

PubH 3365

Microbes, Maps and Models: Introduction to Infectious Disease Epidemiologic Methods

Fall 2019

Credits: 2

Meeting Day: Thursday

Meeting Time: 9:05 -11:00

Meeting Place: Moos 2-120

Instructor: Shalini Kulasingam, PhD

Office Address: WBOB 483

Office Phone: 612-624-7554

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Office Hours: By appointment

I. Course Description

Infectious disease epidemiology is a topic within the field of epidemiology that covers:

- 1) Principles and concepts of infectious disease transmission dynamics necessary to understand how and why diseases spread, and
- 2) Epidemiologic methods, including study designs, needed to quantify key aspects of an infectious disease

This course will discuss:

- 1) How to use modeling to gain insight into the spread and control of infectious disease, and
- 2) The role that geography and GIS plays in gaining insights into the emergence and spread of an infectious disease.

In this undergraduate course, students will learn key epidemiologic concepts that determine who is at risk for acquiring an infectious disease, how infectious diseases spread and what measures can be taken to prevent or control the spread of an infectious disease. This course will focus on how simulation modeling and spatial analyses can provide insights into what contributes to the spread of an infectious disease.. In addition, students will learn how to read and critically review peer-reviewed publications on infectious disease epidemiology using examples drawn from local, national and international settings.

II. Course Prerequisites

PubH 3350, "People, Places and Disease" or equivalent or permission of the instructor. All students must be registered to attend class—no auditors.

III. Course Goals and Objectives

At the end of this course, students will be able to:

1. Describe key epidemiologic measures relevant for infectious diseases
2. Understand epidemiologic methods used to identify which populations are at risk for acquiring an infection
3. Understand the importance of surveillance in infectious disease epidemiology
4. Develop simulation models of infection for an STI or a respiratory infection
5. Understand the role of spatial analyses in infectious disease epidemiology
6. Understand and model the impact of vaccination on the spread of an infection

IV. Methods of Instruction and Work Expectations

Lecture and guest lectures, videos, in-class exercises and tutorials, and active participation via discussion. For lectures given by Dr. Kulasingam, Power Point handouts of the slides will be available electronically from the class Canvas site prior to the start of class. If a student is unable to take notes using this format, they are expected to speak with Dr. Kulasingam in person or communicate over email by the end of the first week of class.

One short break of approximately 5 – 10 minutes will occur midway through each class session.

Other electronic devices (such as phones) will only be permitted during these class breaks.

See University of Minnesota administrative policy, "Use of Personal Electronic Devices in the Classroom: Twin Cities, Crookston, Morris, Rochester"

(<http://policy.umn.edu/Policies/Education/Education/CLASSROOMPED.html>).

Communicating with Professor Kulasingam

Email is the best and most effective way to communicate with Dr. Kulasingam

(kulas016@umn.edu). However, students should expect responses to emails only during work hours. For example, a student who emails a request after 5:30pm should not expect to hear from the instructor until at least 9:00 AM the next morning, but it could be that a feasible response would not occur until after the class.

V. Course Text and Readings and Laptop Requirement

Readings for the course are listed in the syllabus will be posted to the course Canvas site. **NOTE: the readings that are listed are tentative and subject to change.**

In addition, laptops are also required for this course. Students are expected to bring their laptops to each lecture. At the start of the class, Dr. Kulasingam will review how to download and install R.

VI. Course Outline/Weekly Schedule

Week 1: Thursday Sept 5 th , 2019		
9:05-10:00	Kulasingam	Introduction to infectious Disease Epidemiology Methods
10:10-11:00	Kulasingam	Overview of key epidemiologic measures of disease frequency
Required readings: Chapter 2. Measures of Disease Frequency. Aschengrau A and Seage GR. Epidemiology in Public Health		

Week 2: Thursday Sept 12 th , 2019		
9:05-10:00	Cynthia Kenyon, MPH, MDH	Surveillance in detecting infectious diseases
10:10-11:00	Kulasingam	Additional key measures for infectious diseases: SIR models in MS Excel and the importance of time
Required readings: Crabbe H et al. Are pertussis cases reported too late for public health interventions? Retrospective analysis of cases in London and South East England, 2010 to 2015. Euro Surveill. 2017;22(29):pii=30577.		
Due Today: Question based on key epidemiologic measures for infectious diseases Assigned Today: Assignment 1 - Epidemiologic Measures for Infectious Diseases		

Week 3: Thursday Sept 19 th , 2019		
9:05-10:00	Kulasingam	Introduction to R
10:10-11:00	Kulasingam	SIR models in R
Required readings: None – refer to handouts Due Today: Question re: surveillance based on readings and lectures Due Today: Assignment 1		

Week 4: Thursday, Sept 26 th , 2019		
9:05-10:00	Kulasingam	Airborne Transmitted Infections
10:10-11:00	Kulasingam	Epidemiologic study design considerations for Airborne transmitted infections
Required readings: Chapter 10. Respiratory Infections. Thomas JC and Weber DJ. Epidemiologic Methods for the Study of Infectious Diseases Due Today: Question re: model of SIR for measuring incidence and prevalence		

