

ENVIRON 538 / GLHLTH 538 / PUBPOL 582
Global Environmental Health: Economics and Policy
Fall 2014

Time and Location: Tues/Thurs 11:45 am-1 pm
Room: Rubenstein 151

Instructor: Marc Jeuland
Rubenstein 188
Email: marc.jeuland@duke.edu

Office Hours: Wednesday 2:30-4:30 pm; or by appointment

Teaching Assistant: Robin Millican (robin.millican@duke.edu); Office hours / location: TBD

Course summary

Social science perspective on global environmental health. Students will learn to identify primary environmental causes of high burden diseases such as malaria, diarrhea, and respiratory infections; describe how to measure socio-economic impacts of global environmental health diseases; discuss key policies to control global environmental health problems based on private prevention and therapeutic behaviors; and propose frameworks to empirically monitor and evaluate global environmental health policies.

Prerequisites: Introductory course in statistics.

Objectives

By the end of the course, students should be able to:

- Define environmental health in the context of public health, conservation & development policy;
- Gain exposure to a selection of key papers, books and reports related to global environmental health issues;
- Gain exposure to tools of impact evaluation and economic analysis for understanding environmental health behaviors, and analyzing and designing more effective policy solutions;
- Apply statistical methods to examine the empirical bases of environmental health puzzles, particularly for environmental quality valuation, and evaluation of health behavior interventions; and
- Write a paper that draws on 1-4 to describe a concrete empirical application.

Readings

There is no textbook for the course; all readings are posted on Sakai.

You might consider buying and using a copy of the following thin and cheap book. We will use portions of it in the class, and it might be the one thing you will remember about the course long after you lose access to the electronic materials.

World Bank. 2008. Environmental health and child survival: epidemiology, economics, experiences. Washington, DC.

Grading

Student grades will be computed as follows:

- Attendance and general participation – 10%
- Problem sets (4) - 40%
- Response to readings, shared orally with class - 10%
- Final paper - 40%

If you have questions about how your grade will be calculated, or about a grade received on one of these assignments/components, please feel free to ask the instructor outside of class.

Participation. Active participation in class is expected and encouraged, and will be factored into your final grade. In general, strong contributions will be rewarded as improving your grade, whereas repeated absences or lack of engagement during class meetings will result in lowering of your grade. Participation entails demonstrated preparation for class, contribution to discussions and general attentiveness in class, and response to other student response papers (see below).

Problem sets (4). Details on each of these assignments will be provided during the course. They will involve quantitative analysis and practice using data sets, and will follow the schedule shown below (subject to change as needed). In general, it is acceptable to work with others during the initial stages of the problem set analysis, but the write-up and interpretation you submit should be entirely yours, and you should understand all STATA coding that produced the results you present.

One of the problem sets (#2) will be a group assignment in which you will conduct a meta-analysis (an example will be provided) on adoption of averting behaviors to reduce some environmental health risks (e.g., toilets, point-of-use water treatment, cookstoves, bed nets, vaccines). The group composition will be announced just after the end of add/drop, once the class roster has been finalized. The meta-analysis will consist of a review of no fewer than 15 empirical papers related to the particular problem selected by the group; group members will jointly code the data in order to a) draw inferences about key determinants of behavior change; b) identify knowledge gaps; c) comment on potential directions for future research; and d) provide interpretations of the external validity and generalizability of study results.

Expected schedule for problem sets:

- Assignment 1: Simple regressions and descriptive analysis (Due Sep. 11)
- Assignment 2: Meta-analysis and meta-regression (Due Sep. 29)
- Assignment 3: Impact evaluation (Due Oct. 16)
- Assignment 4: Cost-benefit analysis (Due Nov. 4)

Student response to readings (1). You will each be responsible for preparing a response to select readings – Schedule TBD. This response will consist of a short (1 paragraph) summary of key aspects of the paper / reading, followed by a critical discussion of the methodology or basis for the conclusions put forward in it. Your response will conclude with a list of no more than three questions shared with the class to help complement and seed class discussions. The entire response paper should be 1-2 pages, with 1.5 line spacing.

