Boston University School of Public Health
Office of the Dean

BOSTON UNIVERSITY

2016 Population Health Science Research Workshop

(PHS2016)

Friday, September 23, 2016

Boston University School of Public Health

Hiebert Lounge, 14th Floor, Instructional Building

80 E. Concord St., Boston, MA 02118

With thanks to our Senior Advisory Committee

Anna Aizer (Brown University, Economics)
Marcella Alsan (Stanford School of Medicine)
Jeremy Barofsky (Brookings Institution)
Jacob Bor (Boston University School of Public Health)
David Cutler (Harvard University, Economics)
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Subu Subramanian (Harvard T.H. Chan School of Public Health)
Rebecca Thornton (University of Illinois-Urbana, Economics)
Atheendar Venkataramani (Harvard Medical School)

Workshop Program

8:00 AM	*Breakfast*
8:30 AM	**Welcome and Opening Remarks** Sandro Galea & Jacob Bor (Boston University School of Public Health)
8:45 AM	**Session 1 – Population health in a changing environment** Michelle Marcus - Going beneath the surface: Groundwater pollution, regulation, and health (Brown University) *Discussant: Willa Friedman (University of Houston)* David Molitor – Adaptation and the mortality effects of temperature across US climate regions (University of Illinois-Urbana) *Discussant: Anat Nyshadham (Boston College)* Eyal Frank – Declining Bat Populations, Increased Insecticides Use & Fetal Health (Columbia University Earth Institute) *Discussant: Jacob Bor (Boston University School of Public Health)* Sveta Milusheva – Less bite for your buck: using cell phone data to target disease prevention (Brown University) *Discussant: Kevin Croke (World Bank)*
10:45 AM	*Break*
11:00 AM	**Session 2 – Social policy and health across the life-course** Teresa Molina - Helping Children Catch Up: Early Life Shocks and the Progresa Experiment (University of Southern California) *Discussant: Günther Fink (Harvard T.H. Chan School of Public Health)* Jan-Walter De Neve – A Social Vaccine? HIV Infection, Fertility, and the Non-Pecuniary Returns to Secondary Schooling in Botswana (Harvard T.H. Chan School of Public Health) *Discussant: Anna Aizer (Brown University)* Tadeja Gracner – Bittersweet: How Prices of Sugar-Rich Foods Contribute to the Diet-Related Disease Epidemic in Mexico (RAND) *Discussant: Subu Subramanian (Harvard T.H. Chan School of Public Health)*

	Andrew Stokes – How dangerous is obesity? Bias and generalizability in studies of the mortality risks of obesity. (Boston University) *Discussant: Maria Glymour (University of California-San Francisco)*
1:00 PM	*Lunch*
2:00 PM	**Session 3 – Population therapeutics: the role of medicine** Andrew Goodman-Bacon – The long-run effects of childhood insurance coverage: Medicaid implementation, adult health, and labor market outcomes (Vanderbilt University) *Discussant: Lawrence Were (Boston University)* Diane Alexander – Just what the nurse practitioner ordered: independent prescriptive authority and population mental health (Princeton University) *Discussant: Matthew Basilico (Harvard University)* Aaron Baum - Lasting population health impacts of a transient health care supply shock: quasi-experimental evidence from a natural disaster (Mt. Sinai School of Medicine) *Discussant: Jeffrey Ashburner (Harvard Medical School)* Molly Schnell – The role of physician behavior in the opioid epidemic (Princeton University) *Discussant: Atheendar Venkataramani (Harvard Medical School)*
4:00 – 4:30 PM	**Closing discussion -** the state of the field and new directions in population health science research (Sandro Galea, Boston University)

Thank you to Chia-Ying Lin for logistical support for this event.

Jacob Bor (jbor@bu.edu), Sandro Galea (sgalea@bu.edu), conveners

Going beneath the surface: Petroleum pollution, regulation, and health

Michelle Marcus

Brown University

September 9, 2016

Abstract

Growing concern over human exposure to environmental pollution has led to a dramatic increase in environmental regulation. Regulations promote both cleanup of existing contamination and firm adoption of new technologies to avoid future pollution. This paper analyzes the impact of groundwater and soil pollution on infant health and explores whether government-mandated adoption of preventative technologies can improve health. I quantify the effect of exposure to leaking underground storage tanks on infant health using data on maternal addresses to identify precise proximity to sites, and leak timing data to determine exposure during gestation. By exploiting panel data on mothers, I estimate the relative difference in sibling outcomes between exposed and unexposed siblings born to mothers within two narrow distance bands from a leak site. Exposure increases both the probability of low birth weight and preterm birth by about 7 percent. Compliance with new technical standards entirely mitigated the effect of leak exposure on low birth weight. Finally, individuals exhibit avoidance behaviors and move in response to two types of information about leaks: direct notifications and local newspaper coverage.

