilot in Yangon, Myanmar

PRESENTER: **Dr. May Me Thet**, Population Services International Myanmar
AUTHORS: Myat Noe Thiri Khaing, Dr. Phyo Myat Aung, Ye Kyaw Aung

To achieve the Universal Health Coverage (UHC) goal, the National Health Plan is established in Myanmar to strengthen the country's health system and the Government set a path that is explicitly pro-poor. To support this, Population Services International Myanmar(PSI/Myanmar) has introduced a pilot in 2017 with an innovative financing mechanism where private General Practitioners (GP) were contracted to provide basic primary care services in two peri-urban townships of Yangon, Hlegu and Shwe Pyi Thar. The GPs were provided with a capitation payment system. Poor households were selected and registered in the pilot. Households enrolled at contracted GPs were issued health cards to seek services such as services for under 5 years old (U5), family planning (FP), maternal health (MH), non-communicable diseases; hypertension and diabetes (NCD), counselling and referral (CS) and fever and minor illness (Gen) with a standard subsidized rate. The project aims to reduce financial burden of households with a hypothesis that poor families could lessen their financial burden if they seek care at the pilot GPs. The objective of this study is to profile the clinic users and assess equity in service utilization by applying absolute and relative equity indices.

The study uses client registration data and routine clinic data from March 2017 to June 2020. The clinic utilization data were retrieved from clinic data bases.The socioeconomic status of the households was assessed by household assets and measured by constructing a wealth index using principal component analysis. Each type of service utilization was stratified by wealth quintiles. Equity was assessed by measuring differences in service utilization between poorest wealth quintile (Q1) and richest wealth quintile (Q5) and then by calculating slope index of inequality (SII) and concentration index. Statistical significance was set as p=0.05.

Among 7868 beneficiaries, 46.9% had received at least one service from the GPs. Mean age of users was 27.9 (SD 19.6) years. Of all users, females contributed 59.3% and Hlegu residents did 61.3%. Among the users, users for fever and minor illness (Gen) was the highest with 97.8%. It was followed U5 (78.1%), FP (21.9%), CS (18.9%), NCD (17.1%) and MH (13.5%). Service utilizations varied across different wealth quintiles. The differences between Q1 and Q5 were; U5 (55.8% vs. 8.6%), FP (20.5% vs. 4%), MH (12% vs.4.8%), NCD (9.3% vs. 4.5%) and Gen (67.1% vs. 19.8%) and CS (6.4% vs. 8.8%). The SII were significantly negative for all services except counselling and referral, indicating that the users were higher among individuals in the poor wealth quintiles. The concentration indexes for services were; U5 (-0.25) , FP (-0.27), MH (-0.17), NCD (-0.16), Gen (-0.24) and CS (0.08). These index values were statistically significant ($p<0.001$) and it showed that all services utilization except counselling was favored by poor beneficiaries.

The study revealed promising findings that the pilot seemed to be effective for the poor as targeted. Therefore, there is a potential for expansion of strategic purchasing GP clinics in other parts of Myanmar.

The Role of Informal Network Insurance in the Senegalese Health System through a Qualitative Study

PRESENTER: **Modou Diop**, UNIVERSITY OF GRANADA

Background: To face the challenges and improve the governance and functioning of the health insurance financing system, health programs in West Africa must consider the needs and priorities of the rural population, and this cannot be possible without considering the cultural and institutional context in health financing in the region. Neither the state nor the market appear to be able to provide effective health insurance to low- and middle-income workers in the informal sector. Financial capacity must be taken into account, as well as all existing financial organizations (informal or formal) and omitting them can generate bias estimates.

Objective: The general objective of this study is to undertake theoretical and empirical work related to the economic evaluation of traditional informal network health insurance plans in Senegalese communities.

Methods: 28 immigrants living in Granada participated in a qualitative study (14 semi-structured interviews and a discussion group). The participants come from a tontine runed in Granada for immigrants with difficulties in accessing formal services (repatriation insurance, medical insurance, work insurance, etc.). This study is important both to understand the challenges in access to health care for immigrants in Spain, and to better understand the possible challenges and solutions of a health financing system for the informal sector in Senegal.

Results: The main problem of immigrants that we have interviewed, as well as a significant part of Senegalese, is working in the informal sector for two reasons: (1) immigrants without papers (2) lack of institutionalization of the Senegalese state to control many activities of the urban and rural world in Senegal. The creation of the informal network financing system in Granada is to guarantee the right of repatriation to all Senegalese immigrants who have died in Granada or are ill to benefit from care in their country, mainly traditional medicine and family care. Also, in this funding system, both undocumented immigrants and legal immigrants are members. In this way, its members show a connective social capital (bridging social capital) so that the solidarity mechanisms are strong within the community, allowing a common goal to the vulnerable people in their surroundings. The rationale for the creation of informal network health insurance financing systems in Senegal is similar with a single purpose: risk pooling. The direct financing involved in accessing treatment is a barrier for most workers in the informal sector, and therefore people from the same community or from close families often turn to the creations of these systems to guarantee access to treatment at the whole community or family.

Conclusion: Through the evaluation of informal insurance plans, we have shown that the low adherence rates of community insurance plans, both private and government-driven for precarious workers, are not due to a lack of information but rather to i) their lack of confidence with respect to managers and political leaders; ii) in the ability of formal insurance to reduce community inequalities. It also shows the willingness of Senegalese to have a formal financing system that reduces community inequalities.

9:15 AM – 10:15 AM THURSDAY [Social Events]

Socializing and Networking II

9:15 AM – 10:15 AM THURSDAY [Special Sessions]

Early Career Researcher Mentoring Session II

10:45 AM – 11:45 AM THURSDAY [Supply Of Health Services]

ORGANIZED SESSION: Incentives for Health Care Providers in Primary and Secondary Care: From Economic Theory to Policy

SESSION CHAIR: **Rochaix Lise**, Paris School of Economics

ORGANIZER: **Luigi Siciliani**, University of York

Contracts for Primary and Secondary Care Physicians and Equity-Efficiency Trade-Offs

PRESENTER: **Oddvar Kaarboe**, University of Bergen

We study is how different payment systems for general practioners (GPs) and hospital specialists on inequalities in primary care and specialist visits, and the allocative efficiency of health systems. Different payment systems in primary care affect GP incentives to treat or refer patients to the specialist. Similarly, payment systems for specialists affect their incentives to treat the patient, or eventually send the patient back to the GP. In turn, different combination of payment systems in primary and secondary care generate different degrees of inequalities in treatments and referrals that translate also into health inequalities, and different levels of welfare and therefore degree of allocative efficiency.

In this paper we present a model of contracting between a purchaser and two providers of health services, a GP and a hospital specialist. The GP is paid by either fee-for-service, capitation or a combination of the two. Hospital specialists are financed through a DRG-based payment system for the hospital specialist. Both providers are altruistic and obtain utility from patient benefit of treatment and income.

Patients differ in socioeconomic status and can have high or low severity. The GP receives an informative signal on the severity of the patient following an examination. The specialist instead observes severity perfectly. Based on the signal, the GP decides if to refer to a specialist or to treat the patient. For each patient referred by the GP, the specialist decides whether to treat or refer back based on severity. These assumptions give rise to four possible health system configurations: i) the GP refers only patients with high-severity signal and the specialist treats only high-severity patients; ii) the GP refers all patients, but the specialist treats only high-severity patients; iii) the GP refers only patients with high-severity signal, and the specialist treats all patients; iv) the GP refers all patients, and the specialist treats all patients.

Our key findings are as follows. We find that (under minimal conditions) health inequalities are higher when the GP refers only high-severity patients and lower when the specialist treats all patients. More precisely, health inequalities are highest under scenario i) when the GP refers patients with high-severity signal and the specialist treats only high-severity patients; inequalities are intermediate in scenario iii) the GP refers patients with high-severity signal and the specialist treats all patients. There are no health inequalities under scenario ii) or iv) when the specialist treats all patients regardless of whether the GP refers only high-severity patients or all patients. In terms of welfare (allocative efficiency), we find under minimal conditions that welfare is highest under scenario i) when the GP refers patients with high-severity signal and the specialist treats only high-severity patients. Welfare is instead lowest under scenario iv) when the GP refers all patients, and the specialist

treats all patients. Our main policy implication is that a tightening of a GP referral system, i.e. a move from scenario ii) to i) or from iv) to iii) generally increases allocative efficiency but also increases health inequalities.

Diagnostics and Treatment: On the Division of Labor between Primary Care Physicians and Specialists

PRESENTER: **Mathias Kifmann**, Universität Hamburg

An important topic in health care is that patients obtain diagnosis and treatment by the appropriate provider. This often requires that providers refer patients to other providers. The literature on referrals has shown that the extent of appropriate referrals depends on incentives for primary care physicians (PCPs). If they are remunerated by capitation, they have an incentive to refer more patients than optimal, since they can save on their own costs by not treating the patient. Conversely, if PCPs are paid fee-for-service, they are incentivized to (over-)treat patients themselves. Not referring patients that would have greatly benefitted from a referral deteriorates patient's outcomes (underreferral), whereas referring patients who do not benefit, or only marginally benefit, from a referral creates unnecessary costs for the health care system (overreferral). Empirically, there is evidence for both over- and underreferrals

Previous literature has focused on the initial referral decision. This study goes further and considers possible strategic decisions by the specialist to whom the patient is referred. A theoretical model considers a gatekeeping PCP who can refer patients to a specialist. Patients can suffer from a disease which can be of high or low severity. The disease can be treated by both types of physicians. However, the effectiveness of treatment differs between the physicians. In particular, the specialist can treat the high-severity cases better due to her more sophisticated technical and human capital.

