**ENVIRO 736K**

**Planetary Health & Environmental Epidemiology**

**Fall 2018**

Dates / course meeting time:
Academic credit: 3 Credits
Course format: Presentation + Lecture + Discussion + Lab

**Instructor’s information**

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**What is this course about?**

As the pace and scale of human impacts on Earth’s natural systems continue to increase, there is growing importance in understanding and quantifying the implications of these accelerating changes for human health. This field has recently been termed “planetary health.” Throughout this course, we will study the human health impacts of accelerating environmental change through interdisciplinary approaches including environmental science, political science, and public health.

**What background knowledge do I need before taking this course?**

This is a graduate level iMEP elective course. Students are encouraged to have taken one quantitative methodology class (statistics, biostatistics, epidemiology, or econometrics) prior to enrollment. Students from other graduate programs may enroll if space is available. Undergraduate students need permission from the instructor and their own academic advisor to join this class.

**Readings**

The bulk of the reading material will be derived from these commission reports, accessible through Sakai.
- The Rockefeller Foundation—Lancet Commission on planetary health. *The Lancet*
- The Lancet Commission on pollution and health. *The Lancet*
- The Lancet Countdown on health and climate change. *The Lancet*

**Grading**

Each week, one or more students will be asked to share a news event from the prior week which has a planetary health dimension and lead the class in a brief (10-15 minutes) discussion consistent with our
recurring themes: an environmental change shown to have a human health implication; whose health? Who stands to gain/lose by quantifying/publicizing these connections? Why do you think it was reported and who pushed the story? What policies and other types of interventions could address it? This assignment will constitute 10% of the final grade.

Students will write a mini-case study on the subject of planetary health (500-800 words). This will constitute 10% of the final grade. Writing guidelines will be given in class.

- Describe a particular type of environmental change in a specific geographical region. Discuss its scope and rate of change, and any relevant historical, social, and economic drivers.
- Describe a specific human health outcome (or suite of health outcomes) expected to arise from this type of environmental change. Focus here on the evidence base linking the environmental change to its human health impact.
- Generate a novel hypothesis on environmental and human health relationship.

There will be a heavy emphasis on participation, which will constitute 20% of the final grade, including in-class activities, discussions and presentations. We understand that participation means different things to different people. Listening carefully and helping your peers is as, if not more, important than taking an opportunity to speak.

**News Presentation** 10%
- Problem Set (4 total, 10% each) 40%
- Case Study 10%
- Participation (attendance & discussion) 20%
- Final Examination 20%

Without prior permission from one of the instructors, late assignments will be docked one full letter grade for each day they are late.

What are the course policies?

**Academic Integrity:**

As a student, you should abide by the academic honesty standard of the Duke Kunshan University. Its Community Standard states: “Duke Kunshan University is a community comprised of individuals from diverse cultures and backgrounds. We are dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Members of this community commit to reflecting upon and upholding these principles in all academic and non-academic endeavors, and to protecting and promoting a culture of integrity and trust.”

**Academic Policy & Procedures:**

You are responsible for knowing and adhering to academic policy and procedures as published in University Bulletin and Student Handbook. Please note, an incident of behavioral infraction or academic dishonesty (cheating on a test, plagiarizing, etc.) will result in immediate action from me, in consultation with university administration (e.g., Dean of Undergraduate Studies, Student Conduct, Academic Advising). Please visit the Undergraduate Studies website for additional guidance related to academic policy and procedures.
**Academic Disruptive Behavior and Community Standard:**

Please avoid all forms of disruptive behavior, including but not limited to: verbal or physical threats, repeated obscenities, unreasonable interference with class discussion, making/receiving personal phone calls, text messages or pages during class, excessive tardiness, leaving and entering class frequently without notice of illness or other extenuating circumstances, and persisting in disruptive personal conversations with other class members. I do not have a paternalistic policy on laptop usage in class, as it can better facilitate student learning. However, laptops may be distracting to others around you. For this reason, by week 2, students can choose to sit in the laptop section or no laptop section of the classroom, and must remain in that section for the rest of the semester.

**Academic Accommodations:**
If you need to request accommodation for a disability, you need a signed accommodation plan from Campus Health Services, and you need to provide a copy of that plan to me. Visit the Office of Student Affairs website for additional information and instruction related to accommodations.

**What campus resources can help me during this course?**

**Academic Advising and Student Support**
Please consult with me about appropriate course preparation and readiness strategies, as needed. Consult your academic advisors on course performance (i.e., poor grades) and academic decisions (e.g., course changes, incompletes, withdrawals) to ensure you stay on track with degree and graduation requirements.

