

## QBS 130/BIOL 072: FOUNDATIONS OF EPIDEMIOLOGY 1

**This syllabus is subject to change at the professor's discretion.**

### **PROFESSOR:**

Caitlin Howe, PhD, Assistant Professor of Epidemiology, Geisel School of Medicine at Dartmouth.

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Office Location: Dartmouth Hitchcock Medical Center (DHMC), Williamson Translational Research Building, Rm 759, 1 Medical Center Dr, Lebanon, NH

### **GRADUATE TEACHING ASSISTANTS:**

Yiping (Mary) Li

PhD Candidate in QBS

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Minghui Zhang

PhD Candidate in QBS

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### **COURSE MEETINGS:**

Tuesdays and Thursdays 10:10 am - 12:00 pm in LSC105

### **OFFICE HOURS:**

Students may e-mail the professor at any time to arrange a time to meet.

#### Professor Caitlin Howe's Office Hours:

Mondays 9:00 AM-11:00 AM at DHMC (Williamson Building, Office #759) or by appointment.

#### Graduate Teaching Assistant Office Hours:

##### **Yiping (Mary) Li:**

Mondays 3:30 PM-4:30 PM at Hanover Campus (Kellogg 201)

Thursdays 9:00AM-10:00 AM via zoom (link available in Canvas)

##### **Minghui Zhang:**

Mondays 11:00-12:00 PM via zoom (link available in Canvas)

Wednesdays 11:00-12:00 PM at DHMC (Borwell 704)

### **COURSE DESCRIPTION:**

This is the first course of a two-part sequence of graduate level epidemiology (Foundations of Epidemiology I and II). The two courses are designed to teach the underlying theory of epidemiological study design and analysis and prepare students for the conduct of epidemiological research. Design of investigations seeking to understand the causes of human disease, disease progression, treatment and screening methods include clinical trials, cohort studies, case-cohort, case-case, nested case-control, and case-control designs. Concepts of incidence rates, attributable rate and relative rate, induction and latent periods of disease occurrence, confounding, effect modification, misclassification, and causal inference will be covered in depth.

## **PRE-REQUISITES:**

BIOL029 for undergraduates (or instructor's permission)

## **COURSE OBJECTIVES:**

This is the first course in a two-part sequence on Foundations of Epidemiology. The primary goal of this first course is to introduce basic epidemiological theory and methods that will then be expanded upon in the second course. The two-course sequence aims to develop proficiency in concepts and skills used by practicing epidemiologists. Specifically:

- Describing applications of epidemiology for improving public health.
- Calculating and interpreting measures of disease frequency.
- Identifying key characteristics, strengths and limitations of various epidemiological study designs and critiquing the choice of epidemiological study designs to answer specific epidemiological questions.
- Calculating and interpreting measures of excess risk.
- Appraising evidence for causality in exposure-outcome associations.
- Recalling definitions, explaining concepts, and performing and interpreting infectious disease calculations related to basic infectious disease epidemiology.
- Calculating and interpreting test and classification performance metrics and evaluating the trade-offs between sensitivity and specificity for public health applications.
- Describing types, sources, and consequences of measurement error and bias, and calculating and interpreting test and classification performance metrics.
- Evaluating sources, evidence for, and consequences of confounding and applying appropriate methods to assess and control for confounding.
- Explaining the concept of mediation and applying basic methods to test for it.
- Explaining the concepts of effect measure modification and interaction and applying basic methods to test for each.
- Clearly and succinctly describing and evaluating epidemiological studies.

## **COURSE PHILOSOPHY:**

The professors, teaching assistants, and students share a mutual goal of advancing the students' mastery of basic epidemiological theory and methods. The professor and teaching assistants strive to create a course structure and environment that will enable students to best master the course material. Students should actively use that course structure and environment to learn. Evaluations of a student's proficiency with the course material is important to understand and address any deficits in mastery. In addition to formal evaluations by the professors, students should continually evaluate their mastery of the material to best guide their learning process.

