**PUBH 8341, SECTION 001**

Advanced Epidemiologic Methods: Concepts  
Fall 2019

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**COURSE & CONTACT INFORMATION**

**Credits:** 3  
**Meeting Day(s):** Tuesdays, Thursdays  
**Meeting Time:** 9:45am - 11:00am  
**Meeting Place:** Mayo 1250  

**Instructor:** Richard MacLehose, PhD  
**Email:** mac10029@umn.edu  
**Office Phone:** 612-624-1932  
**Office Location:** 441 West Bank Office Building  
**Susan Mason, PhD**  
**Email:** smmason@umn.edu  
**Office Phone:** 612-624-9556  
**Office Location:** 340 West Bank Office Building  

**Office Hours:** By appointment (tinyurl.com/smmappointments)  

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**COURSE DESCRIPTION**

This doctoral seminar introduces students to the conceptual foundations of epidemiologic methodology. The focus is on causal inference, what is required to estimate causal effects, and the strengths and weaknesses of different study designs in this endeavor. Examples and readings are aimed at both clinical/biologic and social/behavioral track students.

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**COURSE PREREQUISITES**

None. A general background in basic epidemiologic concepts is recommended.

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**COURSE GOALS & OBJECTIVES**

Upon completion of this course the student should be able to:

- Describe the causal inference framework that underpins modern epidemiologic thinking. List the criteria that must be met for causal effects to be identified.
- Define the types of biases that threaten our ability to estimate causal effects (confounding, selection bias, measurement error), understand alternative approaches to dealing with them, and recognize situations in which those approaches are appropriate.
- Define effect modification and interaction and implement general approaches for their analysis.
- Articulate the strengths and limitations of classic epidemiologic study designs (randomized control trial, cohort, case-control, cross-sectional), and best practices in using each design.
- Describe the relationships between estimation of causal effects and statistical estimation.

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**METHODS OF INSTRUCTION AND WORK EXPECTATIONS**

**Course Workload Expectations**

PubH 8341 is a 3 credit course. The University expects that for a 3-credit course, you will spend a minimum of 9 hours per week attending class, reading, studying, completing assignments, etc. over the course of a 15-week term. Thus, this course requires approximately 135 hours of effort spread over the course of the term in order to earn an average grade.

The class will meet twice a week. Most topics will be covered over 1-2 weeks. Students are required to arrive prepared for class, including having done the assigned readings any assigned pre-class exercises. **It is expected that students will complete readings and work through assigned exercises from the lectures and readings by the Tuesday of each week** to ensure that they fully understand the material and are prepared for weekly quizzes.

There are **8 homework assignments**, worth 50% of the final grade total. These will be assigned on the Thursdays listed below and are due in class the following Thursday at the beginning of class. Homework assignments should be completed individually, but students are allowed to consult with one another on problems.
In-class quizzes will be administered at the beginning of most weeks. These quizzes will be based on the assigned pre-class exercises and/or readings for the class. **12 quizzes will be given during the semester.** The scores on the lowest 2 quizzes will be discarded and the remaining 10 quizzes will be worth 10% of the final grade.

There is no attendance grade, but **it is expected that students will attend all classes** unless there are extenuating circumstances. There will be no make-up quizzes offered, although students may miss up to 2 quizzes without penalty, since the lowest 2 quiz scores will be dropped. Students who are unable to come to class on days that homework is due should plan to email their homework to the instructors by the beginning of class or send their homework in with a classmate.

**Learning Community**

School of Public Health courses ask students to discuss frameworks, theory, policy, and more, often in the context of past and current events and policy debates. Many of our courses also ask students to work in teams or discussion groups. 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 work, this can mean:

- Setting expectations with your groups about communication and response time during the first week of the semester (or 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.
- Developing a rapport prior to beginning the project (what prior experience are you bringing to the project, what are your strengths as they apply to the project, what do you like to work on?)

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.

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

**COURSE TEXT & READINGS**

Two texts are required. Both are available free of charge online.


Additional readings (e.g., journal articles) are also required, as indicated on the reading list below. These will be made available to students through the course shared folder in Dropbox. Reading assignments marked with an asterisk (*) are **optional** but highly recommended.
<table>
<thead>
<tr>
<th>Week/Instructor</th>
<th>Topic</th>
<th>Readings</th>
<th>Activities/Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week 1: Sept 3-Sept 5</strong></td>
<td>Susan</td>
<td><strong>ME3 – Chapter 2 starting at “Philosophy of Scientific Inference” (p. 18)</strong></td>
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<tr>
<td></td>
<td>Introduction to Epidemiologic Inference</td>
<td><strong>ME3 – Chapter 3</strong></td>
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<td></td>
<td>Measures of Disease Frequency</td>
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<td>Week 2: Sept 10-Sept 12</td>
<td><strong>CI – Chapters 1-3</strong></td>
<td>Tues: Quiz 1</td>
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<td></td>
<td>Susan</td>
<td><strong>ME3 – Chapter 4</strong></td>
<td>Thurs: HW 1 Assigned</td>
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<td></td>
<td></td>
<td><strong>Commentaries on Maldonado and Greenland by Dawid, Shafer, Elwert and Winship, and Kaufman and Kaufman.</strong></td>
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<td></td>
<td>Week 3: Sep 17-Sep 19</td>
<td><strong>CI – Chapters 4-5</strong></td>
<td>Tues: Quiz 2</td>
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<td></td>
<td>Susan</td>
<td><strong>ME3 – Chapter 5</strong></td>
<td>Thurs: HW 1 Due; HW 2 Assigned</td>
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<tr>
<td></td>
<td>Confounding and DAGs</td>
<td><strong>ME3 – Chapter 12</strong></td>
<td>Tues: Quiz 3</td>
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<td></td>
<td><strong>CI – Chapters 6-7</strong></td>
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<td>Week 4: Sep 24-Sep 26</td>
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</tbody>
</table>
|        | Thurs: HW 2 Due; HW 3 Assigned
|        | | Week 5: Oct 1-Oct 3  
| Susan  | • Confounding and DAGs, continued  
|        | Tues: Quiz 4  
|        | Thurs: HW 3 Due; HW 4 Assigned
|        | | Week 6: Oct 8-Oct 10  
| Susan  | • Selection Bias  
|        | • CI – Chapter 8  
|        | | Tues: Quiz 5  
|        | Thurs: HW 4 Due
|        | | Week 7: Oct 15-Oct 17  
|        | • Review  
|        | • MIDTERM (20% of final grade)  
|        | • N/A
|        | | Week 8: Oct 22-Oct 24  
| Rich   | • Measurement Bias  
|        | • CI – Chapter 9 Measurement bias  
|        | • ME3 – Chapter 9 Validity in Epidemiologic Studies, pp. 137-146 (section on Information bias)  
|        | • Dosemeci M, Wacholder S, Lubin JH. Does nondifferential misclassification of exposure always bias a true effect  
|        | Tues: Quiz 6  
|        | Thurs: HW 5 Assigned
### Week 9: Oct 29-Oct 31