JEL Codes: I14, I18, Q52, Q53, Q58

Adaptation and the mortality effects of temperature across US climate regions

Garth Heutel Georgia State University and NBER

Nolan H. Miller University of Illinois at Urbana-Champaign and NBER

David Molitor University of Illinois at Urbana-Champaign and NBER

March 2016

Abstract

We study the relationship between temperature and elderly mortality across US climate regions and its implications for adaptation to climate change. Using daily weather matched to all Medicare beneficiaries from 1992 – 2011, we show that the mortality effect of hot days is much larger in the coolest third of ZIP codes than in the warmest third, and the opposite is true for cold days. While prior predictions based on homogeneous temperature effects imply warming may be beneficial in cool regions, our results suggest that warming is much more harmful in cool regions than in warm regions. As evidence of regional adaptation to local climate, replacing the temperature distribution of any climate region with that of another region—either hotter or colder—results in higher mortality. Comparing effects across states, as the frequency of days within a given temperature range increases, excess temperature-related mortality declines on those days. As one adaptive mechanism, we find that ZIP codes with greater air conditioning penetration have substantially lower mortality due to heat, but little difference in cold-driven mortality. Using climate projection models to predict the temperature distribution at the end of the century, we find that failure to incorporate heterogeneity in the temperature-mortality relationship results in predicted regional mortality effects that are wrong in sign, and overall predicted mortality effects that are roughly 50 percent too small in magnitude.

JEL codes: I18; J14; Q54 Keywords: Mortality; Medicare; Climate change; Adaptation

We thank Don Fullerton and numerous seminar participants for helpful comments.

Declining Bat Populations, Increased Pesticides Use & Infant Mortality

Eyal Frank

Columbia University

Job Market Paper

Version: September 9, 2016

Abstract

Pesticides are a form of environmental pollution yet there are no well identified estimates for their effects. Using a natural experiment I find the first causally interpretable results for the adverse health effects of pesticides. This paper uses mortality shocks to bats - a major predator of insects - that result from the unexpected emergence of a wildlife disease known as White Nose Syndrome (WNS). WNS first emerged in the U.S. in 2006 and started to gradually spread across counties. I use a Difference-In-Differences strategy and find that farmers increase their use of insecticides by 39.6% relative to their mean use. Because insects carry fungi between plants the use of fungicides increases as well by 20.1% relative to the mean. Using linked birth and death certificates I focus on infant mortality due to non-violent causes for births that were conceived during the pesticides application season of April through July. I find that the infant mortality rate increases by 1.01 deaths per 1,000 births in the counties exposed to WNS. This is driven mostly by female infant mortality and represents an increase of 14.5% relative to the mean. These results suggest that mixtures of pesticide compounds can affect health even if each compound is used below its regulatory threshold.

JEL Codes: I10, Q53, Q57.

Keywords: environmental externalities, fetal health, pesticides, functional biodiversity.

Less Bite for Your Buck: Using Cell Phone Data to Target Malaria Prevention

Sveta Milusheva

Brown University

September 11, 2016

Abstract

As populations become increasingly mobile, developing countries face greater challenges in reducing infectious disease because travel between infected and cleared regions can reintroduce infection. How can societies mitigate these spillovers? This paper demonstrates that mobile phone data can help target resources in a cost-effective way to ameliorate the spread of infectious disease into areas close to elimination. Using Senegal and malaria as a case study, the paper quantifies the relationship between travelers and spread of malaria using mobile phone records for 9 million users and detailed incidence data. The study finds that each imported case results in 1.23 cases reported at a health facility. The results are used to develop a targeting strategy and compare it to current policies for targeting travelers. Strategically targeting travelers from specific locations based on the mobility analysis can result in two to four times as many cases being averted as a randomly implemented policy. Combining new data sources on movement with incidence data allows the development of targeted policies that can mitigate the negative spillovers from travel and lower the burden from communicable disease.

Helping Children Catch Up: Early Life Shocks and the *Progresa* Experiment

Achyuta Adhvaryu - University of Michigan & NBER

Teresa Molina - University of Southern California

Anant Nyshadham - Boston College

Jorge Tamayo - University of Southern California

June 5, 2016

Abstract

Can investing in children who faced adverse events in early childhood help them catch up? We answer this question using two orthogonal sources of variation – resource availability at birth (local rainfall) and cash incentives for school enrollment – to identify the interaction between early endowments and investments in children. We find that adverse rainfall in the year of birth decreases grade attainment, post-secondary enrollment, and employment outcomes. But children whose families were randomized to receive conditional cash transfers experienced a much smaller decline: each additional year of program exposure during childhood mitigated more than 20 percent of early disadvantage.