Week 5: Thursday, Oct 3 rd , 2019		
9:05-10:00	Kulasingam	Modeling airborne transmitted infections
10:10-11:00	Kulasingam	Modeling airborne transmitted infections
Required readings: Christian et al. Severe Acute Respiratory Syndrome. Clinical Infectious Diseases 2004; 38:1420–7		
Due Today: Question based on airborne transmitted infections		
Assigned Today: Assignment 2 - Epidemiologic considerations for modeling an airborne transmitted infection		

Week 6: Thursday, October 10 th , 2019		
9:05-10:00	Kulasingam	Modeling airborne transmitted infections
10:10-11:00	Katie Stinebaugh, MDH	Real world considerations for airborne transmitted infections – TB in MN.
Required readings: Dowdy et al. Designing and Evaluating Interventions to Halt the Transmission of Tuberculosis. J Infect Dis. 2017 Nov 3;216(suppl_6):S654-S661		
Due Today: Assignment 2		

Week 7: Thursday, October 17 th , 2019		
9:05-10:00	Kulasingam	Epidemiologic study design considerations for sexually transmitted infections
10:10-11:00	Kulasingam	Modeling STIs
Required readings: Chapter 13. Sexually transmitted infections. Thomas JC and Weber DJ. Epidemiologic Methods for the Study of Infectious Diseases		

Week 8: Thursday, October 24 th , 2019		
9:05-10:00	Kulasingam	Modeling STIs
10:10-11:00	Kulasingam	Modeling STIs
Required readings: Anderson RM , Garnett GP . Mathematical models of the transmission and control of sexually transmitted diseases. Sex Transm Dis. 2000 Nov;27(10):636-43.		
Assigned Today: Epidemiologic considerations for modeling sexually transmitted infections		

Week 9: Thursday, October 31 st , 2019		
9:05-10:00	Alan Lifson, MD	Real world considerations for sexually transmitted infections HIV in Ethiopia
10:10-11:00	Kulasingam	Sexual networks
Required readings: Krebs et al. Developing a dynamic HIV transmission model for 6 U.S. cities: An evidence synthesis. PLoS One. 2019. 14(5): e0217559.		

Week 10: Thursday Nov 7 th , 2019		
9:05-10:00	Kulasingam	The role of mapping for infectious disease
10:10-11:00	Kulasingam	The role of mapping for infectious disease
Required readings: Sims et al. Location, location, location: What can GIS offer sexual health research? STI.2014;90:442-443		
Due Today: Assignment 3		

Week 11: Thursday Nov 14 th , 2019		
9:05-10:00	Searle	GIS for infectious diseases
10:10-11:00	Searle	GIS for infectious diseases
Required readings:		
Assigned Today: Assignment 4 - Critical review of a spatial analysis of an infectious disease		

Week 12: Thursday, Nov 21 st , 2019		
9:05-10:00	Kulasingam	GIS/Spatial analyses for infectious diseases
10:10-11:00	Kulasingam	GIS/Spatial analyses for infectious diseases
Required readings: Lai et al. Understanding the spatial clustering of Severe Acute Respiratory Syndrome in Hong Kong. Environ Health Perspec. 2004.112:1550-1556		
Due Today: Assignment 4		
Assigned Today: Final Report		

Week 13: Thursday Nov 28th, 2019
NO CLASS – HAPPY THANKSGIVING!

Week 14: Thursday, Dec 5 th , 2019		
9:05-10:00	Kulasingam	Vaccines – incorporating vaccination into a model
10:10-11:00	Guest Lecturer – Annie Fedorowitz	Issues with vaccines/vaccine uptake – The ongoing saga of HPV vaccination

VII. Evaluation and Grading

Students will be evaluated on class participation, homework assignments and a final report. There will be a total of 100 class points. Points will be allocated as outlined below.

Attending and contributing to the discussion is key to success in this course. Students will be asked to sign in at the start of each class session. Students will be required to submit a question at the beginning of each class session based on the assigned reading. Each question is worth one point for a **total of 12 points (1 per class session for 12 class sessions beginning the 2nd week of class)**. Ample time during each lecture will be set aside for addressing some of the written questions. Students will be encouraged to ask questions throughout the lecture. Students will also be encouraged to engage in discussion and respectfully debate with the instructor, guest lecturers, and their peers. **For class participation, 1 point will be assigned for each class for a total of 13 points.** Class participation will be assessed based on attendance, engaging in active discussion with classmates and the instructor(s).

Assignments 1-4 will be handed out one week prior to the due date. Each assignment will consist of written responses to specific questions that address a topic covered in one of the readings. Through these assignments, students will gain critical skills in assessing the primary infectious disease epidemiology literature, including identifying study design, interpreting key infectious disease epidemiologic measures, stating key assumptions, discussing the approach to model building if applicable interpreting the results, and identifying strengths and limitations. **Each assignment is worth 14 points.**

A final report is due on the last day of class. The report will be based on lectures and assigned readings. **The final report will be worth 19 points.**

Assignment	Due Date	Points	% of Grade
Question per Class Session	Beginning of Every Class	12	12%
1	September 19	14	14%
2	October 10	14	14%
3	November 7	14	14%
4	November 21	14	14%
Final Report	December 5	19	19%
Class Participation	13 Class Sessions	13	13%
Total		100	100%

* Students should periodically check the course Canvas site to check their grade entries. No retroactive changes to the grade book will be made after December 5th, the last day of class.

