

## **PUBH 6365, SECTION 1**

### **Global Challenges in Infectious Disease Epidemiology**

**Fall, 2019**

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#### **COURSE & CONTACT INFORMATION**

**Credits: 2**

**Meeting Days: M, W, (10/22/2019 - 12/11/2019)**

**Meeting Time: 9:05am - 11:00am**

**Meeting Place: Mayo A110**

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#### **COURSE DESCRIPTION**

This course will focus on the considerable burden due to infectious diseases within middle and low-income countries, as well as the underlying risk factors that lead to their emergence and spread. Students will learn about and review different measures of disease burden and health status. Different diseases of international public health significance will be reviewed, with a focus on epidemiologic research and methods used to describe and analyze disease determinants. The course will also expose students to different interventions (prevention and control strategies) that have been used in both emergency situations, and to reduce the burden of more endemic diseases that significantly impact the health of populations. The scientific literature concerning specific diseases of interest will be examined and discussed in order to illustrate these principles.

We recognize that it is impossible to cover all subjects in global health. Using a case-study approach, the course will instead select a variety of infectious diseases of international importance. We will focus instead on approaches to dealing with these different problems, and some of the methodologies used to study them. This course will allow students to gain both skills and a greater understanding of public health research and practice as it applies to international health.

## COURSE PREREQUISITES

This class is available to Masters or Doctoral students from the School of Public Health; additional students may be admitted by permission of the instructor. Prerequisites include PUBH 6320 Fundamentals of Epidemiology or PUBH 6341 Epidemiologic Methods I.

## COURSE GOALS & OBJECTIVES

Learning objectives include greater appreciation and understanding of infectious diseases, with a particular focus on low and middle-income countries, including:

- Methodologies for disease surveillance and outbreak investigation in resource-limited settings
- Control strategies such as mass drug administration, screening, chemoprophylaxis, community health workers, immunization, education and behavior change, and infection control
- Social, economic, cultural, and other determinants of endemic and epidemic diseases
- Program evaluation and operational research
- Methodologies used for monitoring and evaluation of control and prevention programs
- Critical review of the medical literature
- Developing research proposals to design and evaluate intervention strategies

## METHODS OF INSTRUCTION AND WORK EXPECTATIONS

Each class will last two hours and include a combination of lecture (on a general cross-cutting topic) and class discussion. Students will be assigned readings from the text, as well as articles from the peer review literature to read prior to class. Students will be asked to individually give a short presentation on a particular infectious disease of global health significance, as well as to participate in a group presentation on a challenging infectious disease situation.

### Learning Community

We do not come to our courses with identical backgrounds and experiences and building on what we already know about collaborating, listening, and engaging is critical to successful professional, academic, and scientific engagement with topics. In this course, students are expected to engage with each other in respectful and thoughtful ways. In group discussion, this can mean:

- Respecting the identities and experiences of your classmates.
- Avoid broad statements and generalizations. Group discussions are another form of academic communication and responses to instructor questions in a group discussion are evaluated. Apply the same rigor to crafting discussion posts as you would for a paper.
- Consider your tone and language, especially when communicating in text format, as the lack of other cues can lead to misinterpretation.

In group work, this can mean:

- Setting expectations with your groups about communication and response time as soon as groups are assigned and contacting the TA or instructor if scheduling problems cannot be overcome.
- Setting clear deadlines and holding yourself and each other accountable.
- Determining the roles group members need to fulfill to successfully complete the project on time.

Like other work in the course, all student to student communication is covered by the Student Conduct Code (<https://z.umn.edu/studentconduct>).

## COURSE TEXT & READINGS

The required text for this course is:

Abubakar I, Stagg HR, Cohen T, Rodrigues LC (eds.) Oxford University Press: Oxford, UK, 2016.