Keywords: fetal origins, early life, dynamic complementarities, cash transfers, education, employment, Mexico

JEL Classification Codes: I15, I25, O12

A Social Vaccine? HIV Infection, Fertility, and the Non-Pecuniary Returns to Secondary Schooling in Botswana

Jacob Bor - Boston University

Jan-Walter De Neve - Harvard University

September 12th, 2016

Abstract

Education has been hailed as a "social vaccine" against HIV infection; but there is little causal evidence to support this claim. A 1996 policy reform in Botswana changed the grade structure of secondary school and led to sharp increases in educational attainment among affected birth cohorts. We exploit this cohort-specific exposure and differential impact by birth village as 'natural experiments' to identify the effect of secondary schooling on HIV infection risk, fertility, sexual behaviors, and labor market outcomes. Data were obtained from the complete 2001 and 2011 Botswana Censuses, 1995/96 and 2005/06 Botswana Labor Force Surveys, and 2004 and 2008 Botswana AIDS Impact Surveys, nationally-representative household surveys with HIV biomarker collection. Each additional year of secondary schooling induced by the policy reform decreased the probability of HIV infection by 8.1 percentage points (se=3.1), relative to a prevalence of 25.5% in the pre-reform 1980 birth cohort. Effects were particularly large among women, who also saw a 15.8 percentage point (se=5.7) reduction in the probability of having ever given birth. Turning to mechanisms, we find that schooling had no effect on HIV knowledge; however it influenced norms and behaviors, increasing condom use, HIV testing, and reporting that it is acceptable for women to carry condoms. For women, education delayed sexual debut, increased labor force participation, and had high wage returns. For men, education increased number of partners, but also increased literacy, and discussion about HIV with others. Supply- side measures to expand access to education in developing countries may have large health benefits. Estimates of the returns to schooling that exclude these non-pecuniary benefits may be too low.

JEL Codes: I1, I2, J12, O15

Bittersweet: How Prices of Sugar-Rich Foods Contribute to the Diet-Related Disease Epidemic in Mexico

Tadeja Gracner

University of California, Berkeley

September 9, 2016

Abstract

In response to the growing epidemic of obesity and diet-related chronic diseases, a number of governments are proposing taxes designed to reduce the consumption of un-healthy foods and thereby improve health outcomes. In this paper, I provide the first estimates of the effects of price changes in foods rich in sugar on the prevalence of obesity and diet-related chronic diseases, such as diabetes and hypertension. The analysis is made possible by rich longitudinal and nationally representative micro data on food prices and objective measures of health outcomes in Mexico from 1996-2010. I employ a unique bar- coded level price dataset with product-specific nutritional information combined with two datasets on health outcomes: (1) a state-level administrative dataset and (2) an individual panel dataset. Exploiting plausibly exogenous within-state variation in prices over time, I show that a decrease in the price of sugar-rich foods significantly increases the prevalence of abdominal obesity, type 2 diabetes, and hypertension. In addition, the least healthy and most impatient individuals seem to be more responsive to price changes, suggesting that time preferences are an important mechanism driving the results. Overall, the effect of sugar prices on the incidence of chronic diseases is large. Since the signing of NAFTA, I estimate that the reduction in prices of sugar-rich foods explains 20 percent of the increase in diabetes.

How Dangerous is Obesity? Bias and Generalizability in Studies of the Mortality Risks of Obesity

Andrew Stokes, PhD

Department of Global Health and Center for Global Health and Development, Boston University School of Public Health

Samuel H. Preston, PhD

Department of Sociology and Population Studies Center, University of Pennsylvania

Acknowledgements

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Abstract

Significant uncertainty remains regarding the effects of obesity on the mortality levels of individuals and of populations. In this paper, we illustrate the effects of major biases and threats to generalizability associated with observational studies of the mortality risks of obesity. Our preferred model requires no sample exclusions and uses weight history to address several biases. This model produces hazard ratios associated with overweight, obese class I and obese class II of 1.05, 1.23 and 1.59 respectively and a population attributable fraction (PAF) of 16.2%. Among the biased models examined, the effects of obesity were most significantly underestimated when body mass index at survey was used. In this model, the corresponding hazard ratios were 0.90, 0.98 and 1.28 and the associated PAF was 5.5%. As an estimate of the risks for the entire population, the effects of obesity were most significantly overestimated when the sample was restricted to never-smokers. Under this restriction, the hazard ratios were 1.37, 1.82 and 2.35 and the associated PAF was 35.6%. Commonly employed modeling approaches have produced widely varying estimates of the effects of obesity on mortality. Understanding the effects of obesity on population mortality levels requires attention to both issues of bias and generalizability.