The PCP is not able to perfectly diagnose a patient's health status. Therefore, some patients who do not require specialist treatment may be referred to the specialist. The specialist diagnoses the patient and decides whether to treat herself or to refer the patient back to primary care. Since treatment costs for specialists are higher than the costs of PCP treatment, it can be efficient to refer low-severity patients back to the PCP.

Agency problems arise because diagnostic signals are private information of the physicians.

If physicians are altruistic, too many patients will receive specialist treatment under cost-based fee-for-service contracts. To avoid overreferral, the PCP can be paid a markup for treating patients without referral. However, if PCP diagnosis costs are low, the rent generated by this markup cannot be extracted. For this reason, it may be suboptimal to pay markups to the PCP. Specialist overtreatment can be countered by a markup to the specialist for referring patients back. This directly rewards the specialist for diagnosing and referring the patient. It also indirectly incentivizes the PCP not to refer low-severity patients, since she can predict that these patients will get referred back anyway. Furthermore, any rent can be extracted whenever a markup for the specialist is potentially optimal. Therefore, it can be more attractive to pay a markup to the specialist rather than to the PCP.

The Pricing of Physicians' Services with Distant Medicine and Health Insurance

PRESENTER: **Izabela Jelovac**, GATE UMR CNRS 5824

Medical deserts and balance billing are problematic cornerstones in the French health care system. Indeed, demographic dynamics has led some regions in France to be under-provided in terms of physicians' presence and services. In turn, balance billing, i.e. the possibility for physicians to set their own fees, can be problematic when high physicians' fees restrict the access to health care even more. The recent pandemic has added new challenges to the system. Physicians, and health care workers in general, are central in the alleviation of the sanitary crisis, at the risk of being infected and spreading the pandemic further.

Telemedicine is put forward as a way to alleviate the issue of medical deserts. It also proves very useful to facilitate the provision of physicians' services while restricting unnecessary and dangerous physical contacts during pandemics. However, in a system that allows balance billing, it is important not only to anticipate the pricing of telemedicine, but also how this pricing strategically interacts with the pricing of face-to-face medicine and, ultimately, the consequences on patients' welfare.

To reflect the physicians' ability to set their own fees in a system with balance billing, we analyze how telemedicine influences physicians' pricing decisions both in a monopolistic setting and in a competitive one. To reflect the widespread social protection of patients in France and in many developed countries, we also consider differentiated reimbursement rates for face-to-face medicine and for distant medicine and we analyze their effect on pricing. Ultimately, the analysis of pricing allows us to derive conclusions about both access to medicine and welfare.

This paper relates to four strands of the literature: the literature that analyzes the effects of competition on health care provision; the literature that analyzes the effects of balance-billing in presence of insurance reimbursements; the literature that analyzes the effects of subsidies on competitive pricing and the literature that analyzes competition between distant and around-the-corner suppliers. Up to our knowledge, this paper is the first one to link this interdependent series of issues.

We show that telemedicine logically increases access to medical care and helps overcome the issue of medical deserts. Doing so, it increases the fee for face-to-face visits as well as providers profits. Indeed, controlling both types of medicines allows the providers to discriminate between nearby and distant patients, which results in higher fees for face-to-face medicine. Moreover, fees for telemedicine are set so as to fully extracts the surplus away from distant consumers. These effects of telemedicine on pricing leads to the surprising conclusion that, the consumer surplus decreases when distant medicine is possible, even when it overcomes the medical desert issue.

In all cases but one, the effect of copayments is typical of models with linear demands: The fees that maximize providers profits adjust to copayments in such a way that both demands and patients prices are invariant to copayments. However, we find one exception to such regularity. The patients fee for face-to-face visits can be increasing (decreasing) in the co-payment rate for face-to-face (distant) medicine.

Competition, Quality, and Integrated Care

PRESENTER: **Luigi Siciliani Sici**, University of York

Integrated care had been promoted in several countries in order to provide patient-centred care and improve care coordination (e.g secondary versus primary care, or primary care versus community care). The study investigates provider incentives following integration in a model where providers compete on quality, and identify the circumstances under which integration can either increase or reduce the quality of services provided.

The study uses a Hotelling set-up to model a health care market with two different services and two different providers, with the two providers of each service located at the endpoints of a unit line. Providers compete on quality of both services under regulated prices. The model then compares equilibrium quality when i) services are not integrated, and ii) when services are integrated. "Integration" is modelled as one provider now offering both sets of services, but quality differs across services even following integration.

To characterize the solution, we first assume that providers are identical for a given services, but services differ in demand responsiveness to quality, provider costs, regulated prices, and patient valuations of quality. Two consistent patterns that emerge from the analysis of the effects of integrated care under different types of asymmetry across services: (i) Integration leads to a quality increase for one type of service and a quality reduction for the other service; and (ii) patients tend to benefit (lose) if integration leads to quality dispersion (convergence) across services. We then explore the further insights arising from asymmetries across providers.

We show that when providers differ in costs of providing services, then (i) if the fixed prices are sufficiently low, integrated care leads to a quality increase (reduction) for services with lower (higher) cost of quality provision, thus quality dispersion arises across the services offered by each provider; while (ii) if the fixed prices are sufficiently high, then integrated care leads to a quality reduction (increase) for services with lower (higher) cost of quality provision, thus quality convergence arises across the services offered by each provider.

We conclude by investigating the role of synergies on costs or benefits and its effect on quality, as well as the welfare implications of moving towards integrated care. In the welfare analysis, we identify four group of patients. The first two groups of patients are served by the same providers under both integrated and non-integrated care. Given that transportation costs are the same under both scenarios, the only difference in utility is due to the difference in qualities under integrated and non-integrated care. The third and fourth group involves patients served by some providers under integrated care but are served by different providers when care is not integrated. For the third and fourth group, the difference in patient utility is due to the differences in qualities under the two scenarios, but also due to the differences in transportation costs.

Although the effects of integration on quality and welfare are generally ambiguous, we are able to characterize such effects as a function of key demand and supply parameters.

10:45 AM –11:45 AM THURSDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

ECONOMICS OF OBESITY SIG SESSION: Information, Environment and Health Behaviors

MODERATOR: **Emma Frew**, University of Birmingham

Outdoor Physical Activity and Population Health and Wellbeing: A Cross-Sectional Study of Waterway Users in the UK

PRESENTER: **Nafsika Afentou**, University of Birmingham

AUTHORS: Katrina Hull, Jenny Shepherd, Graeme Reeves, Stephanie Elliott, Patrick Moore, Emma Frew

Background: While the relationship between the benefits from physical activity and health is well-established, there is increasing interest in understanding the additional value provided through promoting population physical activity that takes place in natural settings. Natural environments such as parks, woodlands or waterways have been identified as potential means of increasing outdoor exercise as well as promoting local population mental health and wellbeing. Crucially, exposure to natural environments is associated with reduced morbidity and mortality and improving access to green/blue space is important for alleviating health and wellbeing inequalities within local populations. Furthermore, there is evidence that environmental interventions to encourage 'active travel' could enhance population incidental physical activity but little is known about the short and long-term cost-effectiveness.

Objective: The aim of this study is to explore the causal relationship between 'blue/green space' features and population health and wellbeing, and to map out a methodological framework for capturing the economic value and health and wellbeing benefits from changes made to the environment to encourage physical activity.

Methods: Data will be taken from the cross-sectional UK Waterways Engagement Monitor survey conducted from 04/2019 to 04/2020 (n=21,537). The survey provides details on the usage of waterways (visits, frequency, type of activity, urban/rural access points), and the characteristics of users (socioeconomic, physical activity levels, place of residence). Quality of life (QoL) is measured by the Short Warwick Edinburgh Wellbeing Scale for mental health, and four measures of wellbeing developed by the UK Office for National Statistics. Bivariate and multivariate regression analysis will be conducted to account for the separate and combined effect of the different factors. Known predictors of QoL such as age, sex and income will be incorporated into the model.

Results: The results will determine the features of blue/green space that have a significant impact on health and wellbeing and thus can be considered enablers of engaging in physical activity in natural environments. Going forward, this will inform the development of an economic framework on how to capture the true economic value of using blue/green space to promote physical activity in terms of how population benefits are identified, measured and valued, and offset against costs.

Conclusion: Natural environments are key locations for physical activity and this study will help map out a framework for how their value should be captured within an economic framework.