Term paper. The term paper is the most significant output you will produce in this course, and as such is weighted heavily in your final grade. It should comprise a research effort that is relevant to global environmental health, but need not be one of the specific topics covered in lectures or class readings. It must also be empirical in nature, such that it allows you to apply and further develop skills developed in problem sets. You can work with primary or secondary data sets – some suggestions for potential data sources will be provided on Sakai.

A series of assignments related to the term paper will be due over the course of the semester, in order to motivate progress with timely feedback and stem the urge to procrastinate. These intermediate steps, and expectations for the final product, are detailed below, along with their relative weighting:

- a. Topic selection and annotated bibliography (Due Sep. 18). Select a topic that seems amenable to quantitative analysis that you would like to research, and read at least 5 publications (peer-reviewed) related to the topic. Develop an annotated bibliography for these publications that includes an abstract and summary of main lessons from each paper, and highlights gaps that could be informed by further data analysis and research. Then explain in one page your research topic/question, explain why it is an important issue, what data you might use to consider it, and what you hope to say in terms of policy by the time you complete your research. (3%)
- b. Description of data and empirical strategy (Due Oct. 7). Describe your data set and the methods you will use to analyze it, and present your empirical model for conducting the assessment. (5%)
- c. Oral presentation of initial findings (Nov. 13, 18, 20). Present the initial findings you're your literature review and empirical analysis to the class. (7%)
- d. Final paper submission (Dec. 10 at midnight). Your final paper must address the following issues: a) Why is your topic important; b) What previous research has been done on it, and what gaps exist in our knowledge of it?; c) How are you analyzing the issue (what data and methods have you used?); d) What are your main findings?; e) What, if any, are the implications of your findings for policy and program design? You should generate figures and tables that support your arguments and analyses. (25%)

Tentative Meeting Schedule

A. Unit 1: Introduction

1. Welcome and brief overview (Aug. 26)
2. Global burden of disease: Environmental fraction (Aug. 28)

3. Transitions and dynamics (Sep. 2)
- B. Unit 2: The major environmentally-related diseases
1. Diarrhea (Sep. 4)
 2. Acute respiratory illness (Sep. 9)
 3. Nutrition (Sep. 11)
 4. Climate-related / ecosystems (Sep. 16)
 5. Malaria (Sep. 18) – **Dr. Randy Kramer**
- C. Unit 3: Economic framework for environmental health behavior
1. Household production of environmental health (Sep. 23)
 2. Behavior change interventions: Example of cookstoves (Sep. 25) – **MPP Graduate Laura Morrison**
 3. Economics: Role of preferences (Sep. 30)
- D. Unit 4: Impact evaluation
1. Intro to IE: Experimental design (Oct. 2)
 2. IE: Quasi-experimental evaluation strategies (Oct. 7)
- E. Unit 5: Other useful perspectives
1. Social / psychological aspects (Oct. 9)
 2. Strategic behavior (Oct. 16)
- F. Unit 6: Supply & implementation drivers
1. Intro: Who and how to supply? (Oct. 21)
 2. Cost-benefit analysis (Oct. 23, 28)
 3. The role of government (Oct. 30)
 4. Private sector, NGOs, PSP, etc. (Nov. 4)
 5. Community-driven development (Nov. 6) – **PhD Student Jie-Sheng Tan Soo**
 6. Scaling-up (Nov. 11)
- G. Student presentations (Nov. 13, 18, 20)
- H. Course wrap-up (Nov. 25)

Detailed reading list

Unit 1: Introduction

Aug 26: Motivation and brief overview

Pattanayak et al. (2010). "How valuable are environmental health interventions? Evaluation of water and sanitation programmes in India." *Bulletin of the World Health Organization* 88: 535-542.

Whittington, D.; M. Jeuland; K. Barker, Y. Yuen (2012). "Setting Priorities and Targeting Subsidies among Water, Sanitation, Hygiene and Preventive Health Interventions in Developing Countries." *World Development* 40(8): 1546–1568.