The long-run effects of childhood insurance coverage: Medicaid implementation, adult health, and labor market outcomes

Andrew Goodman-Bacon

Department of Economics, Vanderbilt University

September 9, 2016

Abstract

This paper exploits the original introduction of Medicaid (1966-1970) and the federal mandate that states cover all cash welfare recipients to estimate the effect of childhood Medicaid eligibility on adult health, labor supply, program participation, and income. Cohorts born closer to Medicaid implementation and in states with higher pre-existing welfare-based eligibility accumulated more Medicaid eligibility in childhood but did not differ on a range of other health, socioeconomic and policy characteristics. For whites, Medicaid eligibility before age 10 reduces mortality and disability, increases extensive margin labor supply, and reduces receipt of disability transfer programs and public health insurance up to 50 years later. Total income does not change because earnings replace disability benefits. The government's annual discounted return of about 7 percent on the original expenditure for these cohorts' childhood Medicaid coverage, most of which comes from lower cash transfer payments.

Just What the Nurse Practitioner Ordered: Independent Prescriptive Authority and Population Mental Health

Diane Alexander - Princeton University

Molly Schnell - Princeton University

May 26, 2016

Abstract

While the costs of untreated mental illness are widely recognized, access to treatment is of- ten limited. In this paper, we examine whether allowing nurse practitioners (NPs)—a class of registered nurses with advanced degrees—to prescribe medication without physician supervision or collaboration is associated with improved mental health outcomes. Exploiting time-series variation in independent prescriptive authority for NPs, we find that broadening prescriptive authority is associated both with improvements in self-reported mental health and decreases in mental-health-related mortality, including suicides. These improvements are strongest in areas that are underserved by psychiatrists, and among populations that are traditionally underserved by mental health providers. Furthermore, we find no evidence of crowd out: the number of prescriptions written by physicians is unchanged when NPs can independently prescribe. Together, our results provide strong evidence that extending prescriptive authority to NPs can both help mitigate the negative consequences of physician shortages and extend care to disadvantaged populations.

Lasting population health impacts of a transient health care supply shock: quasi-experimental evidence from a natural disaster

Aaron Baum

Icahn School of Medicine at Mount Sinai Health System, Department of Health System Design and Global Health, Arnhold Institute for Global Health

September 7, 2016

Abstract

This paper estimates the long-run effects of a brief reduction in the supply of health care on population health by exploiting a plausibly exogenous health care supply shock generated by a historic storm. The central finding is that a brief health service disruption adversely affected population health, with clinically meaningful, negative effects on blood pressure that lasted two years after health services were fully restored. The enormous spatial scale of the storm enables separation of the influence of the supply shock and extreme weather conditions, as well as their interaction. I show that being exposed to both channels had compounding, rather than additive, effects. Relative to modeling exposure based only on proximity to meteorological conditions, as is standard in the climate econometrics literature, estimated population health impacts approximately triple when accounting for exposure to disrupted health services in addition to exposure based on proximity to meteorological conditions. This suggests that modeling exposure based only on proximity to meteorological conditions may generate estimates of health impacts of disasters that are biased downward.

The Role of Physician Behavior in the Opioid Epidemic Preliminary and Incomplete

Molly Schnell

Princeton University

September 9, 2016

Abstract

While reports of pain have remained stable over the last 15 years, the use of prescription opioids in the United States has more than quadrupled since 1999. This dramatic expansion in the clinical use of opioids has led to a new wave of drug addiction in the US, with prescription drug overdoses surpassing auto fatalities as the leading cause of accidental deaths in 2008. In this paper, I examine the role that physician behavior has played in this crisis. I first document significant heterogeneity in prescribing practices across observable prescriber characteristics, including specialty, graduation cohort, and medical school rank. As locations differ in their composition of provider attributes, these individual-level differences translate into meaningful differences in opioid prescriptions and deaths involving drugs across locations. To examine what is driving these differences across prescribers, I design a general equilibrium framework of both the primary and secondary markets for opioids. On the supply side, I model the prescription- writing decision of a utility-maximizing physician, while on the demand side I allow tastes for opioids to vary across locations and over time according to a diffusion model from the epidemiology literature. I will estimate my model using detailed, prescriber-level data on all prescriptions written for opioids in the US in each month from 2006–2015 and unique data documenting prices of completed transactions in the secondary market. Applying this framework, I will identify factors that influence the propensity of physicians to write opioid prescriptions, and examine how heterogeneity in both physician behavior and demand characteristics impact the effectiveness of policy interventions. Preliminary results suggest that location-specific policies will be required to effectively curb opioid abuse across the diverse medical environments found in the US.