Simplicity Is the Ultimate Sophistication? A Randomized Experiment to Test If Simple Information Can Boost Sophistication and Commitment Demand in Physical Activity

PRESENTER: **Diarmaid Ó Ceallaigh**, Erasmus University Rotterdam

Physical activity is a textbook example of time-inconsistent behavior – people continually fail to follow through on their physical activity (PA) intentions. Given this, and the importance of PA in tackling the obesity problem, PA is a popular target for behavioral interventions. However, despite a rich set of such interventions, very few reach the goal of sustainably improving PA habits.

One exception to this are interventions using commitment devices, which have been shown to be effective to overcome time inconsistency in several health behaviors, including PA. However, the take-up of these contracts is usually low. The main behavioral economic models of self-control all predict that the demand for commitment devices increases in the individual's sophistication, or awareness of their time inconsistency problems. However, causal empirical evidence on the link between sophistication and commitment demand, or on interventions to increase sophistication, is lacking, particularly in large general population samples.

To address this gap, I run a randomized experiment to test whether a simple information intervention can increase sophistication and in turn boost the demand for commitment. The experiment is run through a three-wave longitudinal online survey that is completed over a four-week period by members of the *Lifelines* general population cohort study from the north of the Netherlands. A subset of survey respondents are randomly allocated to one of two information treatments. These treatments involve providing each respondent with information in wave 2 of the survey on their PA time inconsistency levels over the previous two weeks.

I analyse the treatment effect on sophistication and demand for commitment. I exploit the longitudinal nature of the survey to derive the measures of time inconsistency and sophistication using elicitations of a respondent's ex-ante *ideal* and *predicted* PA for a two-week period and an ex-post measure of their *actual* PA. Demand for commitment is measured using hypothetical scenario questions. Measures are incentivised using *choice-matching*, a recently developed method of incentivising honest answers to survey questions.

4,382 responses were gathered between March-June 2021. In the full sample, the treatments had no effect on sophistication or demand for commitment. In the subgroup of participants who were time inconsistent at baseline, one of the treatments had no effect while the other reduced sophistication and demand for commitment, which was the opposite of the intended effect.

Overall, this intervention was not found to be effective in increasing sophistication and demand for commitment. However, a positive link was found between sophistication and commitment demand which provides valuable additional evidence on the nature of this relationship.

Health Information and Lifestyle Behaviours: Short and Long-Term Impacts of a Diabetes Diagnosis

PRESENTER: **Dolores Jiménez**, UNIVERSITY OF GRANADA

AUTHORS: Alessio Gaggero, Joan Gil, Eugenio Zucchelli

Background and motivation

Acquiring timely information on the evolution of an individual's health and related risks could potentially affect patients' behaviour and reduce avoidable health care use and associated costs.

Yet, evidence on the effects of health information on behavioural changes is still mixed, especially among individuals with chronic conditions. In addition, there is little causal evidence on the impact of a type-2 diabetes mellitus (T2DM) diagnosis, especially around its long-term effects on behavioural risk factors such as obesity, smoking and alcohol consumption.

The main objective of this paper is to identify short- and long-term causal impacts of a T2DM diagnosis on lifestyle behaviours by employing a Regression Discontinuity Design (RDD) and uniquely suited administrative longitudinal data.

Data and methods

We make use of rich individual-level longitudinal data drawn from administrative records of patients followed over seven consecutive years (2004-2010) from Spain. In addition to standard sociodemographic variables, this dataset includes clinical measurements of height and weight; a wide range of diagnosed conditions; measures of lifestyle (smoking and drinking) and glycated haemoglobin, HbA1c, a biomarker routinely employed to measure the concentration of blood sugar and to diagnose T2DM.

We estimate short and long-term impacts of a T2DM diagnosis using a fuzzy RDD exploiting the exogenous cut-off value in the diagnosis of T2DM provided by HbA1c. We measure the impact of a T2DM diagnosis on clinically measured BMI, quitting smoking and quitting drinking within one year, two years, three years and up until ten years from the date of the diagnosis. We explore heterogeneity in the impact of a diagnosis by gender and employment status. Furthermore, we provide a series of robustness checks.

Results

We find that following a diagnosis of T2DM individuals appear to substantially reduce their weight short-term, especially among women, obese and middle-age individuals. Moreover, individuals diagnosed with depression and those with comorbidities seem to be mostly affected by the diagnosis. Contrary to previous findings, we also provide evidence of statistically significant long-term impacts on BMI. We do not detect any statistically significant impact of a T2DM diagnosis on other potentially relevant behaviors such as alcohol or smoking. Our results are consistent across both parametric and non-parametric estimations with varying bandwidths.

Conclusions

Overall, results suggest the relevance of health information in causally affecting behavioral changes in key lifestyle factors. Importantly and differently from previous studies, we also suggest the presence of relevant long-term impact of a T2DM diagnosis on BMI. Reliable evidence on whether a diagnosis can influence modifiable risk factors, might help policy makers and medical doctors to ease costs and challenges linked to T2DM faced by health care systems.

Changing University Students' Alcohol Culture with a Web-Based Intervention: Results from a Randomized Controlled Trial

PRESENTER: **Jane Greve**, VIVE - The Danish Center for Social Science and Research

AUTHORS: Stefan Bastholm Andrade, Rune Vammen Lesner Sr.

In most Western countries, excessive alcohol intake among university students is a cause of concern. The majority of students view binge drinking (i.e., drinking more than five units of alcohol on one occasion) as a cornerstone of university life, and many find it difficult to go against the dominant drinking culture. While digital health interventions have been shown to reduce drinking among university students, no intervention has been aimed at changing the overall university drinking culture. This intervention draws on classic nudging tools and applies multiple components targeting the drinking culture at a Danish university. The intervention provided the students with tools that helped them make pre-commitment strategies and change their views on the social norms that prevent excessive alcohol intake.

To evaluate the impact of the intervention, we conducted a cluster randomized controlled experiment among university students at Aarhus University. The students were stratified by gender and self-reported binge drinking. Each student was assigned to either a control or an intervention group. The intervention included multiple components, such as online self-affirmation tools, pre-commitment strategies, and motivational text messages. A baseline questionnaire was sent to the participants when school started in September 2019, and a follow-up questionnaire was sent out two months later. The primary outcomes were measured with the Alcohol Use Disorder Identification Test (questions 1-3). To examine the mechanisms underlying the effect, we analyzed two motivational factors for participating in the drinking culture at the university: alcohol consumption as both and a personal benefit and a facilitator of socialization. To assess the motivational factors, we used self-reported information about the benefits associated with drinking and questions about whether the students had been to a party without drinking and whether they had experienced difficulties saying "no" to alcohol.

In total 961 students signed up, and 509 of them completed the follow-up questionnaire. Compared to the students in the control group, the students in the intervention group had a 15.8% ($P<.001$) reduction on their monthly level of alcohol intake two months after the intervention. The result is driven by a large effect on male and first-year students. The intervention had no effect on other alcohol-related outcomes, such as binge drinking, alcohol addiction, or severely harmful alcohol consumption. Our results also showed that while the students in the intervention group found it less difficult to say "no" to drinking there were no difference in the assessment of being part of the student environment between the students in the intervention and control group.

That the effect of the intervention was largest among the young and first-year students, who will be the responsible for the drinking culture at the University in the coming years, suggest that small nudging-based interventions can potentially have significant long-term beneficial effects.

10:45 AM – 11:45 AM THURSDAY [Cross-Cutting Themes And Other Issues]

HEALTH PREFERENCE RESEARCH SIG SESSION: Stated Preferences in Applied Contexts

MODERATOR: **Fern Terris-Prestholt**, London School of Hygiene & Tropical Medicine

Investigating the Effect of Motivation on Stated Job Preferences of Community Health Workers in Ethiopia Using a Hybrid Choice Model

PRESENTER: **Nikita Arora**, London School of Hygiene & Tropical Medicine

AUTHORS: Kara Hanson, Abiy Seifu Estafinos, Dorka Woldesenbet, Romain Crastes dit Sourd, Matthew Quaife

Introduction

It is believed that understanding the job preferences of health workers can help policymakers better align incentives and retain a motivated workforce in the public sector. However in discrete choice experiments (DCEs), perhaps surprisingly, one antecedent to health workers' job choices and behaviours that hasn't yet been incorporated, is their motivation to do the jobs. The simple inclusion of measures of motivation in the utility function underpinning a DCE can lead to endogeneity bias and measurement error. A hybrid choice modelling approach is thus recommended when capturing latent characteristics like motivation. This paper is the first application of a hybrid choice model to measure the effect of multidimensional motivation on the job preferences of community health workers (CHWs).

Methods

We interviewed 202 CHWs in Ethiopia. Motivation was assessed quantitatively using a series of thirty questions, on a five-point Likert scale. Stated preferences for hypothetical jobs were captured using an unlabelled DCE. Each choice task in the DCE had three choices – two job alternatives comprising of differing levels of 6 attributes, and a status quo coded with only a constant. We estimated four main models: a multinomial logit (MNL) model, a mixed multinomial logit (MMNL) as base models, and two **hybrid** choice models - one an extension of the MNL and the other of the MMNL. Both hybrid choice models consisted of three latent variables identified using an exploratory factor analysis.