## **RESPONSIBILITIES & EXPECTATIONS:**

### Students in this course are expected to:

1. Read the appropriate textbook material before each lecture.
2. Keep track of course activities and announcements via our Canvas site.
3. Attend and focus during lectures and actively engage in class work and discussions.
4. Demonstrate understanding of course material on problem sets, quizzes, and exams.
5. Seek help from your Professor or TAs when needed.

### Professors can be expected to:

1. Be organized and well prepared throughout the course.

2. Explain course material clearly and efficiently.
3. Answer student questions thoroughly during class and during consultations outside of class.
4. Create evaluations to comprehensively test knowledge & understanding of the course material.
5. Grade student work fairly and return it promptly.

The Teaching Assistants can be expected to:

1. Master the material presented at lecture.
2. Grade homework assignments fairly and return them promptly.
3. Assist students with understanding the course material during office hours.
4. Serve as a liaison between students and the professor.

**COURSE MATERIALS:**

Textbook: The course textbook is **Epidemiologic Methods, 2<sup>nd</sup> edition**, by N.S. Weiss and T.D. Loepsell. 2014. Oxford University Press, Oxford. Additional readings and faculty-generated course materials will be posted on Canvas. The textbook is held on reserve at the Dana Biomedical Library for students to borrow during the term for periods of 24 hours at a time. Students can also access an online copy of this textbook through the library: [https://search.library.dartmouth.edu/permalink/01DCL\\_INST/16rgcn8/alma991033550574805706](https://search.library.dartmouth.edu/permalink/01DCL_INST/16rgcn8/alma991033550574805706). If any student encounters a financial challenge related to this class, please let the professor know.

Other Course Material: The professor creates and manages course content for personal use by students. Students are not permitted to publicly share course content including, but not limited to, lecture slides, lecture recordings, problem sets, handouts, or exams. This applies to all or part of course materials. If a student would like to use or post course content outside of the course, please contact the professor for permission.

**COURSE REQUIREMENTS & GRADING:**

Grades will be calculated as described in the table.

Method of Assessment	Contribution to Final Grade
Class Participation	10%
Problem Sets	10%
Quiz	10%
Midterm Exam	30%
Final Exam	40%

The percentile to letter grade conversion is:

		Undergraduate Student Grade <sup>1,2</sup>	Graduate Student Grade <sup>3</sup>	
94 - 100%	A	Excellent mastery of the course material	HP (High Pass)	Work quality that is distinctly superior to that normally expected of a graduate student
90 - <94%	A-			
87 - <90%	B+	Good mastery of the course material	P (Pass)	Work of good quality normally expected of a graduate student
83 - <87%	B			
80 - <83%	B-			
77 - <80%	C+	Acceptable mastery of the course material	LP (Low Pass)	Work which is acceptable for graduate credit, but in which the student exhibited one or more serious deficiencies
73 - <77%	C			
70 - <73%	C-			
67 - <70%	D+	Deficient mastery of the course material	NC (No Credit)	Unsatisfactory work, not acceptable for graduate credit
63 - < 67%	D			

60 - <63%	D-			
0 - <60%	E	Serious deficiency in mastery of the course material		

<sup>1</sup>In accordance with Dartmouth College’s policies

<sup>2</sup>The appendage of a “+” or “-” to the grade indicates mastery slightly above or below the norm for that grade, respectively.

<sup>3</sup>In accordance with Dartmouth’s Guarini School of Graduate and Advanced Studies’ policies

**Problem Sets:** Problem sets will be one of the primary mechanisms to learn the course material. Each problem set will be completed via Canvas. Discussing problem sets with classmates is encouraged to promote learning. **After discussing problems and concepts, each student should write up solutions separately. You should not share or receive electronic or written copies of work related to problem sets with other students. Students should acknowledge other students with whom they collaborated.** Problem sets will be graded for correctness. Late assignments will be penalized 10% for each 24-hour period (or part thereof). Late submissions will be accepted **until the answer key is released**. Each student’s lowest problem set score will be dropped when calculating their course grade. Please direct requests for extensions or re-grading to the professor.