Additional reading will be assigned as described in the syllabus, and posted to the course web site

## COURSE OUTLINE/WEEKLY SCHEDULE

Week	Topic	Readings	Activities/Assignments
10/23/19	Communicable Diseases and Global Health  Prevention and Control  Data Used to Monitor Infectious Diseases (Lifson)	Abubakar, Chapter 1: Introduction  Abubakar, Chapter 2: Surveillance	Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality, 1980–2015: Global Burden of Disease Study 2015. Lancet 2016;388:1459-544
10/28/19	Defining a Research Problem and Significance  Eradication of Infectious Diseases (Searle)	Abubakar, Chapter 3: Outbreak Investigations  Abubakar, Chapter 6: Investigating Emerging Infectious Diseases	Fenner. Global eradication of smallpox. Rev Infect Dis 1982;4(5): 916-30  Molyneux D, Sankara DP. Guinea worm eradication: PLoS Negl Trop Dis. 2017;11(4):e0005495.
10/30/19	Randomized Individual Clinical Trials (Lifson)  Cluster Randomized Community Trials (Searle)	Abubakar, Chapter 4: Study Design  Abubakar, Chapter 5: Clinical Trials  Abubakar, Chapter 12: Vaccine Effectiveness	<b>Student Presentation: Infectious Disease</b>  Henao-Restrepo et al. Efficacy and effectiveness of an rVSV-vectored vaccine expressing Ebola surface glycoprotein. Lancet. 2015;386(9996): 857-66.
11/4/19	Screening for Infectious Diseases  Perinatal Congenital Infections (Lifson)	Abubakar, Chapter 8: Clinical Epidemiology  Abubakar, Chapter 27: Congenital Infections  Abubakar, Chapter 20: Vector borne infections	<b>Student Presentation: Infectious Disease</b>  WHO Guideline on syphilis screening and treatment for pregnant women. 2017:1-5  CDC. Guidance for providers caring for pregnant women with Zika virus exposure, MMWR 2017;66(29).
11/6/19	Operational/Implementation Analysis (Lifson)  Cost Effectiveness Analysis (Kulasingam)	Abubakar, Chapter 17: Economic Analysis of Interventions  Abubakar, Chapter 26: Parasitic Infections	<b>Student Presentation: Infectious Disease</b>  Amoussouhoui AS Implementation of program to improve the management of Buruli ulcer in Benin. PLoS Negl Trop Dis 2018; 12(3): e0006291.  Chowdhury. Indian and Nepalese programmes of indoor residual spraying for visceral leishmaniasis. Annals Trop Med Parasit 2011;105:31–45
11/11/19	Study Subjects, Sampling  Exposure and Outcome Measures (Searle)	Abubakar, Chapter 9: Public Health Microbiology  Abubakar, Chapter 13: Basic Statistical Methods	<b>Class Presentation (Challenges, Group 1): Cholera Yemen</b>  <b>Class Presentation (Challenges, Group 2): Avian flu in China</b>

11/13/19	Natural Disasters Complex Humanitarian Emergencies (Lifson)	Abubakar, Chapter 11: Immunoepidemiology  Abubakar, Chapter 19: Feco-oral infections	<b>Class Presentation (Challenges, Group 3): Yellow fever</b>  <b>Written Assignment # 1 Due</b> Piarroux Understanding the cholera epidemic, Haiti. Emerg Infect Dis 2011;17: 1161-8.
11/18/19	Social and Cultural Determinants of Health (Lifson)	Abubakar, Chapter 24: Transmissible spongiform encephalopathies  Abubakar, Chapter 25: HIV infection	<b>Student Presentation: Infectious Disease</b>  Abara HIV epidemic and human rights among men who have sex with men in sub-Saharan Africa: Glob Public Health. 2017 Apr;12(4):469-482  Vinck. Institutional trust and misinformation in the response to the 2018-19 Ebola outbreak in, DR Congo: Lancet Infect Dis. 2019;19(5):529-36.
11/20/19	Qualitative Research (TBD)	Abubakar, Chapter 18: Respiratory infections  Abubakar, Chapter 22: Hepatitis B and C	<b>Student Presentation: Infectious Disease</b>  De Schacht. Barriers to access and adherence to tuberculosis services, as perceived by patients: A qualitative study. PLoS One 2019;14(7):e0219470.  Ibragimov. Stigmatization of people who inject drugs by pharmacists in Tajikistan. Harm Reduct J 2017;14:64
11/25/19	Spatial Analysis (Searle)	Abubakar, Chapter 14: Spatial epidemiology	TBD
11/27/19	Transmission Models  Social Network Analysis (? Smith)	Abubakar, Chapter 15: Contact studies  Abubakar, Chapter 16: Transmission-dynamic models  Abubakar, Chapter 23: Sexually transmitted infections`	Amirkhanian. Social network HIV/STD prevention intervention for men who have sex with men in Russia and Hungary. AIDS 2015; 29(5): 583–93  Gyarmathy. Social network structure and HIV infection among injecting drug users in Lithuania AIDS Behav 2014; 18(3): 505–510
12/2/19	Nosocomial infections (Lifson)	Abubakar, Chapter 7: Hospital infection outbreaks  Abubakar, Chapter 10: Molecular epidemiology  Abubakar, Chapter 21: Health care associated infections	Dan-Nwafor. A cluster of nosocomial Lassa fever cases in a tertiary health facility in Nigeria: Int J Infect Dis 2019; 83:88-94  Bantubani. Potentially infectious tuberculosis and multidrug-resistant tuberculosis among hospital inpatients in KwaZulu Natal, South Africa PLoS One. 2014 Mar 13;9(3):e9086

