COURSE DESCRIPTION

This course takes a global perspective, exploring the diverse environmental phenomena that influence the transmission of infectious diseases. Complex dynamics, feedbacks and spatial flows inherent in the transmission of environmentally driven infectious diseases are examined, focusing on vector-borne diseases, tropical parasites and waterborne pathogens. The epidemiological significance of environmental processes are explored, including weather, climate extremes, hydrology, development projects, and land use change. Anthroponotic and zoonotic diseases of global significance are examined with respect to how environmental factors shape their distributions, intensity, environmental fate, transport, and persistence. The specific epidemiological consequences of climate change, dams, irrigation, agricultural intensification and de/re-forestation are emphasized, and analytical tools for their study presented and critiqued, including methods for modeling coupled environmental-epidemiological systems.

SCHOOL LEVEL AND DEPARTMENT COMPETENCIES

- Interpret the geographic and demographic distributions and morbidities and mortality of major infections in the US and globally
- Implement strategies to prevent and control infectious diseases
- Appraise the environmental, behavioral and social factors that contribute to the emergence, re-emergence, and persistence of infectious diseases
- Describe major environmental risks to human health ranging from the local to global scale
- Assess the sources and movement of contaminants through the environment
- Characterize the magnitude, frequency and duration of environmental exposures
- Apply the principles of epidemiology to assess health effects of environmental exposures
- Evaluate the risks posed by environmental hazards using risk assessment methods
- Critique major global priorities and the reasons for their prioritization
LEARNING OBJECTIVES
At the completion of the course, the successful student will be able to:

● Characterize the epidemiologic features of environmentally-mediated infectious diseases;
● Demonstrate knowledge of the role of environmental phenomena in limiting, maintaining and facilitating infectious disease spread;
● Apply their focus in the course to infectious disease problems in the developing world, considering both the health burden and potential solutions from a development perspective;
● Understand the ways in which the effects of environmental phenomena, such as climate change, on infectious disease differ in the developing world;
● Articulate the importance of integrating environmental sustainability into existing global health initiatives;
● Develop strategies for communicating the environmental drivers of infectious disease to global health funders, agencies, and populations in the field;
● Summarize measures for the control and prevention of environmentally-mediated infectious diseases;
● Display competency with available methods for assessing the environmental drivers of infectious disease systems, including the strengths and shortcomings of various approaches;
● Interpret the results of studies which explore coupled environment-disease systems, identifying sources of uncertainty.

EVALUATION
Grades will be assigned based on the following formula:

- Class participation: 20%
- In-class exercises: 50% (10 exercises* at 5% each)
- In-class presentation: 30%

*at least one exercise will be take-home

Class participation will be assessed by the instructor and will be based on the student’s preparation for class, contributions to class discussion, in-class questions, participation on the course blog, interaction with instructor in office hours, and participation in group activities.

In-class exercises will assess students’ engagement with course readings and lectures. Exercises will vary from short multiple-choice quizzes, to short-answer questions, to basic problem solving. Each exercise will be worth 5% of the final grade. PhD students can lead a class discussion in lieu of 2 in-class exercises.

The objective of the final presentation is to fill a gap identified in the course content by delivering a ~30 minute presentation on a set of environmental drivers of infectious disease of interest to students. The presentation will be delivered in pairs, and you will use the Eisenberg EnvID framework (Eisenberg et al., 2007) as a guide in designing your presentation. Your presentation will explore either:
(1) a specific mechanism across three infectious disease systems (i.e. one cell in the EnvID matrix, examined for three systems), or
(2) three mechanisms for a specific infectious disease system (i.e. three cells in the EnvID matrix for one system).

More details will be provided in the first few weeks of the class. For both presentation types, presented material must include a quantitative overview of the health burden, a critical review of the evidence for the environmental driver(s), a critique of the methods used to establish the environment-disease relationship(s), and the anticipated effect of environmental change. The presentation will comprise 30% of the course grade.

If you will miss a class, you must notify the instructor in advance of your absence. At the next class attended after the missed session, the student will present (~7-10 minutes) on a topic mutually agreed upon by the student and instructor (drawn from media, scientific or other sources). Presentations for extra credit may be available at the instructors' discretion, and extra credit will be used to bump borderline grades to the next level (e.g. from an A- to an A).

ACADEMIC HONOR CODE
The RSPH requires that all material submitted by a student in fulfilling his or her academic course of study must be the original work of the student.

EMORY UNIVERSITY ROLLINS SCHOOL OF PUBLIC HEALTH

Environmental Determinants of Infectious Diseases  
(EH750, Spring Semester - 2015)
Room: GCR P39 -- Time: Wednesday, 1-4pm 
Instructor: Justin Remais, PhD

INTRODUCTION
Class 1 (1/14): Course Introduction: why are we here?  
Class 2 (1/21): Environmentally-mediated infectious diseases (EMIDs): defining environment, links to epidemiology of infectious disease, and the nature of evidence at the environment/ID interface

ANALYTICAL METHODS FOR EMIDs
Class 3 (1/28): Risk and epi (risk models vs. intervention trials) for waterborne pathogens  
Class 4 (2/4): Transmission dynamics and an introduction to math models  
Class 5 (2/11): Math models and density dependence: the ecological and environmental underpinnings of its limiting/facilitating effects  
Class 6 (2/18): Dynamic spatial models, suitability models, and empirical spatial modeling

MAJOR ENVIRONMENTAL FACTORS INFLUENCING EMIDs
Class 7 (2/25): CLIMATE: debate on climate change as an environmental driver of the future distribution of VBDs 
Class 8 (3/4): WATER/SANITATION: the influence of concurrent infrastructure dev’t and environmental change 
Spring Break (3/9-13)  
Class 9 (3/18): MOVEMENT: Host movements: why they matter and the underlying socio-environmental drivers  
Class 10 (3/25): SEASONALITY: Seasonal trends and the time domain: how weather influences EMID dynamics  
Class 11 (4/1): (TBD) ANTIMICROBIAL RESISTANCE: insights into environmental drivers of ABR
Class 12 (4/8): STUDENT CONTRIBUTIONS Student-led sessions (X3)  
Class 13 (4/15): STUDENT CONTRIBUTIONS Student-led sessions (X3)  
Class 14 (4/22): Wrap-up + STUDENT CONTRIBUTIONS Student-led sessions (X3)
Topics of discussion:

- How do global climate change, extreme weather events and dams influence the transmission of infectious diseases?

- What tools are available to study the complex links between deforestation and disease vectors; between agriculture and waterborne pathogens?

- How will development projects and urbanization shape future risks of infectious disease?

This course takes a global perspective, exploring the diverse environmental phenomena that influence the transmission of infectious diseases.

We explore the complex dynamics, feedbacks and spatial flows inherent in the transmission of environmentally driven infectious diseases including vector-borne diseases, tropical parasites and waterborne pathogens.

Student presentations from previous years:

- What is the impact of road construction on infectious disease spread? On the spread of antibiotic resistance?
- Climate and vectorborne disease: what is the evidence?
- How do land use changes in wetlands affect malaria and Dengue vector abundance?
- Ecosystem biodiversity: facilitating or limiting infectious disease transmission?
- *Vibrio cholerae* - competing environmental drivers that determine the spatial distribution
- Temperature regulation of diarrheal disease: evidence and public health implications