Final grades will be based on the 100 total points and assigned as follows:

100.0 - 92.5	A
90.0 - 92.4	A-
87.5 - 89.9	B+
82.5 - 87.4	B
80.0 - 82.4	B-
77.5 - 79.9	C+
72.5 - 77.4	C
70.0 - 72.4	C-
67.5 - 69.9	D+
62.5 - 67.4	D
60.0 - 62.4	D-
< 60	F

S ----- Achievement is satisfactory, equivalent to a C- or better.

Students may elect to take the class on a S/N basis, with satisfactory achievement equivalent to a grade of C or better.

For additional information, please refer to:

<http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html>.

Course Evaluation

The SPH will collect student course evaluations electronically using a software system called CoursEval: www.sph.umn.edu/courseval. The system will send email notifications to students when they can access and complete their course evaluations. Students who complete their course evaluations promptly will be able to access their final grades just as soon as the faculty member renders the grade in SPHGrades: www.sph.umn.edu/grades. All students will have access to their final grades through OneStop two weeks after the last day of the semester regardless of whether they completed their course evaluation or not. Student feedback on course content and faculty teaching skills are an important means for improving our work. Please take the time to complete a course evaluation for each of the courses for which you are registered.

Incomplete Contracts

A grade of incomplete "I" shall be assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., documented illness or hospitalization, death in family, etc.), the student was prevented from completing the work of the course on time. The assignment of an "I" requires that a contract be initiated and completed by the student before the last official day of class, and signed by both the student and instructor. If an incomplete is deemed appropriate by the instructor, the student in consultation with the instructor, will specify the time and manner in which the student will complete course requirements. Extension for completion of the work will not exceed one year (or earlier if designated by the student's college). For more information and to initiate an incomplete contract, students should go to SPHGrades at: www.sph.umn.edu/grades.

University of Minnesota Uniform Grading and Transcript Policy

A link to the policy can be found at onestop.umn.edu.

VIII. Other Course Information and Policies

Grade Option Change (if applicable):

For full-semester courses, students may change their grade option, if applicable, through the second week of the semester. Grade option change deadlines for other terms (i.e. summer and half-semester courses) can be found at onestop.umn.edu.

Course Withdrawal:

Students should refer to the Refund and Drop/Add Deadlines for the particular term at onestop.umn.edu for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw.

Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Office of Admissions and Student Resources at sph-ssc@umn.edu for further information.

Student Conduct Code:

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: *Student Conduct Code*. To review the Student Conduct Code, please see:

http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf.

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

Use of Personal Electronic Devices in the Classroom:

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference:

<http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

Scholastic Dishonesty:

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. (Student Conduct Code:

http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see:

<http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html>.

The Office for Community Standards has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty <https://communitystandards.umn.edu>. If you have additional questions, please clarify with your instructor for the course. 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.

Makeup Work for Legitimate Absences:

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see:

<http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html>.

Appropriate Student Use of Class Notes and Course Materials:

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: <http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

Sexual Harassment:

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy:

<http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>

Equity, Diversity, Equal Opportunity, and Affirmative Action:

The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy:

http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf.

Disability Accommodations:

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center Student Services is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DRC at 612-626-1333 or drc@umn.edu to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.

For more information, please see the DS website, <https://diversity.umn.edu/disability/>.

Mental Health and Stress Management:

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>.

The Office of Student Affairs at the University of Minnesota:

The Office for Student Affairs provides services, programs, and facilities that advance student success, inspire students to make life-long positive contributions to society, promote an inclusive environment, and enrich the University of Minnesota community.

Units within the Office for Student Affairs include, the Aurora Center for Advocacy & Education, Boynton Health Service, Central Career Initiatives (CCE, CDes, CFANS), Leadership Education and Development – Undergraduate Programs (LEAD-UP), the Office for Fraternity and Sorority Life, the Office for Community Standards, the Office for Student Engagement, the Parent Program, Recreational Sports, Student and Community Relations, the Student Conflict Resolution Center, the Student Parent HELP Center, Student Unions & Activities, University Counseling & Consulting Services, and University Student Legal Service.

For more information, please see the Office of Student Affairs at <https://osa.umn.edu/>.

Academic Freedom and Responsibility: *for courses that do not involve students in research:*

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, (Dr Kristin Anderson, SPH Dean of Student Affairs), or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

* *Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".*

Student Academic Success Services (SASS): <http://www.sass.umn.edu>:

Students who wish to improve their academic performance may find assistance from Student Academic Support Services. While tutoring and advising are not offered, SASS provides resources such as individual consultations, workshops, and self-help materials.

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