12/4/19	International Health Systems  Health System Actors (Searle)		Miller. The effects of global health initiatives on NGOs working with gay men and HIV/AIDS in Northwest China. Med Anthropol Q. 2016;30(3):414-30  Cancedda. Lessons learned by a nongovernmental organization during the Ebola epidemic in Sierra Leone. J Infect Dis 2016;214(suppl 3):S153-63.
12/9/19	Ethics and Internal Research (Lifson)		<b>Written Assignment # 2 Due</b>  Krosin. Problems in comprehension of informed consent in rural and peri-urban Mali, Clin Trials 2006;3:306-13.  London L. Ethical oversight of public health research Am J Public Health 2002;92(7):1079-884.
12/11/19	Panel Discussion: Working in Global Health		

## SPH AND UNIVERSITY POLICIES & RESOURCES

The School of Public Health maintains up-to-date information about resources available to students, as well as formal course policies, on our website at [www.sph.umn.edu/student-policies/](http://www.sph.umn.edu/student-policies/). Students are expected to read and understand all policy information available at this link and are encouraged to make use of the resources available.

The University of Minnesota has official policies, including but not limited to the following:

- Grade definitions
- Scholastic dishonesty
- Makeup work for legitimate absences
- Student conduct code
- Sexual harassment, sexual assault, stalking and relationship violence
- Equity, diversity, equal employment opportunity, and affirmative action
- Disability services
- Academic freedom and responsibility

Resources available for students include:

- Confidential mental health services
- Disability accommodations
- Housing and financial instability resources
- Technology help
- Academic support

## EVALUATION & GRADING

### Class Participation:

A sign-in sheet will be circulated each class, and will be counted as part of the student's overall grade in terms of participation. This reflects the core belief that coming to and participating in class is an essential part of the learning process.

### Written Assignments:

Assignments are take-home exercises; each student should do their own work. Assignments are due in class on the due date indicated in the syllabus. Students should take time to make sure that their papers are well organized and written; written communication is important in public health.

Below is a list of the activities by which you will be graded and their assigned weights:

*Draft 8/8/19*

<b>Activity</b>	<b>Percent of Grade</b>
Challenging problem presentation	20%
Written Assignment #1	20%
Written Assignment #2	20%
Class presentation Infectious Disease Problem	20%
Class participation	20%

### **Grading Scale**

The University uses plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following, and you can expect the grade lines to be drawn as follows:

<b>% In Class</b>	<b>Grade</b>	<b>GPA</b>
93 - 100%	A	4.000
90 - 92%	A-	3.667
87 - 89%	B+	3.333
83 - 86%	B	3.000
80 - 82%	B-	2.667
77 - 79%	C+	2.333
73 - 76%	C	2.000
70 - 72%	C-	1.667
67 - 69%	D+	1.333
63 - 66%	D	1.000
< 62%	F	

- A = achievement that is outstanding relative to the level necessary to meet course requirements.
- B = achievement that is significantly above the level necessary to meet course requirements.
- C = achievement that meets the course requirements in every respect.
- D = achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F = failure because work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (Incomplete).
- S = achievement that is satisfactory, which is equivalent to a C- or better
- N = achievement that is not satisfactory and signifies that the work was either 1) completed but at a level that is not worthy of credit, or 2) not completed and there was no agreement between the instructor and student that the student would receive an I (Incomplete).

