

# PUBH 8403, SECTION 001

## Research Skills in Biostatistics Fall 2019

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### COURSE & CONTACT INFORMATION

**Credits:** 1  
**Meeting Days:** Wednesday  
**Meeting Time:** 2:30-3:20pm  
**Meeting Place:** Mayo A-434 (main Biostatistics conference room)

**Instructor:** Lynn Eberly, PhD  
**Office Address:** A-465 Mayo Building, MMC 303, 420 Delaware Street SE, Minneapolis, MN 55455  
**Office Phone:** 612-624-1436 (but for faster response please e-mail me instead!)  
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**Office Hours:** by appointment

### COURSE DESCRIPTION

This course introduces doctoral students in Biostatistics to research skills necessary for writing and defending a dissertation, and more generally for a career in research. Format and course topics will vary from week to week, as described below. Students will be given assignments to reinforce skills presented in class. The class meeting time (immediately before seminars) was chosen to facilitate subsequent seminar attendance, since learning how to both give and listen to scholarly talks is itself a research skill.

### COURSE PREREQUISITES

Stat 8101-02 and admission to the PhD program in Biostatistics. The course is meant to be taken the fall before the PhD written exam is to be attempted, so "Schedule 2" students would typically wait to enroll until their second year in the program.

### COURSE GOALS & OBJECTIVES

Upon successful completion of the course, students will be well-versed in the basic tools needed to transition from a bachelors/Masters mentality (where mere mastery of a variety of coursework is sufficient) to a PhD mentality (where instigation, development, presentation, and publication of original research is required). Skills covered will include CV-writing, mathematical word processing, oral and poster presentation skills, computer systems and efficient and responsible use of high-speed multicore processors, choosing a thesis area and advisor, scientific writing, an introduction to grant writing and research ethics, and a variety of other research survival skills.

### METHODS OF INSTRUCTION AND WORK EXPECTATIONS

#### Course Workload Expectations

PubH 8403 is a 1 credit course. The University expects that for each credit, you will spend a minimum of three hours per week attending class or comparable online activity, reading, studying, completing assignments, etc. over the course of a 15-week term. Thus, this course requires approximately 45 hours of effort spread over the course of the term in order to earn an average grade.

#### Learning Community

School of Public Health courses often ask students to discuss frameworks, theory, policy, ethics, and more, often in the context of past and current events and debates in the public arena. 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 discussions 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>).

### **Methods of Instruction**

Methods of instruction will be through in-class presentations and group discussions, and by homework assignments, including hands-on practice with the various software packages utilized. Prof. Eberly will sometimes be assisted by one or more guests who will co-lead the day's discussion.

There is a course Canvas site where readings and assignments will be posted, along with copies of presentations and optional extra materials and resources; find it at [canvas.umn.edu](https://canvas.umn.edu).

## **COURSE TEXT & READINGS**

There is no required text for the course, but readings and websites will be provided as needed. See the weekly schedule below; additional readings may be added based on student input and links to these will be made available in the course Moodle site.