- **Estimation and Hypothesis Testing**
- **ME3** – Chapter 10 Precision and Statistics in Epidemiologic Studies
- **CI** – Chapter 10 Random Variability
- Poole C. Low P-values or narrow confidence intervals: which are more durable? *Epidemiology* 2001;12:291-4.
- Amrhein V, Trafimow D and Greenland S. Inferential statistics are descriptive statistics. Pre-print.

- **Tues: Quiz 7**
- **Thurs: HW 5 Due; HW 6 Assigned**

### Week 10: Nov 5-Nov 7

- **Estimation and Hypothesis Testing, continued**
- **Logical Fallacies**
- ME3 – Chapter 10 Precision and Statistics in Epidemiologic Studies
- CI – Chapter 10 Random Variability
- Poole C. Low P-values or narrow confidence intervals: which are more durable? *Epidemiology* 2001;12:291-4.
- Amrhein V, Trafimow D and Greenland S. Inferential statistics are descriptive statistics. Pre-print.

- **Tues: Quiz 8**
- **Thurs: HW 6 Due; HW 7 Assigned**

### Week 11: Nov 12-Nov 14

- **Randomized Trials**
- **Cohort Studies**
- ME3 Chapter 6 (read through subsection ‘Experimental Studies’ pp 87-93)
- ME3 – Chapter 7 (Cohort Studies, pp 100-110)
- Hernan MA, Alonso A, Logan R, Grodstein F, Michels KB, Willett W, Mason JE, Robins JM. Observational Studies Analyzed Like Randomized Experiments: An Application to...

| Week 12: Nov 19-Nov 21 | Case-Control Studies | ME3 – Chapter 8 (Case-control Studies, pp. 111-122) | Tues: Quiz 10 |
| Rich | | ME3 – pp. 171-182 [Matching] | |
| Week 14: Dec 3-Dec 5 | Case-Control Studies | Matching | Tues: Quiz 12; HW 8 Due |
| Rich | Catching Up | Review | |
| Week 15 Dec 10 | FINAL EXAM (20% of final grade) | | |

**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

The total grade for the course is a weighted average of homework assignments, the midterm exam and the final exam

- Homework assignments (8) comprise 50% of the total grade
- Quizzes (10) comprise 10% of total grade
- Midterm exam is 20% of the total grade
- Final exam is 20% of the total grade

[Enter a detailed statement of the basis for grading here. Include a breakdown of course components and a point system for achieving a particular grade. Include expected turnaround time for grading/feedback. Please refer to the University’s Uniform Grading Policy and Grading Rubric Resource at https://z.umn.edu/gradingpolicy]

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:

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

- 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).
### Evaluation/Grading Policy Description

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 [https://z.umn.edu/dishonesty](https://z.umn.edu/dishonesty)

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: [https://z.umn.edu/integrity](https://z.umn.edu/integrity).

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.

Indiana University offers a clear description of plagiarism and an online quiz to check your understanding ([http://z.umn.edu/iuplagiarism](http://z.umn.edu/iuplagiarism)).

### Late Assignments

Late homework will have 10 points deducted per day late. Homework turned in after the homework key has been posted will receive 0 points. In appropriate cases, extensions will be given on homework deadlines; these must be requested in advance.

### Attendance Requirements

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](http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html)

### CEPH COMPETENCIES

<table>
<thead>
<tr>
<th>Competency</th>
<th>Learning Objectives</th>
<th>Assessment Strategies</th>
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</thead>
<tbody>
<tr>
<td>1. Apply epidemiological methods to the breadth of settings and situations in public health practice</td>
<td>Apply a wide range of epidemiologic methods</td>
<td>Homework assignments will be assigned for most of the methods discussed in the course</td>
</tr>
<tr>
<td>3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software as appropriate</td>
<td>Epidemiological data will be analyzed using current techniques</td>
<td>Homework assignments will require students to analyze examples provided by the instructor.</td>
</tr>
<tr>
<td>4. Interpret results of data analysis for public health research, policy or practice</td>
<td>Interpret results of all models presented in the class</td>
<td>Each homework will require students to interpret the results of models they have implemented</td>
</tr>
<tr>
<td>19. Communicate audience-appropriate public health content, both in writing and through oral presentation</td>
<td>Students should be able to present the results of their analyses in a manner sufficient to convey their work to a technical audience.</td>
<td>Homework will assess the ability to convey this information in a clear and concise fashion.</td>
</tr>
</tbody>
</table>