Results

As expected, the hybrid choice models provided additional behavioural insights into the preferences of CHWs, compared to the base models. CHWs who were likely to be intrinsically motivated and agreed to work in their role because they can help people, also strongly preferred 5 days of training, good facility quality, good health outcomes and had strong disutility towards a higher than average salary. On the contrary, CHWs who were extrinsically motivated and said that they were likely to be motivated by the recognition they got from other people, had stronger disutility for heavy workload and higher preferences for good facility quality.

Conclusion

We show a link between heterogeneity in preferences for hypothetical job choices and motivation, and Our results have implications for managers and can directly inform how respondents with different motivations can be attracted to different job profiles

"*All the World Is a Bumster*": The Economic Drivers and Health Consequences of Gambian Men's Interactions with Foreign Tourists

PRESENTER: **Matthew Quaife**, London School of Hygiene & Tropical Medicine

AUTHORS: Mareme Diallo, Assan Jaye, Melisa Martinez Alvarez

Objectives: This study aimed to describe the economic determinants and health implications of transactional sex between Gambian men and foreign tourists near tourist resorts in The Gambia. The Gambia has a thriving tourist industry, but in recent decades has developed a reputation as a destination for older, mostly female tourists to seek sexual relationships with young Gambian men. During partnerships or in return for sex, Gambian men may receive financial support or in some cases the opportunity to travel to Europe with a partner. There has been little previous research among these men on sexual risk behaviours, physical and mental health, and health service utilisation.

Methods - We conducted mixed method data collection among Gambian men who regularly interact with tourists: a cross-sectional quantitative survey and discrete choice experiment (DCE) with 208 respondents. The survey asked questions on demographic characteristics, sexual history with Gambian and tourist partners, health-seeking behaviours, and mental wellbeing. The discrete choice experiment sought to measure potential trade-offs between monetary or other rewards and risky sex.

Results - We found that sexual activity between Gambian men and tourists was prevalent but infrequent, 49% reported ever having sex with a tourist. Condom use at last sex was significantly higher with tourist partners (63%) than with Gambian partners (40% - $p<0.01$). STI symptoms in the previous 12 months were reported by 12% of participants, and HIV knowledge was notably low. Drug use in the previous three months was reported by 49% of respondents, all of whom used cannabis. Health care seeking was comparatively high for physical health conditions compared to sexual or mental health conditions. In the DCE, condom use was the largest determinant of choice, money was valued significantly and positively, and participants significantly favoured partnerships with younger women, and which presented an opportunity to travel to Europe. Qualitative data validated and explained some reasons for quantitative findings, for example the reasons for being a bumster:

"*They expect that they get invitation to come [to Europe]. They expect that they make some money every month. They expect marriage all those to get better life. [male interview participant]"*

Or pressures to engage in unprotected sex:

"*...some don't use to bother about [safe sex] [...] They will be ready to do it at the very spot. They can have you bend down at the beach itself [male interview participant]"*

Conclusion - Young men working on the beaches of The Gambia face substantial health risks linked to economic precarity, including from STIs and mental health issues. More work is needed to understand tradeoffs between risk and protection choices in these relationships.

What Factors Do Clinicians Value Most in Selecting Physician Preference Items? a Survey Among Italian Orthopaedists.

PRESENTER: **Michela Meregaglia**, CERGAS SDA Bocconi

AUTHORS: Dr. Patrizio Armeni, Ludovica Borsoi, Giuditta Callea, Aleksandra Torbica

Introduction

Physician preference items (PPIs) are high-cost medical devices on which clinicians express firm preferences with respect to a particular manufacturer and a specific product. The aim of this research is to understand what are the most important factors, as well as their relative importance, in the choice of new PPIs (i.e., hip or knee prosthesis) adoption on behalf of orthopaedic clinicians in Italy.

Methods

Based on a literature review and clinical experts' opinions, we identified a number of key factors (e.g. HTA recommendation) and their corresponding levels (e.g. positive HTA recommendation). We administered an online survey (Qualtrics) to hospital orthopaedists using two experimental techniques for preference elicitation, i.e. case 1 best-worst scaling (BWS) and binary discrete choice experiment (DCE). BWS data were analysed through descriptive statistics (i.e. best-minus-worst score) and conditional logit model. The same type of regression was applied to DCE data, and a willingness-to-pay (WTP) was estimated. All analyses were conducted using Stata 16.

Results

A total of 108 orthopaedists (93.5% male; mean age: 52.8; 64.8% from Northern Italy) were enrolled in the survey. In BWS, the most important factor was 'clinical evidence', followed by 'quality of products', 'previous experience' and 'HTA recommendation', while the least relevant items were 'relationship with the sales representative' and 'cost'. DCE results suggested that orthopaedists prefer high-quality products with robust clinical evidence, positive HTA recommendation and affordable cost, and for which clinicians have a consolidated experience of use and a good relationship with the sales representative. The WTP for a high-quality product was estimated at €2.091, and for a good relationship at €3.469.

Conclusions

This is the first study aimed at analysing the multidimensionality of clinician's decision-making process in selecting new PPIs in orthopaedics in Italy. Despite clinical evidence and quality of products are declared as two of the most important dimensions in adopting new hip or knee prostheses, when other factors populate a hypothetical scenario, physicians are not willing to accept them at any cost (e.g. high quality product or with robust clinical evidence and very bad support from the producer).

10:45 AM –11:45 AM THURSDAY [Cross-Cutting Themes And Other Issues]

ORGANIZED SESSION: Internet Healthcare Market in China

SESSION CHAIR: **Hongqiao Fu**, Peking University Health Science Center

DISCUSSANT: **Terence C Cheng**, Harvard T.H. Chan School of Public Health

Direct to Consumer Telemedicine Platforms and Markets for Medical Advice

PRESENTER: **Sean Sylvia**, University of North Carolina at Chapel Hill

AUTHORS: Karishma D'Souza, Hao Xue, Yian Fang, Winnie Yip

While previously limited to small scale programs, large-scale commercial telehealth consultation services have grown rapidly in recent years, particularly in middle income countries. Emergence of these "Direct-to-Consumer" (DTC) telehealth platforms has potential to fundamentally alter the market for primary care in a number of dimensions. Most directly, DTC telehealth expansion could represent a marked increase in competition due to the ability for providers to cheaply enter geographically disperse markets and to lower search costs facing patients. We study the DTC telehealth market in China – the country experiencing the most rapid growth of for-profit DTC platforms. Drawing on data covering all online platforms providing telehealth consultations via telephone or video conference as of November 2019, along with matching data from more than 500 unannounced visits from standardized patients presenting nine different disease cases, we present four main results. First, the structure of platforms varies widely on a number of dimensions including physician recruitment, ability of patients to rate physicians and type of rating used, consultation fee structure, whether fees are set by the platform or physicians, and whether platforms also sell drugs for revenue. Second, diagnostic quality is higher among platforms that also sell drugs and those with higher consultation fees but these platforms do not provide superior treatment advice. Third, platforms where patients are able to rate physicians and those with higher consultation fees are significantly are more likely to prescribe unnecessary medications even when not receiving revenue from drug sales. Finally, compared to traditional onsite providers in lower-level clinics, online DTC platforms provide superior diagnostic quality and treatment advice but are more to refer patients to other (onsite) providers when unnecessary to do so. If patients follow referral advice, this final result suggests that consultations through online DTC platforms may serve as a new market for supplementary medical advice rather than as a substitute for traditional onsite consultations.

How Do Consumers Respond to Performance Disclosure in the Health Sector? Evidence from Online Medical Consultations in China

PRESENTER: **Hongqiao Fu**, Peking University Health Science Center

This study investigates consumers' response to performance disclosure of physicians in Haodf.com, which is one of the leading third-party online healthcare platforms in China. Using a natural experiment that Haodf.com releases the list of "excellent doctors" in January 2019, we examine consumers' choice of physicians for online medical consultations. We report three main findings. First, compared to physicians who were just below the threshold of "excellent doctors", physicians who were just above the threshold attracted more online visits. Second, "excellent doctors" provided 5%-7% more online medical consultations after Haodf.com released the list, even though their prices rose moderately. It suggests that patients were more likely to choose physicians with performance certification. Third, young consumers are much more responsive. We conclude that consumers are responsive to performance disclosure in the online health market.

Distance Still Matters: The Geography of Online Medical Consultations in China

PRESENTER: **Duo Xu**, Peking University

AUTHORS: Hongqiao Fu, Qiulin Chen, Winnie Yip

Telemedicine and telehealth hold promise for reducing or eliminating access barriers caused by travel distance. However, little is known about how the Internet affects patients' online provider choices and thus the spatial distribution of healthcare utilization. This study investigates the effect of distance on flows of online medical consultations using a unique dataset from one of the leading third-party online healthcare platforms in China: Haodf.com. We show that the geographic distance between doctors and patients is negatively associated with online service utilization, though this effect is almost 50% weaker for online medical services than it is for offline medical services. We also find a strong "home bias" in which patients and doctors tend to locate in the same prefecture and in the same province. Further analyses suggest that the need for in-person doctor visits for follow-up examinations and treatments after an online consultation may be the key factor contributing to the distance effect. These findings have policy implications for improving healthcare access.