Aug 28: Global burden of disease: Environmental fraction

Lim et al. (2012). "A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990—2010: a systematic analysis for the Global Burden of Disease Study 2010." *Lancet* 380(9859): 2224-2260.

Pruss-Ustun and Corvalan (2006). "Preventing diseases through healthy environments. Towards an estimate of the environmental burden of disease." World Health Organization. Select pages.

Smith et al. (1999). "How much global ill health is attributable to environmental fractions." *Epidemiology* 10(5): 573-584.

Sep 2: Transitions and dynamics

Cutler et al. (2006). "The determinants of mortality." *Journal of Economic Perspectives* 20(3): 97-120.

Jeuland, M.; S. Ozdemir; D. Fuente; M. Allaire; D. Whittington (2013). "The long-term dynamics of health benefits from improved water and sanitation in developing countries." *PLoS ONE* 8(10): e74804. doi: 10.1371/journal.pone.0074804.

Smith and Ezzati. (2005). "How environmental health risks change with development: The Epidemiologic and Environmental Risk Transitions Revisited." *Annual Review of Environmental Resources* 30: 291-333.

World Bank (2008). "Chapter 6: Approaches to Environmental Health." Pp. 85-90.

Unit 2: The major environmentally-related diseases

Sep 4: Diarrhea

Clasen et al. (2014). "Estimating the impact of unsafe water, sanitation and hygiene on the global burden of disease: evolving and alternative methods." *Tropical Medicine and International Health* 19 (8): 884-893.

Fewtrell et al. (2005). "Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis." *Lancet Infectious Diseases* 5: 42-52.

Keusch et al. (2006). "Chapter 19: Diarrheal Diseases." In: *Disease Control Priorities in Developing Countries*. Eds. Jamison et al. Washington D.C.: World Bank. Pp. 371-387.

Waddington et al. (2009). "Effectiveness and sustainability of water, sanitation, and hygiene interventions in combating diarrhea." *Journal of Development Effectiveness* 1(3): 295-335.

Sep 9: Respiratory illness

Balakrishnan et al. (2014). "Addressing the Burden of Disease Attributable to Air Pollution in India: The Need to Integrate across Household and Ambient Air Pollution Exposures." *Environmental Health Perspectives* 122 (1): A6-7.

Bruce et al. (2006). "Ch. 42: Indoor Air Pollution." In: *Disease Control Priorities in Developing Countries*. Eds. Jamison et al. Washington D.C.: World Bank. Pp. 793-815.

Dherani et al. (2008). "Indoor air pollution from unprocessed solid fuel use and pneumonia risk in children aged under five years: a systematic review and meta-analysis." *Bulletin of the World Health Organization* 86(5): 390-398.

Simoës et al. (2006). "Ch. 25: Acute Respiratory Infections in Children." In: *Disease Control Priorities in Developing Countries*. Eds. Jamison et al. Washington D.C.: World Bank. Pp. 483-497.

Optional

Speizer et al. (2006). "Ch. 35: Respiratory Diseases of Adults." In: *Disease Control Priorities in Developing Countries*. Eds. Jamison et al. Washington D.C.: World Bank. Pp. 681-693.

Sep 11: Nutrition

Currie and Vogl (2013). "Early-Life Health and Adult Circumstance in Developing Countries." *Annu. Rev. Econ.* 5:1-36.

Shulevitz (2012). "Why Fathers Really Matter." *The New York Times Magazine*. Sep. 9, 2012.

World Bank (2008). "Ch.2 & 3: Environmental Health, Malnutrition, and Child Health & How Environmental Health Supplements Other Child Survival Strategies." Pp. 17-43.

Optional

Cebu Study Team (1991). "A child health production function estimated from longitudinal data." *Journal of Development Economics* 38 (1992) 323-351.

Sep 16: Climate / ecosystems-related

Maystadt and Muller (2012). "Environmental Migrants: A Myth?" IFPRI Research Brief 18. Washington D.C.