**Language Learning Studio**
If you want additional help with academic writing – and more generally with language learning – you are welcome to go to the Language Learning Studio (LLS), located in the Conference Center. You can find more information on the LLS website.
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<tr>
<th>Week 1</th>
<th>Introduction to Planetary Health</th>
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<tbody>
<tr>
<td>Planned in-class activities</td>
<td>There will be no class meetings during the first week 8/28 and 8/30. These class times will be rescheduled for a field trip at a later date TBD.</td>
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<tr>
<th>Week 2</th>
<th>Introduction to Planetary Health</th>
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<tr>
<td>Research Methods I: Introduction to Environmental Epidemiology</td>
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<tr>
<td>Planned in-class activities</td>
<td><strong>Part I:</strong> Introductions, course logistics, and an overview of global environmental change and human health. What is planetary health, where has it come from, and what characterizes it? <strong>Part II:</strong> Explore basic concepts of environmental epidemiology, emphasis is placed on the principles and methods of epidemiologic investigation, appropriate summaries and displays of data, and the use of classical statistical approaches to describe the health of populations. Topics include ratios and proportions; methods of direct and indirect adjustment, and clinical life table which measures and describes the extent of disease problems. Various epidemiologic study designs for investigating associations between risk factors and disease outcomes are also introduced, culminating with criteria for causal inferences.</td>
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<tr>
<td>Assignments</td>
<td>Problem Set 1 Assigned (Due Week 4)</td>
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<th>Week 3</th>
<th>Population Growth and Urbanization</th>
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<td>Planned in-class activities</td>
<td>Most of the world's population now live in towns and cities and, for the foreseeable future, most population growth will be in urban areas. What does this changing landscape mean for the planet and health?</td>
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<td>Week 4</td>
<td>Research Methods II: Exposure and Outcome Assessment</td>
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<tr>
<td>Planned in-class activities</td>
<td>This week we will learn the basics of environmental epidemiology, including cause (exposure variable) and outcome (disease or outcome variable). We will also introduce how to use a directed acyclic graph (DAG) to choose which variables on which to condition to control confounding between exposure (cause) and disease (outcome or effect) in your model.</td>
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| Assignments | Problem Set 1 Due in class  
Problem Set 2 Assigned (Due Week 6) |

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<tr>
<th>Week 5</th>
<th>Air Pollution, Indoor and Ambient Air Quality and Health</th>
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| Pre-class work for students | Reading - Required  
The Lancet Commission on pollution and health. *The Lancet*  
- Air Pollution (p.13)  
- Air pollution, poverty, and environmental injustice (p.30)  
Reading - Optional  
| Planned in-class activities | Air pollution is the biggest topic in environment and health. The learning objectives of this lesson are: define air pollution and the common air pollutants, understand study designs, identify common sources of indoor and outdoor air pollution, discuss methods to reduce air pollution. |

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<th>Week 6</th>
<th>Research Methods III: Confounding, Measurements of Association</th>
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<tr>
<td>Planned in-class activities</td>
<td>This week we will delve deeper into environmental epidemiology. We will cover: rates and risk ratios, binary outcomes and odds ratio, confounding and conditioning on a variable, stratification and effect modification.</td>
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| Assignments | Problem Set 2 Due in Class  
Problem Set 3 Assigned (Due Week 8) |

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<th>Week 7</th>
<th>Soil Erosion and Chemicals</th>
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| Pre-class work for students | Reading - Required  
The Lancet Commission on pollution and health. *The Lancet*  
- Soil, heavy metal, and chemical pollution (p.16)  
- Global spread of extractive industries: oil and gas production, mining, and smelting (p.28)  
Reading – Optional  
- John Snow and Broad Street Pump,  
http://www.ph.ucla.edu/epi/snow/snowcricketarticle.html |
### Planned in-class activities

Water pollution is any contamination of water with chemicals or other foreign substances that are detrimental to human, plant, or animal health. These pollutants include fertilizers and pesticides from agricultural runoff; sewage and food processing waste; lead, mercury, and other heavy metals; chemical wastes from industrial discharges.

### Week 8

**Research Methods IV: Epidemiology Study Designs**

**Planned in-class activities**

What is a perfect study design? What is a feasible study design. Armed with knowledge on how to measure exposure, outcome, and confounders, we will delve into how to use these data points. This section of the class will introduce cross-sectional study, case-control study, cohort study, and randomized controlled trials.

**Assignments**

- Problem Set 3 Due in Class
- Problem Set 4 Assigned (Due Week 10)

### Week 9

**Water Pollution and Waterborne Diseases**

**Pre-class work for students**

- **Reading - Required**
  - The Lancet Commission on pollution and health. *The Lancet*
  - Water Pollution (p.14)
  - Water pollution, poverty, and environmental injustice (p.30)
  - John Snow and Broad Street Pump, [http://www.ph.ucla.edu/epi/snow/snowcricketarticle.html](http://www.ph.ucla.edu/epi/snow/snowcricketarticle.html)
  - Flint Michigan Leaded Tap Water (TBD)

**Planned in-class activities**

Water pollution is any contamination of water with chemicals or other foreign substances that are detrimental to human, plant, or animal health. These pollutants include fertilizers and pesticides from agricultural runoff; sewage and food processing waste; lead, mercury, and other heavy metals; chemical wastes from industrial discharges.

### Week 10

**Research Methods V: Statistical Modeling and Inference**

**Planned in-class activities**

We will cover the theoretical basis of linear regression, ANOVA, logistic regression, Cox proportional hazard model. This lecture to equip students to read and understand common statistical techniques.

**Assignments**

- Problem Set 4 Due in Class
- Case Study Assigned (Due Week 12)

### Week 11

**Climate Change, Environmental Conservation and Public Health Interventions**

**Pre-class work for students**

- **Reading - Required**
  - The Rockefeller Foundation—Lancet Commission on planetary health. *The Lancet*
  - Trends in global environmental change (p.1980)
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<th>Week 12</th>
<th>Research Methods VI: Multiple Measurements</th>
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<td>Planned in-class activities</td>
<td>The global environment is in a state of rapid flux. We will explore technological, policy, and behavioral changes that would reduce vulnerability to a rapidly changing environment while providing benefits in today’s world, including agriculture, fisheries management, urban design, climate change mitigation.</td>
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<tr>
<td>Assignments</td>
<td>Case Study Due in Class</td>
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<tr>
<th>Week 13</th>
<th>Sustainable Development Goals</th>
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| Pre-class work for students | Reading - Required  
The Lancet Commission on pollution and health. *The Lancet* - Pollution-related disease, poverty and the SDGs (p. 26) |
| Planned in-class activities | How will the 17 SDG goals and its 169 targets help achieve planetary health? |

| Week 14 | Final Examination |