### **Student Disease Presentations:**

In a short presentation of ~15 minutes, describe the following:

1. What is the cause (agent and pathogenesis, as appropriate) of the disease?
2. How is infection acquired (transmission)?
3. What are the symptoms of the disease? Is there asymptomatic infection? (pathogenicity). What is the case fatality rate?
4. How is the disease diagnosed?
5. Is there any treatment (and what is it)?
6. What are the prevention and control strategies?

### **Challenging Cases:**

Students will be assigned to groups, and asked how they would address a "challenging problem" in global health. The goal for each team is to tackle a real-life global health-related problem and to come up strategies for how this can best be addressed. The class presentation should include discussion of the following points:

1. Describe the problem to be solved, including its epidemiology in the context of the specific country or geographic area.
2. What are some of the risk factors (both immediate and underlying) that may be contributing to this problem?
3. What specific intervention or strategic approach do you recommend to help control or minimize this problem? If may want to mention organizations/stakeholders will you partner with.
4. What are the main objectives of your intervention or approach to control or minimize this problem?
5. As part of your monitoring and evaluation plan, what measures or outputs will you use to help assess program impact?
6. What do you see as the challenges/barriers/limitations in implementing this intervention?

### **Group 1 Presentation:**

In October 2016, an outbreak of cholera began in Yemen and is ongoing. Yemen is a developing country, and the poorest country in the Middle East. Since 2011, Yemen has been in a state of political crisis. In 2014, a religious-political-armed movement declared themselves in control of the country after a coup d'état. After the former President was shot dead by a sniper a new civil war broke out, along with a Saudi Arabian-led military intervention aimed at restoring the previous government, Saudi-led coalition air strikes have led to devastation of Yemeni infrastructure, health, water and sanitation systems. The war has blocked food imports and lead to a famine that is affecting millions. There is also lack of safe drinking water, caused by depleted aquifers and the destruction of the country's water infrastructure. As of 1 July 2018 there have been 1,115,378 suspected cholera cases and 2,310 associated deaths. Children under 5 years old represent 29% of total suspected cases. This is considered the worst cholera outbreak in recorded history.

### **Group 2 Presentation:**

Since March 2013, when the avian influenza A(H7N9) virus infection was first detected in humans, a total of 1567 laboratory-confirmed human cases, including at least 615 deaths, have been reported to the World Health Organization. All but three of the reported cases have occurred in China these three had epidemiological links to mainland China. As long as the virus still circulates in poultry and the environment, further human cases can be expected. Currently available epidemiological and virological evidence suggests that this virus has not acquired the ability of sustained transmission among humans, and the likelihood of human-to-human transmission of the A(H7N9) virus is low. However, the influenza virus is constantly evolving and while a future pandemic is a certainty, when and where it will start, and which virus strain it will be, are all unknown.

### **Group 3 Presentation:**

There is a large, ongoing outbreak of yellow fever in multiple states of Brazil. Between 1 July 2017 and 28 February 2018, 723 confirmed human cases of yellow fever have been reported in Brazil, including 237 deaths; during the same period of 2016/2017 there were 576 confirmed cases, including 184 deaths. Early cases were reported from forested rural areas. However, confirmed epizootics in large cities, such as Salvador in Bahia, represent a high risk for a change in the transmission cycle. Yellow fever virus transmission continues to expand to areas were previously considered to be at low risk of transmission and, consequently, yellow fever vaccination was not recommended. Between 1 July 2017 and 28 February 2018, a total of 4,161 epizootics among non-human primates have been reported, of which 554 have been laboratory-confirmed. Epizootics have been reported in 23 of the 27 federal entities in the country. As of March 2018, the numbers of confirmed cases of yellow fever in unvaccinated international travelers have increase to a total of ten cases.

### **Class Discussion of Articles in Peer-Reviewed Literature:**

The instructor will select a journal article that represents either an epidemiologic investigation of an infectious disease, or an intervention study to reduce disease burden. Students are expected to read this article in advance of the class. Class discussion will include the following points:

1. What is the research question this article is addressing? What is the underlying problem and why is it significant?
2. What is the study design? What are the advantages and disadvantages of this design and is it appropriate for this question?
3. What is the study setting? Who are the study subjects? How were they recruited? What are inclusion and exclusion criteria?
4. If a clinical or community trial, what is the primary intervention? If an observational study, what is the primary exposure? What are the other exposures? How were they measured?
5. What is the primary outcome? What are secondary outcomes? How were they measured?
6. What can one conclude from this study? Are there any serious limitations or biases? What are the implications for public health?