Myers et al. (2013). "Human health impacts of ecosystem alteration." *Proceedings of the National Academy of Sciences* 110 (47): 18753–18760.

Smith et al. (2014). "Chapter 11. Human Health: Impacts, Adaptation, and Co-Benefits." In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability*. Intergovernmental Panel on Climate Change.

Zhang and Hiller (2008). "Climate Change and the Transmission of Vector-Borne Diseases: A Review." *Asia-Pacific Journal of Public Health* 20 (1): 64-76.

Optional

Hashizume et al. (2008). "Rotavirus infections and climate variability in Dhaka, Bangladesh: a time-series analysis." *Epidemiol. Infect.*, 136, 1281–1289.

Levy et al. (2008). "Seasonality of rotavirus disease in the tropics: a systematic review and meta-analysis." *International Journal of Epidemiology* 38: 1487-1496.

Levy et al. (2012). "Part 1: State and Trends of the Environment." In: *Global Environmental Outlook 5*. United Nations Environmental Programme: Valletta, Malta.

McMichael et al. (2006). "Climate change and human health: present and future risks." *Lancet* 367: 859–69.

Sep 18: Malaria

Breman et al. (2006). "Ch. 21: Conquering Malaria." In: *Disease Control Priorities in Developing Countries*. Eds. Jamison et al. Washington D.C.: World Bank. Pp. 413-431.

Keiser et al. (2005). "Reducing the burden of malaria in different eco-epidemiological settings with environmental management: a systematic review." *Lancet Infectious Diseases* 5: 695-708.

Yasouka and Levins (2007). "Impact of deforestation and agricultural development on anopheline ecology and malaria epidemiology." *American Journal of Tropical Medicine and Hygiene* 76(3): 450-460.

Unit 3: Economic framework for environmental health behavior

Sep 23: Household production of environmental health

Eisenberg et al. (2007). "Environmental Determinants of Infectious Disease: A Framework for Tracking Causal Links and Guiding Public Health Research." *Environmental Health Perspectives* 115(8): 1216-1223.

Glanz and Bishop (2010). "The Role of Behavioral Science Theory in Development and Implementation of Public Health Interventions." *Annu. Rev. Public Health.* 31:399–418.

Krieger (1999). "Sticky webs, hungry spiders, buzzing flies, and fractal metaphors: on the misleading juxtaposition of "risk factor" versus "social" epidemiology." *J Epidemiol Community Health* 53:678–680.

Pattanayak and Pfaff (2009). "Behavior, Environment, and Health in Developing Countries: Evaluation and Valuation." *Annu. Rev. Resour. Econ.* 1:183–217

Optional

Jeuland, M.; M. Lucas; J. Clemens; D. Whittington (2009). "Estimating the private benefits of vaccination against cholera in Beira, Mozambique: a travel cost approach." *Journal of Development Economics* 91: 310-322.

Sep 25: Behavior change interventions: Example of cookstoves

Anenberg et al. (2013). "Cleaner Cooking Solutions to Achieve Health, Climate, and Economic Cobenefits." *Environmental Science and Technology* 47: 3944–3952.

Bensch et al. (2014). "Why Do Households Forego High Returns from Technology Adoption Evidence from Improved Cook Stoves in Burkina Faso." *Ruhr Economic Papers*: Bochum, Germany.

Pattanayak et al. (2014). "Designing & Evaluating Behavior Change Interventions to Improve the Adoption and Use of Improved Cookstoves." Report to USAID: Duke University TRAction project; Durham, NC.

Sep 30: Economics: The role of preferences

Orgill, J.; M. Jeuland; A. Shaheed; J. Brown (2013). "Water quality perceptions and willingness to pay for clean water in peri-urban communities in Cambodia." *Journal of Water & Health* 11(3): 489-506. doi:10.2166/wh.2013.212.

Jeuland, M.; V Bhojvaid; A Kar; J. Lewis; O. Patange; S.K. Pattanayak; N Ramanathan; I. Rehman; J. Tan Soo; V. Ramanathan (2013) "Preferences for improved cookstoves: Evidence from rural villages in north India" Working Paper.