Monetary Incentives and Peer Referral in Promoting Digital Network-Based Secondary Distribution of HIV Self-Testing Among Men Who Have Sex with Men in China: A Three-Arm Randomized Controlled Trial

PRESENTER: **Ying Lu**, UNC Project-China

AUTHORS: Yuxin Ni, Yi Zhou, Dan Wu, Xi He, Xiaofeng Li, Shanzi Huang, Jason Ong, Joseph Tucker, Sean Sylvia, Guangquan Shen, Yongjie Sha, Mengyuan Cheng, Chen Xu, Fengshi Jing, Hongbo Jiang, Wencan Dai, Liqun Huang, Weiming Tang

Background

Digital network-based methods may enhance peer distribution of HIV self-test kits, but implementation research is needed to optimize the approach. We aimed to assess whether monetary incentives and peer referral can improve a secondary distribution HIV self-testing program among men who have sex with men (MSM) in China.

Method

A three-arm randomized controlled trial was conducted in Guangdong, China. Biological males aged 18 years or older who ever had male-to-male sex were recruited as index participants via social media. Indexes were randomly assigned into one of the three arms: standard secondary distribution (control) group, secondary distribution with monetary incentives (SD-M) group, and secondary distribution with monetary incentives plus peer referral (SD-M-PR) group. Indexes were encouraged to distribute HIV self-testing (HIVST) kits to members within their social networks (defined as alters). Indexes in the SD-M group received a fixed $3 incentive per verified test by an alter. Indexes in SD-M-PR group were also able to send personalized peer referral links for kit applications to alters and receive $3 per verified alter test. All incentives were paid by online transactions. The primary outcomes were the mean number of alters testing and first-time alter testers in each group, compared using two-sample t-tests. Analysis was done by intention-to-treat. This trial was registered with Chinese Clinical Trial Registry, ChiCTR1900025433.

Results

Between October 21, 2019, and September 1, 2020, we enrolled 309 eligible indexes (control: 102; SD-M: 103; SD-M-PR: 104). The mean number of unique alters testing per index in the control group was 0·57±0·96, compared with 0·98±1·38 in the SD-M group (mean difference [MD] 0·41, 95% CI: 0·08-0·74), and 1·78±2·05 in the SD-M-PR group (MD=1·21, 95% CI: 0·77-1.65). The mean number of unique first-time alter testers in the control group was 0·16±0·39, compared with 0·41±0·73 in the SD-M group (MD=0·25, 95%CI: 0·09-0·41), and 0·57±0·91 in the SD-M-PR group (MD=0·41, 95% CI: 0·22-0·60). The cost per alter tested was $15.67 in the control group, $9.95 in the SD-M group, and $6.62 in the SD-M-PR group, reductions of 37% and 58%, respectively.

Discussion

Intervention of monetary incentives alone and the combined interventions of monetary incentives and peer referral can promote secondary distribution of HIVST among MSM. Intervention of monetary incentives alone can motivate first-time testing among people within their social networks.

10:45 AM –11:45 AM THURSDAY [Evaluation Of Policy, Programs And Health System Performance]

HEALTH SYSTEMS' EFFICIENCY SIG SESSION: Determinants and Costs of Overuse and Overprescribing

MODERATOR: **David Lugo-Palacios Lugo Palacios**, London School of Hygiene and Tropical Medicine

The Cost of Overprescribing for Childhood Illnesses in Dandé, Burkina Faso

PRESENTER: **Pâbidon Bertrand Some**, Regional Directorate of Health

AUTHORS: Fadima Yaya Bocoum, Saidou Yonaba

Title: The Cost of Overprescribing for Childhood Illnesses in Dandé, Burkina Faso

Introduction: About 50% of medicines are irrationally prescribed according to the World Health Organization. Overprescribing leads to ineffective treatments and the emergence of antimicrobial resistances. It imposes economic burden. To date, the rate, the related cost and the factors of overprescribing for children under 5 have not yet been studied in low income countries with a free healthcare policy. This study filled this gap and aimed to: identify factors associated with overprescribing; estimate the rate and the incremental cost of overprescribing.

Methods: We conducted a cross sectional study including 20 of 33 first-level health facilities in the Dandé district in Burkina Faso from January 1 to December 31, 2018. Data collection relied on review of consultation and prescription records of children under 5 who sought treatment for malaria, pneumonia, rhinitis, dysentery, local bacterial infection and other pathologies.

We included in the sample 660 consultations by a three-stage sampling technique. We first collected records of symptoms, diagnosis and treatment from consultation registers and prescription strains. Then, we compared the records for appropriateness against the following criteria: the plausibility of the diagnosis with reference to the Integrated Management of Childhood Illness (IMCI); the indication for the drug, the medication effectiveness, the righteous of the dosage, the righteous of the directions, the absence of interactions, the absence of unnecessary duplication with other drugs, the righteous of the therapy duration and the low cost of the drug compared to others of equal utility. We considered there was overprescribing if in terms of symptoms, the diagnosis made didn't match with that proposed by IMCI or if in terms of medication appropriateness, at least one of them didn't respond " yes" to any of the above criteria.

Using a binary dependant variable indicating appropriate prescription, we then performed a logistic regression incorporating the child's age, the diagnosis made, the prescribed drug and the prescriber's skills as covariates to identify associated factors. Modelling a propensity score matching using that model, we then estimated the incremental cost of overprescribing by the average treatment effects estimator.

Results: The proportion of overprescribing for childhood illnesses was 71.7% (95% CI [67.8-75.3]). Regardless of the other factors in the logistic model, pathology and drug were significantly associated with overprescribing ($p < 0.001$). In fact, prescriptions intended to manage rhinitis were 5.9 times (95% CI [3.7; 9.6]) likely to be overprescribed than those intended to manage malaria. Prescriptions that included amoxicillin were 5.5 times (95% CI [4.5; 6.8]) likely to be overprescribed than those including artemether/lumefantrine. The incremental cost of overprescribing was 0.41 euro (95% CI [0.32; 0.49]) higher than that appropriate ($p < 0.001$).

Conclusion: Overprescribing for childhood illness is very common, leading to a waste of resources. Rhinitis management as antibiotics prescription deserve special attention. The results will help anticipate the measures to be taken for the patient safety and the sustainability of the free healthcare policy.

The Cost of Overutilizing Hospitals for Diabetes and Hypertension Care in Tanzania

PRESENTER: **Brady Hooley**, Swiss Tropical and Public Health Institute

AUTHORS: Fabrizio Tediosi, Brianna Osetinsky

Background: The organization of Tanzania's public health system is intended to provide most outpatient care across a large number of primary- and secondary-level dispensaries and health centres, with more specialized referral services being accessible at fewer tertiary-level hospitals. The goal of this structure is to reduce cost while improving access to care. However, patients more frequently seek care at hospitals than at health centres or dispensaries for various reasons, such as a higher perceived quality of care at hospitals, and a lack of medicines at health centres and dispensaries. People living with chronic conditions such as hypertension or diabetes can require specialized care and must regularly renew prescriptions, so many self-refer to hospitals. This is costly for both patients that incur higher transport costs and for the health system. In the context of an increasing burden of hypertension and diabetes in Tanzania, there is a need to mitigate cost escalation in order for the expansion health insurance coverage to be financially sustainable. This analysis of National Health Insurance Fund (NHIF) claims estimates the cost savings associated with a scenario of improved decentralization of hypertension and diabetes care from hospitals to health centres and dispensaries.

Methodology and Findings: We analysed 450,930 NHIF claims from 2016 for diabetes and hypertension medicines approved by the National Essential Medicines List for use by at least two different health facility levels; 54.5% of the claims were for diabetes and 45.5% were for hypertension. Overall, TZS5.27 billion (US$2.36 million) was claimed for the included medicines. Hospitals accounted for 83.3% of the number claims, followed by health centres (10.0%), and dispensaries (6.7%). The mean claim cost was also highest at hospitals (TZS12,812, USD$5.8), followed by health centres (TZS6,203, USD$2.8) and dispensaries (TZS5,843, USD$2.6). Using the same overall number of prescriptions, we predicted the cost savings of decentralization based on the observed mean medicine cost for each type of facility, and each facility type's relative abundance in the health system. We estimated that in the best scenario possible, if hypertension and diabetes medicines were mostly provided by dispensaries (85% of prescriptions), with fewer being provided by health centres (11%) and hospitals (4%), then the NHIF could save up to 47.5% on these medicines (TZS 2.50 billion, US$1.12 million).

Conclusion: These findings indicate that NHIF beneficiaries access diabetes and hypertension medicines at hospitals at a disproportionately high frequency and cost. Increasing the use of primary health facilities by improving the availability of medications or by encouraging or requiring NHIF beneficiaries to first seek care at lower level facilities could result in substantial savings for the NHIF, and carry positive externalities for dispensaries and health centres by way of increased revenue from insured patients.