**Quiz:** An in-class quiz will provide an early assessment of a student’s independent mastery of the course material. The quiz will be approximately 45 minutes long. Collaboration **is not** permitted on in-class quizzes.

**Exams:** There will be a proctored midterm and final exam that will be used to assess mastery of the course materials through multiple choice questions, short answer questions, and longer essay questions. The midterm will take place during class time on October 24<sup>th</sup>, 2024. The final exam date is scheduled for November 26<sup>th</sup>, 2024 8:00 AM – 11:00 AM. The exams will require recall and synthesis of the course material, critical thinking using the concepts and skills covered in the class, as well as precise and concise communication using appropriate epidemiological terminology. Collaboration **is not** permitted on the midterm or final exams. All questions about the exam should be directed to your professor.

**Course Participation:** Active participation by students in this course is essential for optimal learning. Students should plan to attend class in person whenever possible. We understand that students may need to access the course remotely and/or asynchronously because of illness or other legitimate reasons. If you are unable to attend class, please email your professor in advance. For the health and safety of others please **do not attend class when you are sick**, nor when you have been instructed by Student Health Services to stay home.

### Lecture and Assignment Schedule Fall 2024

Date	Topic	Reading	Assignment
Tues 9/17	Studying Health Outcomes in Populations; Disease Frequency Measures I	Chapter 1,2,3	
Thurs 9/19	Disease Frequency Measures II	Chapters 3,4	
Tues 9/24	Study Designs I	Chapters 5,6	PS1: Disease Frequency
Thurs 9/26	Study Designs II Stats Primer I	Chapters 5,6	
Tues 10/1	Measures of Excess Risk I	Chapter 9	PS 2: Study Designs
Thurs 10/3	<b>Quiz</b> (material up to and inc. 9/26) Measures of Excess Risk II	Chapter 9	

Tues 10/8	Measures of Excess Risk III	Chapter 9	PS 3: Excess Risk and Stats Review
Thurs 10/10	Causal Inference/Stats Primer II	Chapter 8	
Tues 10/15	Infectious Disease Epidemiology I		PS 4: Excess Risk & Causal Inference
Thurs 10/17	Infectious Disease Epidemiology II		
Tues 10/22	Diagnostic Testing	Chapter 19 <u>Interpreting a Covid-19 test result</u> <u>False Negative Tests for SARS-CoV-2 Infection--Challenges and Implications</u>	
Thurs 10/24	<b>Midterm Exam</b> (material up to & inc. 10/10)		
Tues 10/29	Bias & Measurement Error I	Chapter 10	PS 5: Infectious Disease Epi & Diagnostic Testing
Thurs 10/31	Bias & Measurement Error II	Chapter 10	
Tues 11/5	Confounding I	Chapter 11	PS 6: Meas. Error & Bias
Thurs 11/7	Confounding II	<u><a href="#">Variation in racial/ethnic disparities in COVID-19 mortality by age in the United States: A cross-sectional Study</a></u>	
Tues 11/12	Effect Modification and Interaction I	<u>On the Distinction Between Effect Modification and Interaction</u>	PS 7: Confounding
Thurs 11/14	Effect Modification and Interaction II Mediation	<u>Effect modification, interaction and mediation: an overview of theoretical insights for clinical investigators</u>	
Tues 11/19	Health Disparities Course Wrap Up	<u><a href="#">Measuring structural racism: a guide for epidemiologists and other health researchers.</a></u>	PS 8: Effect Modification, Interaction, Mediation
<b>Final Exam:</b> In-person (LSC 105) on Tues 11/26 8:00 AM – 11:00 AM			

**POLICIES, STUDENT ACCOMODATIONS, AND RESOURCES:**

Academic Honor Principle: Honesty is the foundation of the academic pursuit of knowledge. In recognition of this, the professor and teaching assistants will not overlook any violations of the Academic Honor Principle. The Faculty of Dartmouth College and the Geisel School of Medicine are **obligated** to report potential violations of the Academic Honor Principle. Further guidance for collaboration on course assessments is provided below.