Poulos et al. (2012). "Consumer preferences for household water treatment products in Andhra Pradesh, India." *Social Science and Medicine* 75 (4): 738-746.

Optional

Shaheed, A.; J. Orgill; M. Montgomery; M. Jeuland; J. Brown (2014). "Why "improved" water sources are not always safe." *Bulletin of the World Health Organization* 92: 283-289.

Yang et al. (2006). "Unpackaging Demand for Water Service Quality: Evidence from Conjoint Surveys in Sri Lanka." *World Bank Policy Research Working Paper No. 3817*. Washington, DC.

Unit 4: Impact evaluation

Oct 2: Intro to IE: Experimental design

Brown, J.; M. Jeuland; A. Hamoudi; G. Turrini (2014). "Heterogeneous effects of information on household behaviors to improve water quality" *Duke University Working Paper*.

Ezzati et al. (2004). "Environmental risks in the developing world: exposure indicators for evaluating interventions, programmes, and policies." *J Epidemiol Community Health* 59: 15–22.

Hamoudi, A, M. Jeuland, S. Lombardo, S.R. Patil, S.K. Pattanayak, and S. Rai (2012). "Household responses to water quality testing in rural India: Evidence from a randomized experiment." *American Journal of Tropical Medicine and Hygiene* 87: 18-22; doi:10.4269/ajtmh.2012.12-0051.

Pattanayak (2009). "Rough Guide to Impact Evaluation of Environmental and Development Programs." *SANDEE Working Paper No. 40-09*.

Oct 7: IE: Quasi-experimental evaluation strategies (Oct. 7)

Habicht et al. (1999). "Evaluation designs for adequacy, plausibility and probability of public health programme performance and impact." *International Journal of Epidemiology* 28:10-18.

Jeuland, M.; M. McClatchey; S.K. Pattanayak; C. Poulos (2014). "Do decentralized community treatment plants provide better water? Evidence from Andhra Pradesh." *Duke University Working Paper*.

Tarozzi et al. (2009). "Commitment Mechanisms and Compliance with Health-Protecting Behavior: Preliminary Evidence from Orissa, India." *American Economic Review Papers & Proceedings* 99(2): 231–235

Unit 5: Other useful perspectives

Oct 9: Social / psychological aspects

Dickinson & Pattanayak (2014). "Open sky latrines: Social reinforcing in the case of a (very) impure public good." Working paper.

Pattanayak et al. (2009). "Shame or subsidy revisited: social mobilization for sanitation in Orissa, India." Bull World Health Organ 87:580–587.

Tsutsui et al. (2010). "A policy to promote influenza vaccination: A behavioral economic approach." Health Policy 97: 238-249.

Optional

Atmadja et al. (2012). "Discount rate estimates in rural India: What difference do they make?" Working Paper.

Oct 16: Strategic behavior

Dow et al. (2012). "Complementarities under Competing Risks." T American Economic Review 89(5): 1358-1371.

Yarnoff (2012). "Prevention versus Treatment with Competing Disease Risks." Working Paper.

Unit 6: Supply & implementation drivers

Oct 21: Who should intervene and intro to supply-side issues

Besley and Ghatak (2007). "Reforming Public Service Delivery." Journal of African Economies 16; AERC supplement 1: 127-156.

Gersovitz and Hammer (2003). "Infectious Diseases, Public Policy, and the Marriage of Economics and Epidemiology." World Bank Research Observer 18(2): 129-157.

Madon et al. (2008). "Implementation Science." Science 318: 1728-1729.

World Bank (2008). "Environmental Health Experiences in Developing Countries." Pp. 90-110.

Optional

Davis, J.; H. Lukacs; M. Jeuland; A. Alvestegui; B. Soto; G. Lizarraga; A. Bakalian (2008). "Sustaining the benefits of rural water supply investments: Experience from Cochabamba and Chuquisaca, Bolivia." Water Resources Research 44: doi:10.1029/2007WR006550.