Avoidable Attendances at Emergency Departments in the English National Health Service - What Are the Influences of Individual and Primary Care Provider Characteristics

PRESENTER: **Timothy Jamieson**, Centre for Health Economics University of York

AUTHORS: Rita Santos, Hugh Gravelle

- Objectives — To explore avoidable emergency department attendance in the English NHS, examining the characteristics of individuals and of the primary care provision they face that are associated with probability of avoidable emergency department use, alongside general features and long-term trends.
- Design — Application of two definitions of 'avoidable' emergency department use to individual-level attendance data, and regression analysis using a logistic model incorporating fixed effects at Emergency Care Provider level.
- Setting — Hospital Episode Statistics Accident & Emergency dataset for the period April 2016-March 2019. This incorporates attendances to all Type 1 emergency care providers operating in England.
- Participants — All individuals attending Type 1 emergency care providers in England, excluding children under 16, attendances on days likely to be atypical of normal working days, e.g. Bank Holidays, Christmas etc., and where the primary care provider responsible for an individual is not clear.
- Main outcome measures — Change in probability of avoidable attendance associated with the characteristics of individuals, and of the primary care provision they face, under two different definitions of 'avoidable' - that in use by NHSDigital, and a novel definition tailored to the HES dataset.
- Results — A range of between 9.06% and 22.2% of attendances are found to be avoidable with the definitions used here. Strong associations are seen between the characteristics of individuals and avoidable attendance, especially age, ethnicity, and rurality of location. Better overall patient experience of primary care providers revealed through GP Practice survey responses are associated with a lower probability of avoidable attendance at the individual level, but the strength of association is much weaker than for the individual's own inherent characteristics. In particular extended hours primary care provision shows little association with avoidable attendance.
- Conclusions — In contrast to some recent findings, this examination does not support a strong association between primary care provision and avoidable emergency department attendance. Interventions intended to reduce avoidable emergency department attendance might be better targeted outside of primary care and focused on groups more likely to attend avoidably. Such targeting might also provide opportunities to reduce inequity in access to health care.

10:45 AM –11:45 AM THURSDAY [Health Beyond Health Care Services: Non-Medical Production Of Health And The Value Of Health]

Labour Supply and Health

MODERATOR: **Stefan Boes**, University of Lucerne

The Impact of Early Retirement, Nation-Related and Personal Characteristics on Cognitive Decline

PRESENTER: **Prof. Aviad Tur-Sinai**, Max Stern Yezreel Valley College

The increasing prevalence of cognitive decline (CD) in old age has become a global challenge. Our study aims to enhance understanding of this phenomenon by evaluating longitudinal effects of personal and national determinants on memory decline (MD) among European retirees.

We used data from two interviews collected in 12 European (EU) countries and in Israel by SHARE - a multidisciplinary, cross-national bank of survey data. Our sample included 11,930 retirees aged 50+ who were interviewed at baseline (T1) and again four years later (T2). MD was evaluated by the change in the recalled number of words at T2 compared to those remembered at T1. Ten words were presented at each interview and participants were asked to repeat them, first immediately and again after a few minutes (maximum 20 words). The scale for evaluation of change over time ranged from -20 to +20.

Except for gender, all of our explanatory variables had a significant effect on MD including age, education, health/function status, depressive symptoms, early retirement, active lifestyle and EU-countries divided into four geographical regions. Decline over time in physical and mental health variables had an additional significant negative effect on memory.

These findings lead us to suggest focusing on what we know and are able to change in order to postpone MD. In addition to promotion of national policies to prolong years of education and participation in the workforce, we recommend introducing programs that encourage people to postpone retirement, and adjusting workplace conditions in order to enable older persons to continue contributing to the workforce. We also suggest promoting an active lifestyle among older adults, especially in Mediterranean and eastern European nations by implementing health and active leisure education programs.

The two main messages of our paper are:

1. Declines in health and functioning negatively affect memory, while education and active lifestyle have a protective effect.
2. Moreover, early retirement has a similar negative effect on memory change in each of the studied EU-regions even when controlling for all of the personal and behavioral factors.

Take-up and Labor Supply Responses to Disability Insurance Earnings Limits

PRESENTER: **Judit Krekó Krek**, Centre for Economic and Regional Studies, Hungarian Academy of Sciences

AUTHORS: Daniel Prinz, Andrea Weber

Most disability insurance programs have earnings limits: beneficiaries lose some or all of their benefits if they earn above a threshold. These earnings limits are meant to screen out applicants with high remaining earnings capacity, but they can also inefficiently limit the labor supply of beneficiaries. We develop a simple framework to evaluate this trade-off. We show that in a U.S.-style “cash cliff” design (where beneficiaries lose all benefits if they earn above the substantial gainful activity (SGA) level, two key objects need to be estimated: the marginal selection effect and the marginal labor supply effect of moving the earnings limit. At the optimal level, these two effects balance each other out.

We then use a policy reform in Hungary to illustrate these mechanisms. In 2008, the earnings limit accompanied to a low-value benefit of partially disabled persons, the regular social allowance was reduced from 80% of the pre-disability wage to 80% of the statutory minimum wage for new entrants, while it remained the same for beneficiaries who were already approved. The new legislation, enacted unexpectedly at the end of 2007, was in line with the strategy of the government to curb excessive reliance on disability benefit and reducing the costs of the program.

We exploit this policy change to understand how selection into the program and labor supply once in the program changed. The causal inference relies on comparing labor market outcomes of beneficiaries entering before and after the policy change. We show that individuals who enter the program before and after the reform appear very similar in their health, employment status, and earnings. This suggests that decreasing the earnings limit did not improve the efficiency of screening in the DI program. At the same time, applying difference in difference framework and an event study design, we find that individuals who enter the program after the earnings limit was reduced have meaningfully lower labor supply, both at the extensive and the intensive margin.

The main contribution of this paper relative to earlier studies on earnings limits is the characterization of both the screening and the labor supply effects of the earnings limit. Moreover, this is the first paper to study a *decrease* in the earnings limit. As a contribution to the debate on the roots of low exit rate from disability benefits, the paper demonstrates that reducing the earnings limit did not encourage beneficiaries to exit the benefit and take a job paid above the limit, but left moderately disabled persons with lower income. This suggests that the overall welfare impact of the reform was negative and higher earnings limit would be optimal. The results indicate that a low earnings limit might prevent disabled beneficiaries from fully using their remaining working capacity even if the level of the benefit is very low.

Health, Working Status and Social Protection Policies By Gender during the Financial Crisis in Europe

PRESENTER: **Luisa Delgado-Marquez**, UNIVERSITY OF GRANADA

AUTHORS: Silvia Calzón-Fernández, Teresa Sánchez-Martínez, Araceli Rojo Gallego-Burín, M. Puerto López del Amo-González, José J. Martín-Martín, Manuel Correa

Background: Social determinants of health have a strong gender component and markedly different effects on men and women. The 2008 financial crisis brought about considerable changes in national policies, as well as in the finances and working conditions of individuals. The present study aims to analyse gender inequalities in the self-perceived health of working-age Europeans between 2001 and 2014, in order to explore how they were affected by individual as well as structural health determinants.

Methods: A multilevel longitudinal analysis was conducted using data generated in the European Union (excluding Germany, Denmark, Croatia, and Slovakia for their lack of data during our time frame). The population comprises men and women between the ages of 20 and 64 (working age), and is defined by Eurostat’s EU-SILC survey, (Statistics on Income and Living Conditions) from the longitudinal microdata included in the 2011-2014 rotating panel. Our analysis includes 115,719 men (approximately 277,725 observations) and 124,619 women (approximately 299,085 observations). The main independent variable used was sex (male or female), and the rest of the independent variables were age, educational attainment level, working status, severe material deprivation, household income, chronic disease and National social expenditure (General Government Sector in EU-SILC, described as a percentage of GDP, and comprises social protection, sickness and disability, old age, family and children, unemployment, housing, and social exclusion). The dependent variable was self-perceived health (dichotomized as either good or bad) and the independent variables were individually performed unpaid work and national social expenditure.

Results: Disparities between countries (after controlling for the variables included in the study) account for up to 7.7% of the differences in the self-perceived health of women and up to 7.4% of those of men. Unpaid work is linked to a higher chance of women reporting bad health (OR=1.12), but failed to produce significant differences among men. However, being unemployed might be linked with worse self-perceived health among men (OR=1.38) than among women (OR=1.21). Retirement is also associated with poorer self-perceived health for men (OR=1.77) than for women (OR=1.57), as does inactivity (with OR=1.94 for men and OR=1.61 for women). Conversely, the protecting effects of being a student may be stronger for women (OR=0.69) than for men (OR=0.74). For each increase of 1% of GDP in social expenditure the odds of describing one’s health as bad decreased by 3.7% among women and 3% among men.

Conclusion: The results of this study emphasise the importance of unpaid work as a risk factor for women's bad self-perceived health. Also, unemployment has a strong harmful effect on both women and men, although it is more harshly felt by the latter. Poverty remains a substantial risk factor for both sexes, whereas educational level and income are asymmetrical protective factors of self-perceived health, with a stronger effect on women than men. The present study suggest that certain public policies should be implemented in order to mitigate the effects of financial crises.