Principles of Community: We value integrity, responsibility, and respect for the rights and interests of others. We are dedicated to establishing and maintaining a safe and inclusive campus where **all** have equal access to Dartmouth’s educational and employment opportunities. We strive to promote an environment of sexual respect,

safety, and well-being. In its policies and standards, Dartmouth demonstrates unequivocally that sexual assault, gender-based harassment, domestic violence, dating violence, and stalking are not tolerated in our community. We encourage students with concerns about classroom climate to talk to your professor, advisor, or Deans.

Religious Observation: Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your course participation, please contact the professor as early in the term as possible to discuss appropriate accommodations.

Student Accessibility and Accommodation: Undergraduate students requesting disability-related accommodations and services for this course are required to register with Student Accessibility Services (SAS; [Apply for Services; student.accessibility.services@dartmouth.edu](mailto:student.accessibility.services@dartmouth.edu)) and to request that an accommodation e-mail be sent to me in advance of the need for an accommodation. Then, students should schedule a follow-up meeting with me to determine relevant details such as what role SAS or its [Testing Center](#) may play in accommodation implementation. This process works best for everyone when completed as early in the quarter as possible. If students have questions about whether they are eligible for accommodations or concerns about the implementation of their accommodations, they should contact the SAS office. All inquiries and discussions will remain confidential.

Graduate students should consult the following web-site:

<https://graduate.dartmouth.edu/diversity/overview/students-disabilities> and contact Gary Hutchins ([gary.l.hutchins@dartmouth.edu](mailto:gary.l.hutchins@dartmouth.edu)) and the relevant program contact (For QBS this is Krissy Giffin: [Kristine.e.giffin@dartmouth.edu](mailto:Kristine.e.giffin@dartmouth.edu)) to discuss any accommodations that may be needed for the course. Please then follow up with me so we can implement these accommodations. This process works best for everyone when completed as early in the quarter as possible. All inquiries and discussions will remain confidential.

Sexual Respect Resources: The [Title IX Office](#) at Dartmouth provides a wealth of information on students' rights with regard to sexual respect and resources that are available to all in our community. Please note that faculty members are obligated to share disclosures regarding conduct under Title IX with Dartmouth's Title IX Coordinator. Should you have any questions, please feel free to contact Dartmouth's Title IX Coordinator ([Kristi.Clemens@Dartmouth.edu](mailto:Kristi.Clemens@Dartmouth.edu)).

Mental Health Resources: The academic environment at Dartmouth can be challenging, terms can be intensive, and classes may not be the only demanding part of life. If you are having suicide ideation thoughts, please call the [national suicide prevention hotline](#): 1-800.273.8255 (three digit dialing code: 988). There are also a number of campus resources available to students to support wellbeing, including [Dartmouth College Counseling Services](#) and the [Student Wellness Center](#).

#### Consent to Record:

1. Consent to recording of course meetings and office hours that are open to multiple students.

By enrolling in this course,

- a) I affirm my understanding that the instructor may record meetings of this course and any associated meetings open to multiple students and the instructor, including but not limited to scheduled and *ad hoc* office hours and other consultations, within any digital platform, including those used to offer remote instruction for this course.
- b) I further affirm that the instructor owns the copyright to their instructional materials, of which these recordings constitute a part, and my distribution of any of these recordings in whole or in part to any person or entity other than other members of the class without prior written consent of the instructor may be subject to discipline by Dartmouth up to and including separation from Dartmouth.

2. Requirement of consent to one-on-one recordings

By enrolling in this course, I hereby affirm that I will not make a recording in any medium of any one-on-one meeting with the instructor or another member of the class or group of members of the class without obtaining the prior written consent of all those participating, and I understand that if I violate this prohibition, I will be subject to discipline by Dartmouth up to and including separation from Dartmouth, as well as any other civil or criminal penalties under applicable law. I understand that an exception to this consent applies to accommodations approved by SAS for a student's disability, and that one or more students in a class may record class lectures, discussions, lab sessions, and review sessions and take pictures of essential information, and/or be provided class notes for personal study use only.

If you have questions, please contact the Office of the Dean of the Faculty of Arts and Sciences.