### **Written Assignment #1**

Select a communicable disease of public health significance, for which you will propose a research study. For this disease and proposed research question, write a 2 page paper (single space) plus an additional page with at least 10 references, on the background and significance of the problem you propose to evaluate.

- I. What is your research question? State in 1-2 sentences your research proposal.
- II. Topics you may wish to address are:
  - A. What is the incidence and prevalence of the disease in the geographic setting? What are epidemiologic trends? Who are the populations affected?
  - B. What is the health burden (morbidity/mortality) for this disease or health problem?
  - C. What are the risk factors for this disease or health problem? (Can be biological behavioral and/or socioeconomic--ideally related to your research question.
  - D. Why is investigating this disease important? Why is your research proposal significant? For example, does the project address an important problem or a critical barrier to progress in the field? If the aims of the project are achieved, how will scientific knowledge, technical capability, and/or clinical practice be improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?



## Written Assignment #2

Select a communicable disease of public health significance, for which you will propose a research study. This may or may not be the same question as you proposed for your significance paper. Write a 1- 2 page paper (single space) describing the methodology you are proposing.

- I. List your research question
- II. What is your study population?
  - A. What are your inclusion and exclusion criteria?
  - B. How will it be recruited and enrolled?
- III. What measures will you collect?
  - A. Exposures
    1. What is your primary exposure (observational studies) or intervention?
    2. What other exposure measures will you collect? (including potential confounders)
      - a. Characteristics of study population
      - b. Other factors of interest that may influence outcome?
  - B. Outcome Measures
    1. What is your primary outcome?
    2. What are your secondary outcomes?
  - C. How will your exposure and outcome variables be collected and measured (data collection)? (e.g., survey, data abstraction, laboratory testing, etc.)

Evaluation/Grading Policy	Evaluation/Grading Policy Description
<p><b>Scholastic Dishonesty, Plagiarism, Cheating, etc.</b></p>	<p>You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis (As defined in the Student Conduct Code). For additional information, please see <a href="https://z.umn.edu/dishonesty">https://z.umn.edu/dishonesty</a></p> <p>The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <a href="https://z.umn.edu/integrity">https://z.umn.edu/integrity</a>.</p> <p>If you have additional questions, please clarify with your instructor. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.</p> <p>Indiana University offers a clear description of plagiarism and an online quiz to check your understanding (<a href="http://z.umn.edu/iuplagiarism">http://z.umn.edu/iuplagiarism</a>).</p>

<b>Evaluation/Grading Policy</b>	<b>Evaluation/Grading Policy Description</b>
<b>Late Assignments</b>	Assignments are due in class on the due date indicated in the syllabus. In fairness to those who have turned in their papers on time, late papers will be penalized.
<b>Attendance Requirements</b>	A sign-in sheet will be circulated each class, and will be counted as part of the student's overall grade in terms of participation.
<b>Extra Credit</b>	Extra credit is not available.

## EPIDEMIOLOGY MPH COMPETENCIES

<b>Competency</b>	<b>Learning Objectives</b>	<b>Assessment Strategies</b>
Demonstrate an understanding of the distribution, by person, place and time, and the risk factors for major public health problems	Different diseases of international public health significance will be reviewed, with a focus on epidemiologic research and methods used describe and analyze disease determinants	(1) Class presentations (challenging problems and individual ID presentation)  (2) Written assignments
Develop a mastery of how epidemiologic methods are utilized in at least one specialty area.	Learning objectives include greater appreciation and understanding of infectious diseases, with a particular focus on low and middle-income countries	(1) Class presentations (challenging problems and individual ID presentation) (2) Participation in class discussion (3) Written assignments
Critically evaluate the published epidemiologic research	Critically evaluate published research on: (a) Significance; (b) Study sample; (c) Internal and external validity; (d) Bias, confounding, other limitations (e) Conclusions are justified by the data	(1) Participation during in class discussions reviewing published literature  (2) Written assignment #1
Design an epidemiologic study that addresses the best methods to test that hypothesis for either existing data or data to be collected	Design an epidemiologic intervention. Apply considerations such as: (a) Temporality, (b) Pathophysiology, (c) Etiology of the exposure (d) Prediction of that outcome	(1) Class presentation on challenging problem  (2) Written assignments #2