10:45 AM –11:45 AM THURSDAY [Demand And Utilization Of Health Services]

Local Health Care Demand and Neighborhood Effects

MODERATOR: **Kara Hanson**, London School of Hygiene & Tropical Medicine

Does Distance from Primary Health Centers Affect Access to Quality Care? Implications for the Design on Primary Care Systems.

PRESENTER: **Krishna Rao**, Johns Hopkins Bloomberg School of Public Health

AUTHORS: Michael Peters, Navneet Kumar, Japneet Kaur

Many low and middle-income countries have pursed a policy of establishing health centers close to communities to make quality primary care services available to communities. Expectedly, studies have found that distance to service delivery points affects service use; however, importantly, several studies also report that patients often bypass nearby government health centers to seek more expensive care farther away, which suggests that patients are sensitive to perceptions of quality of care. In India, rural health markets are composed of a mix of public and mostly private health care providers, the latter being predominantly informal providers. As such, these markets offer patient's a choice of providers in close proximity. Of interest is to understand if distance to government health centers affects the quality of care that patients are able to access. In early 2020 we conducted a sample household survey in the state of Bihar in India in which we recorded where ill household members sought care. In a follow-up study we visited a sample of the providers who had treated these ill household members and measured their distance from the household, and their quality of care using clinical vignettes and direct patient observation. Our findings confirmed earlier reports that most (68%) first contact visits are to private (informal) providers. Households were never far from a health care provider - the majority (91%) of households lived with 1Km of any provider, but only 33% lived with 5 km of a qualified medical doctor. Distance travelled to seek care increased with illness severity. Expectedly, use of the local primary health center declined with distance, and the majority (85%) of patients living nearby a primary health center bypassed it. Quality of care measures based on direct patient observation and clinical vignettes showed that quality of care was poor among both public and private providers; importantly, there was no significant difference between care received in government primary care centers and from private providers, including informal providers. As such, distance from the primary health center did not have a significant effect on the probability of a patient receiving quality care. These findings have several implications. Pushing government curative care services closer to communities may not result in increased service use given the dense existing rural health care markets. Further, if government primary care providers are only able to achieve similar levels of clinical care quality as private providers, then their presence offers no real quality benefit to rural patients (except in terms of lower treatment cost). As such, there is a need to re-think government policy of pushing health services to communities, which is often done at great effort and cost.

Modelling the Dynamic Interdependence in the Demand for Primary and Secondary Care Using a Hidden Markov Approach

PRESENTER: **Mauro Laudicella**, University of Southern Denmark

AUTHOR: Paolo Li Donni

The demand for emergency secondary care (ESC) is growing fast in many publicly funded health care systems absorbing a large share of their resources. Therefore, redirecting the demand of care from ESC to primary care (PC) is a long-standing policy objective and the rapid spread of the COVID-19 is adding urgency to implementation of new policies.

This paper introduces a new econometric model to study the dynamic interdependence between the demand of PC and ESC and to measure their potential substitution effect. The model extends the class of finite mixture models for longitudinal count data to the bivariate case by using a trivariate reduction technique and a hidden Markov chain approach. The model captures some of the distinctive characteristics of the demand of care studied in the literature. Utilisation of PC and ESC are allowed to be jointly determined as patients may access both type of care in the same time occasion. State dependence within and across outcomes is captured by including a lag of PC and ESC in the two outcome equations reflecting the fact that past utilisation is often a strong predictor of present. Persistency in individual health and preferences is modelled by individual specific parameters following a discrete latent variable and capturing unobservable heterogeneity. Assuming a first order Markov chain in the distribution of the latent allows for disentangling unobservable time-varying heterogeneity from the dynamic effect of utilisation of care. Finally, time-specific non-permanent shocks that may affect both outcomes are captured by a residual correlation parameter.

We provided an empirical application of the model to study the demand of PC and ESC in patients experiencing a shock to their circulatory system in the Danish National Health System. We find evidence of a substitution effect with an additional PC visit in the previous period reducing present ESC visits by about 12.6 percentage points suggesting a fair scope for intervention to policies aiming at redirecting part of the demand of care from ESC to PC. This is in line with results from other empirical studies identifying the substitution effect from the exogenous variation of a policy reform increasing the capacity and accessibility of PC. The proposed model extends previous studies removing the need of an exogenous source of variation for identifying the model, thus allowing the researcher to test for a substitution effect in any segment of the demand of PC and ESC. This could be particularly important from a policy perspective as it allows for exploring the potential scope of a new policy before the latter is implemented in a pilot or countrywide.

Finally, we find evidence that individual profiles of utilisation of health care are persistent, but not permanent. They have a probability of about 17 percent of changing during the time of our study and move to their closest neighbour (from low to medium user, from medium to low or high, and from high to medium), with the majority of switches occurring during the first two and a half years after the initial health shock.

Hospital Quality and Patient Choice: Is There a Neighbourhood Effect?

PRESENTER: **Yuxi Wang**, Cergas Bocconi

AUTHOR: Anna-Theresa Renner

Background

Free healthcare provider choice as an indicator of system responsiveness is not only a policy goal of itself but can potentially improve the quality of the public healthcare sector, as under fixed prices, hospitals are incentivised to compete on quality. This is especially relevant for elective procedures such as hip replacements, where patients can carefully select their providers based, amongst others, on quality indicators. Despite the extensive empirical evidence on the effect of provider quality on hospital choice, most studies have omitted a potentially crucial dimension: the effect of social interactions in the decision-making process.

We, therefore, investigate the free patient choice of healthcare providers based on quality indicators (in-hospital mortality and 30-day readmission) derived from past events in the Italian context. We distinguish between overall mortality or readmission rates experienced by all observed patients, and the same rates experienced only by patients from the same municipality.

Method

Exploiting a dataset of all Southern Italian patients over 65 who underwent hip replacement surgery from 2012 to 2015, we build our analysis on a patient-level additively separable utility function to obtain the random utility choice model. We explore the influence of lagged and standardized quality indicators, all observed hospital characteristics and travel time on individual choice while controlling for hospital patient volume, case-mix, hospital as well as regional fixed effects. We also divide the population into non-rural and rural residents, given the disparate

constraints. Following the established literature on patient hospital choice, we estimate the random utility using both a highly flexible "Mixed Logit" model and the more traditional "Conditional Logit" with patient characteristics interaction terms.

Results

Our results suggest that there are significant neighbourhood effects in the choice of hospitals, The "local" quality indicators, deducted from the patient's neighbours' past experiences, show a strong influence on the choice of hospital among rural residents, especially for female and those below 80 years old. Patients in non-rural areas, however, tend to choose hospitals with better overall, "global", quality indicators. Moreover, patient tastes vary substantially over hospital quality and travel time. Overall, our analysis revealed that patients from smaller municipalities are more sensitive to quality information derived from their own vicinity.

Discussion

We have focused specifically on the information flow within spatial networks in patient choice, which offers important insights to the literature that often fails to account for decision heuristics. Because rural residents are much more responsive to neighbourhood information on quality, this potential sharing of hospital experience indicate the potential disparity in available information on provider quality. On the aggregate, this perceived quality disparity can lead to uncalled-for long travels that incur significant private costs among elderly patients. This reduction in social welfare could be avoided by increased publicly available information on the objective hospital quality indicators.

10:45 AM –11:45 AM THURSDAY [Economic Evaluation Of Health And Care Interventions]

ORGANIZED SESSION: The Uses and Limits of Pragmatic Health Technology Assessment Methods and Processes

SESSION CHAIR: **Rob Baltussen**, Radboudumc

ORGANIZER: **Cassandra Nemzoff**, Center for Global Development

DISCUSSANT: **Shankar Prinja**, Post Graduate Institute of Medical Education & Research

Pragmatic Health Technology Assessment to Accelerate Priority Setting in Low- and Middle-Income Countries

PRESENTER: **Cassandra Nemzoff**, Center for Global Development

AUTHORS: Francis Ruiz, Kalipso Chalkidou, Abha Mehndiratta, Lorna Guinness, Francoise Cluzeau, Hiral Shah

Health Technology Assessment (HTA) is a policy-based research process which aims to improve the efficiency and equity of the healthcare system with the limited financial resources available in healthcare. While there is a growing appetite for the use of HTA in low-and middle-income countries (LMICs), they are constrained by limited capacity, data, and appropriate priority setting governance structures to carry out the detailed HTA processes and analyses typically found in high-income countries. Nonetheless, policy makers in LMICs often need evidence quickly to take decisions, which cannot be delayed, for various government processes such as budget negotiations, ministerial and parliamentary meetings, procurement contracting, and tariff negotiations. More rapid or pragmatic HTA (pHTA) methods, in various forms, exist in many parts of the world and could be refined to suit LMIC policy makers' immediate needs. These approaches have limitations and should not be viewed as a substitute for more detailed analyses, but rather as a stepping-stone towards HTA institutionalization and one 'tool' in countries' HTA toolbox. There is a need to design, support, and test bespoke pHTA methods and processes suited to LMICs, drawing on international experience.