Oct 23/28: Valuation and cost-benefit analysis

Boardman et al. (2010). Cost-benefit analysis: Principles and Practice. "Ch. 1: Introduction to Cost-Benefit Analysis and Ch. 7: Dealing with Uncertainty." Prentice-Hall.

Fonseca et al. (2011). "Life-cycle costs approach: Costing sustainable services." WASHCost Briefing Note 1a: IRC International Water and Sanitation Centre.

Jeuland, M.; S.K. Pattanayak (2012). "Benefits and costs of improved cookstoves: Assessing the implications of variability in health, forest and climate impacts" PLOS One 7(2): e30338. doi:10.1371/journal.pone.0030338.

Jeuland, M.; M. Lucas; J. Clemens; D. Whittington (2009). "A Cost Benefit Analysis of Vaccination Programs in Beira, Mozambique." World Bank Economic Review 23 (2):235-267.

Optional

Nauges et al. (2008). "The value of water connections in Central American cities: a revealed preference study." Environment and Development Economics 14: 349-370.

Pattanayak et al. (2005). "Coping with unreliable public water supplies: Averting expenditures by households in Kathmandu, Nepal." Water resources research 41: W02012.

Oct 30: The role of government / public sector provision

Chattopadhyay and Duflo (2004). "Impact of Reservation in Panchayati Raj: Evidence from a Nationwide Randomised Experiment." Economic and Political Weekly 39(9): 979-986.

Cook, J.; M. Jeuland; B. Maskery; D. Lauria; D. Sur; J. Clemens; D. Whittington (2008). "Using private demand studies to calculate socially optimal vaccine subsidies in developing countries." Journal of Policy Analysis and Management 28 (1): 6-28.

Rauch and Evans (2000). "Bureaucratic structure and bureaucratic performance in less developed countries." Journal of Public Economics 75: 49-71.

Nov 4: Private sector, NGOs, PSP, etc.

Bustreo et al. (2003). "Can developing countries achieve adequate improvements in child health outcomes without engaging the private sector?" Bulletin of the World Health Organization 81(12): 886-895.

Edwards and Hulme (1996). "Too close for comfort? The impact of official aid on nongovernmental organizations." World Development 24(6): 961-973.

Gassner et al. (2008). "Does the private sector deliver on its promises? Evidence from a global study in water and electricity." GRIDLINES: Public-Private Infrastructure Advisory Facility.

Jeuland, M.; J.S. Tan-Soo; S.K. Pattanayak (2014). "The role of preference and institutional heterogeneity in adoption of environmental health improvements: Evidence from a randomized cookstove promotion experiment." Duke University Working Paper.

Townsend et al. (2004). "Creating Spaces of Resistance: Development NGOs and their Clients in Ghana, India and Mexico." *Antipode* 36: 871-889.

Optional

Davis, J. (2005). "Private-sector participation in the water and sanitation sector." *Annu. Rev. Environ. Resour.* 30: 145-83.

Troncoso et al. (2011). "Understanding an improved cookstove program in rural Mexico: An analysis from the implementers' perspective." *Energy Policy* 39: 7600-7608.

Nov 6: Community-driven development

Dewilde et al. (2008). "An integrated method for evaluating community-based safe water programmes and an application in rural Mexico." *Health Policy and Planning* 23: 452-464.

Isham and Kähkönen (2010). "Institutional Determinants of the Impact of Community-Based Water Services: Evidence from Sri Lanka and India." *Economic Development and Cultural Change* 50(3): 667-691.

Pritchett and Woolcock (2004). "Solutions When the Solution is the Problem: Arraying the Disarray in Development." *World Development* 32(2): 191-212.

Nov 11: Scaling-up

Mangham and Hanson (2010). "Scaling up in international health: what are the key issues?" *Health Policy and Planning* 25: 85-96.

White (2009). "Theory-Based Impact Evaluation: Principles and Practice." 3iE Working Paper 3: International Initiative for Impact Evaluation: New Delhi, India.

World Bank (2008). "Chapter 6: Approaches to Environmental Health." Pp. 85-110.