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<th>TITLE</th>
<th>EPI 570R Concepts and Methods in Infectious Disease Epidemiology</th>
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<td>CREDIT HOURS</td>
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| INSTRUCTOR                        | Ben Lopman, PhD, MSc  
Associate Professor  
Department of Epidemiology  
Rollin School of Public Health  
Emory University  
Email: blopman@emory.edu  
Phone: 404-727-7485  
Office hours: TBD |
| SEMESTER                          | Fall 2017                                                     |
| SCHEDULE                          | Meeting for 2 hours each week of Fall semester               |
| FORMAT                            | Combination of lectures and student-led discussions.          |

**BRIEF COURSE DESCRIPTION**

The epidemiology of infectious diseases differs in a fundamental way from the epidemiology of non-infectious diseases: one person’s disease status affects the risk of others in the population. This course will provide an overview of the history, concepts and analytical methods that specifically apply to the study of infectious diseases. One of the key assumptions that underlies many classical epidemiologic methods is that events are independent. Clearly, this is not the case for infectious diseases. Therefore, dedicated concepts and methods are required for their study. This course covers a range of methodological approaches and concepts for infectious disease epidemiology including: natural history, household transmission studies; concepts of dynamic modeling; sero-epidemiology; vaccines and vaccine epidemiology; molecular epidemiology and pathogen strain dynamics; and emerging infectious diseases. The course will be a combination of instructor-led lectures and student-led presentations. All students will be expected to take an active role.

**SUSTAINABILITY**

Infectious diseases result from the interplay of the human host, the pathogen and the environment in which both the host and pathogen live (or die). sustainability and climate change influence the environment and, in turn, disrupt patterns of infectious diseases. The Piedmont Project has crystalized my thinking about how to integrate these issues into my syllabus and concepts in this course. As an example, habitat destruction and deforestation are a driving force behind the emergence and re-emergence of infectious diseases such as the Ebola Virus outbreak in West Africa and the global spread of Zika. For some great writing on this, see David Quammen’s piece on Ebola. In addition to the environment, most infectious diseases transmit from person-to-person. The frequency and intensity of human contact is a social process, partly governed by our built environment, with major implications for how infectious diseases spread. Infectious disease epidemiology is fundamentally a quantitative science, concerned with what can be measured. However, these underlying drivers, including climate change and sustainability, will be considered in this course. To this end, we are incorporating a session on ‘Environmental determinants of Infectious Diseases’ and inviting guest speakers to talk about ‘Economics of Infectious Diseases and Sustainable Financing’ and ‘Human Contact and infectious Disease Transmission’.

**PREREQUISITES AND REQUIREMENTS**

- EPI/GLEPI students have priority registration.
- Class prerequisites are EPI 540/GH 517 and concurrent enrollment in EPI 740, or permission of the instructor.
- Course is offered to students planning a thesis or practicum related to infectious disease epidemiology on an infectious disease topic.
EVALUATION

- **Student presentations (30%)** The second half of the class each week will be student-led presentations. Each student, alone or in pairs, will prepare a summary of an assigned reading and present in 'journal club' format. The student(s) will then lead a discussion about the paper.
- **In-class participation (30%)** All students will have the opportunity and be expected to contribute to the weekly discussions. Discussions will be initiated by presenting student and then will then be opened to all.
- **Take-home group project (40%)** This will be a semester long project. Students will identify an infectious disease problem and select an appropriate methodology for its investigation. Grade will be split between a proposal due in the middle of the course (10%) and final report (30%).

LEARNING OBJECTIVES ASSOCIATED WITH THE COMPETENCIES

- To be able to identify unique challenges and appropriate methods for assessing the burden of infectious diseases.
- Understand direct and indirect effects of vaccination and methods for evaluating vaccines.
- To be able to identify the factors that determine a pathogen's outbreak potential and transmission characteristics.
- To understand how time series analysis can be used to study infectious diseases.
- To understand essential concepts in infectious disease transmission modeling.

COMPETENCIES

SCHOOL LEVEL

- Use analytic reasoning and quantitative methods to address questions in public health and population-based research.
- Describe environmental conditions, including biological, physical, and chemical factors that affect the health of individuals, communities, and populations.
- Describe the use of epidemiological methods to study the etiology and control of disease and injury in populations.
- Describe behavioral, social, and cultural factors that contribute to the health and well-being of individuals, communities, and populations.

DEPARTMENT LEVEL

- Describe public health problems in terms of magnitude, time, place, person and their associated risk factors
- Identify major epidemiologic problems of importance
- Identify key sources of data for epidemiologic purposes
- Differentiate between descriptive and analytic epidemiologic methods
- Critically evaluate the strengths and weaknesses of different study designs with respect to a given research question
- Calculate basic epidemiologic measures
- Interpret epidemiologic results in a causal framework
- Evaluate the strengths and weaknesses of the epidemiologic literature
- Communicate epidemiologic information in a scientific report

TEXTBOOK

Required
Infectious Disease Epidemiology
Ibrahim Abubakar, Helen R. Stagg, Ted Cohen and Laura C. Rodrigues.
Oxford University Press. 2016
**WEEK 1**  
**The unique epidemiology of infectious diseases**  
**Readings**  

**WEEK 2**  
**Studying the natural history of infections**  
**Readings**  

**WEEK 3**  
**Infectious disease dynamics and mathematical models**  
**Guest lecturer: Molly Steele**  
**Readings**  

**WEEK 4**  
**What is a contact for an infectious disease? (incl network epidemiology)**  
**Readings**  

**WEEK 5**  
**Studying transmission in households and beyond**  
**Readings**  

**WEEK 6**  
**Advanced molecular detection: how is it changing our understanding of IDs?**  
**Readings**  

**WEEK 7**  
**Vaccines I: direct, indirect and total effects**  
**Readings**  

**WEEK 8**  
**Vaccines II: designing vaccine studies**  
**Readings**  

**WEEK 9**  
**Sero-epidemiology**  
**Readings**  
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<th>WEEK 10</th>
<th>Pathogen evolution, strain replacement and multi strain models of disease</th>
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<th>WEEK 11</th>
<th>Human host genetics and infectious disease dynamics</th>
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<th>WEEK 12</th>
<th>Analytical challenges with emerging infectious diseases</th>
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<th>WEEK 13</th>
<th>Time series data and models for infectious diseases</th>
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<th>WEEK 14</th>
<th>Assessing severity and reporting pyramids</th>
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