A Pilot Study to Rapidly Assess the Cost Effectiveness of Peritoneal Dialysis Vs Haemodialysis for Patients with Acute Kidney Injury in Rwanda

PRESENTER: **Solange Hakiba**, RIHSA

AUTHORS: Cassandra Nemzoff, Nuri Ahmed, Dr. Tolulope Olufiranye OLUF, Alexis Rulisa, Grace Igiraneza, Ina Kalisa, Maelle Barbancon, Matiko Riro, Mr. Sukrit Chadha, Diana Kizza, Natasha Salant, Sidonie Uwimpuhwe, Peter Baker, Kalipso Chalkidou, Francis Ruiz

Introduction: The Government of Rwanda (GoR) oversees a robust Community Based Health Insurance (CBHI) scheme which covers more than 80% of the population. To manage growing demand for wide-ranging health services, GoR is working to introduce health technology assessment (HTA) to inform its allocation decisions. Dialysis was selected as a priority topic for the first HTA pilot.

Methods: Using available international and Rwandan-specific data, a cost-effectiveness analysis and budget impact analysis were completed to compare hemodialysis (HD) with peritoneal dialysis (PD) for patients with acute kidney injury. A pragmatic approach was undertaken to provide a decision quickly as requested by the GoR, and to demonstrate the usefulness of HTA. The topic was selected based on it being a high-cost service already covered by the CBHI scheme, and the availability of local and international data. These data were sourced pragmatically, and gaps were filled with expert opinion from clinicians in Rwanda.

Results: The CEA found that PD was both slightly less expensive and less costly compared with HD. In the payer perspective among patients aged 15-49, HD had an incremental cost-effectiveness ratio (ICER) of RWF 294,221 (I$995), compared with PD. In the societal perspective for the same age group, HD had an ICER of RWF 404,097 (I$1367) compared with PD. At a threshold of 0.5 x GDP per capita (RWF 358,000 or I$1212), this analysis suggested that HD was cost-effective relative to PD only in the payer perspective for patients aged 15-49; for other scenarios, HD was not cost effective compared with PD, and thus PD appeared to be the preferred strategy. Importantly, sensitivity analysis showed that HD kits were a significant cost driver and if the cost were reduced by half, as they are in one hospital in Rwanda, HD would be cost-effective in both the payer and societal perspectives. Budget impact analysis highlighted that more savings could be achieved from improving the efficiency of HD (the current standard of care) including this cost reduction, than shifting to PD provision gradually over time.

Conclusions: Conducting a cost-effectiveness analysis pragmatically had its limitations, most importantly that there remained uncertainty about the costs, modality, and care pathway of patients undergoing PD. Nonetheless, the analysis can guide short term improvements in the efficiency of delivering HD including price and tariff negotiations. In the medium term, it can inform the development of further work focused on better understanding the feasibility of PD delivery as well as a broader strategy for patients needing dialysis across the country.

Using Expedited Approaches to Assess the Safety, Clinical Effectiveness and Cost-Effectiveness of Cancer Technologies in India

PRESENTER: **Hiral Shah**, Center for Global Development

AUTHORS: Abha Mehndiratta, Francis Ruiz, Apurva Ashok, Cassandra Nemzoff, Jayashree Thorat, Prakash Nayak, Manju Sengar, Priya Ranganathan, CS Pramesh

Approximately 1 in 9 Indians will develop cancer during their lifetime and an estimated 2.2 million people are already living with cancer in India. The management of cancer can include a multitude of interventions including prevention, diagnosis, chemotherapy, surgical intervention, radiotherapy, supportive care, and palliative care. Most of these interventions are expensive, posing a significant financial burden on families with limited household income. With a population of 1.4 billion that faces a rising burden of cancer, an important priority in India is ensuring equitable and cost-effective prevention and treatment to meet demand for cancer treatment. Resource use decisions to improve cancer care are unavoidable, and priority setting will take place with or without formal health technology assessments or cost-effectiveness analyses (CEA). Given the resource, data, and analytical demands of traditional HTA methods and processes, there has been interest in developing expedited approaches to help inform critical policy decisions.

Within India, to reduce disparities in care across various geographic regions, the National Cancer Grid (NCG), a network of over 220+ major cancer hospitals and research institutes, patient groups and charitable institutions across India, has undertaken the development and

implementation of evidence-based guidelines to address challenges in the delivery of first-line standard of care. However, until now, guideline development has focused on safety and clinical efficacy, whereas incorporation of cost-effectiveness evidence has been limited.

We hypothesise that useful evidence can be produced to inform the NCG's decisions without requiring de novo CEA, and that the benefits perhaps outweigh the risks of relying more on international data.

Our research question is whether international evidence from established HTA agencies on a cancer technology can be generalised to India with the purpose of informing clinical guidelines, procurement, and/or pricing. In answering this question, we develop a robust, transparent, and pragmatic framework which uses expedited approaches including rapid reviews, price benchmarking analysis and qualitative judgement to assess whether recommendations can be generated on the cost-effectiveness of cancer technologies in India using international evidence.

Rapid reviews were conducted using a systematic review approach where evidence sources were stated *a priori*. Two independent researchers screened and extracted information from these evidence sources on safety, clinical effectiveness, and cost-effectiveness. Finally, a price benchmarking analysis was conducted using a previously published methodology by Lopert et al, 2013. Evidence generated from this approach will be critically reviewed and appraised by a dynamic group of experts in clinical oncology, health economics, public health, quality measurement and improvement based at Tata Memorial Center, Center for Global Development and the International Decision Support Initiative.

Within this organised session, we will present the application of this framework to a specific decision problem - erlotinib as a monotherapy for first-line treatment of locally advanced or metastatic EGFR-TK mutation positive non-small cell lung cancer (NSCLC) compared with international benchmarking standards. We highlight the likely strengths, limitations, and potential trade-offs when using expedited approaches in comparison to a full CEA. Finally, we provide recommendations on how evidence using this rapid approach will be used to translate into policy.

The Use of Evidence for Benefit Package Design in DCP3 Pakistan – Combining Cost-Effectiveness, Disease Burden and Other Decision Criteria

PRESENTER: **Dr. Maryam Huda**, The Aga Khan University

AUTHORS: Maarten Jansen, Nuru Saadi, Urooj Gul, Shehrbano Sherazi, Ala Alwan, Sameen Siddiqi, Raza Zaidi, Rob Baltussen, Anna Vassall

Background:

DCP3 provides evidence on the most cost-effective interventions across low- and middle-income countries. Pakistan is one of the first countries to adopt DCP3 for designing its Universal Health Coverage Benefit Package (UHC-BP). Designing an essential package of health services requires consideration of evidence on burden of disease, budget impact, cost effectiveness of interventions and social context to define which services are to be covered through different platforms.

Methods

We reviewed DCP3 intervention descriptions and adjusted, where possible, the cost-effectiveness data to the context of Pakistan. In addition, we collected evidence on unit costs, coverage rates, cost per capita, primary, secondary and tertiary level budget impact, and burden of disease averted for a total of 180+ interventions. We also performed fiscal space analysis. This information was developed in four alternative implementation scenarios, differing in coverage rates and budget impact. In an evidence-informed deliberative process, Technical Working Groups (TWGs) involving more than 100 stakeholders interpreted these scenarios in conjunction with other criteria like feasibility, equity, financial risk protection and social and economic impact for prioritization. The TWGs eventually prioritized interventions for implementation and provided recommendations on the UHC-BP to the National Advisory Committee (NAC). The NAC sent its recommendations to the Ministry of Health for endorsement.

Results

Four scenarios were developed which showed the cumulative optimised spending of the interventions per year at pre-specified coverage rates, for 4 different snapshots: at year 2 – with year 2 coverage rates, at year 5 – with year 5 coverage rates, at year 10 – with year 10 coverage rates, and finally with 80% target rates, in line with the Sustainable Development Goals. They are for a district level package, combining community level, primary health care level, and first-level hospital interventions. The final prioritization reflected both evidence and the local assessment of feasibility and other considerations. Based on these scenarios a final package was approved which is composed of 88 interventions with a cost per capita of USD 13/ person/ year.

Conclusion

Within a limited policy time frame, we developed a pragmatic method that partially localized evidence, highlighted evidence gaps and promoted extensive local deliberation. Though we provided the best possible estimates in the limited time period and specific policy context, we faced considerable challenges given the underlying weak and biased data base. We call for a collaborative effort by the wider community to focus on understanding and communicating the key data gaps in this area from the perspective of national decisions makers, as well as the tools and models used to organize and present the data. Our work highlights the central importance of developing local evidence generation and deliberation processes as a precursor to defining UHC benefit packages going forward.

12:00 PM –1:30 PM THURSDAY [Special Sessions]

CENTERPIECE SESSION: Revisioning Health Economics

MODERATOR: **Winnie Yip**, Harvard T.H. Chan School of Public Health

SPEAKER: **Mariana Mazzucato**, University College London