## COURSE OUTLINE/\*\*TENTATIVE\*\* WEEKLY SCHEDULE (After Week 7, topics & assignments order may change!)

Week	Topic	Guest(s)	Readings Due*	Assignments Given**
Week 1: 4 Sept	<ul style="list-style-type: none"> <li>A typical path from now to graduation</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li><b>Assignment 1 (due next week):</b> Select one of the topic areas (A through H) in the American Statistical Association 'Ethical Guidelines for Statistical Practice' as a discussion topic of interest to you.</li> </ul>
Week 2: 11 Sept	<ul style="list-style-type: none"> <li>Introduction to library research resources</li> </ul>	<ul style="list-style-type: none"> <li><b>Shanda Hunt</b>, public health specialist at the Bio-Med Library</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li><b>Assignment 2 (due next week):</b> Find a methods paper by a Biostatistics or Statistics faculty member that is interesting to you.</li> </ul>
Week 3: 18 Sept	<ul style="list-style-type: none"> <li>Reproducible research and simulation studies</li> </ul>	<ul style="list-style-type: none"> <li><b>Lin Zhang</b>, Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Burton et al. 2006 Stat Med</a></li> </ul>	<ul style="list-style-type: none"> <li><b>Assignment 3 (due next week):</b> Implement a simulation study; draft an outline of your write-up by filling in Burton et al's Figure 1 (items 1 through 9) for your simulation.</li> </ul>
Week 4: 25 Sept	<ul style="list-style-type: none"> <li>Parallel computing</li> </ul>	<ul style="list-style-type: none"> <li><b>Tom Murray</b>, Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li><b>Assignment 4 (due next week):</b> Parallelize your simulation study and re-run; finalize your write-up: turn your outline into writing (including results and conclusions).</li> </ul>
Week 5: 2 Oct	<ul style="list-style-type: none"> <li>Some LaTeX fundamentals relevant to CVs, talks, and posters</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li><b>Assignment 5 (due next week):</b> Write your CV in LaTeX.</li> </ul>
Week 6: 9 Oct	<ul style="list-style-type: none"> <li>Effective poster presentations</li> </ul>	<ul style="list-style-type: none"> <li><b>Cavan Reilly</b>, Professor, <b>Mark Fiecas</b>, Assistant Professor, <b>Erika Helgeson</b>, Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Gelman et al. Am Stat 2002</a></li> </ul>	<ul style="list-style-type: none"> <li><b>Assignment 6 (due next week):</b> Draft a simple poster for your simulation study; spend your time thinking about layout, graphics, and tables rather than about writing. (Writing will be next week.)</li> </ul>
Week 7: 16 Oct	<ul style="list-style-type: none"> <li>Effective scientific writing</li> </ul>	<ul style="list-style-type: none"> <li><b>Jim Hodges</b>, Professor</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li><b>Assignment 7 (due next week):</b> Finalize your poster, completing the writing and polishing the layout.</li> </ul>
Week 8: 23 Oct	<ul style="list-style-type: none"> <li>Manuscript submission and review</li> </ul>	<ul style="list-style-type: none"> <li><b>Joe Koopmeiners</b>, Associate Professor, <b>Xianghua Luo</b>, Associate Professor, <b>Eric Lock</b>, Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Tips on Publishing and Reviewing Papers in Statistics Journals</a></li> </ul>	<ul style="list-style-type: none"> <li><b>Assignment 8 (due next week):</b> Take the methods paper you chose in Assignment 2 and act as a reviewer by briefly critiquing it: write down an overview of the method and short lists of its strengths, weaknesses, and public health/clinical relevance.</li> </ul>

Week 9: 30 Oct	<ul style="list-style-type: none"> <li>• <b>Reproducible research and documenting your statistical work</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Ann Brearley</b>, Assistant Professor, BDAC staff statisticians (TBN)</li> </ul>	<ul style="list-style-type: none"> <li>• Skim and be ready to discuss Dr. Brearley's best practices summary (in the Canvas site); we'll focus on discussing areas most of interest to you</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Assignment 9 (due next week):</b> Rearrange the directory structure for some project of yours so that it is better organized <b>OR</b> improve your documentation within a somewhat complex R script of yours</li> </ul>
Week 10: 6 Nov	<ul style="list-style-type: none"> <li>• <b>High performance computing at MSI</b></li> </ul>	<ul style="list-style-type: none"> <li>• TBD</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Assignment 10 (due next week, group assignment):</b> With your group, choose one of the faculty papers identified in Assignment 2. Create a git repository (or other versioning system), accessible by the entire group, for an oral presentation that your group will write about that paper.</li> </ul>
Week 11: 13 Nov	<ul style="list-style-type: none"> <li>• <b>Ethics – specific topic(s) TBD based on Assignment 1</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Jim Neaton</b>, Professor</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">IBS-ENAR Presentation Guidelines</a> (this reading is relevant to the Assignment, not to the class content)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Assignment 11 (due next week, group assignment):</b> Using the lists submitted in Assignment 8, <u>draft</u> a short oral presentation about this method <i>for a clinical/public health research audience</i>.</li> </ul>
Week 12: 20 Nov	<ul style="list-style-type: none"> <li>• <b>Working with clinical and other non-statistical collaborators</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Saonli Basu</b>, Professor, <b>David Vock</b>, Associate Professor, <b>Ashley Peterson</b>, Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="https://simplystatistics.org/2013/10/09/the-care-and-feeding-of-your-scientist-collaborator/">https://simplystatistics.org/2013/10/09/the-care-and-feeding-of-your-scientist-collaborator/</a></li> <li>• <a href="https://simplystatistics.org/2013/10/08/the-care-and-feeding-of-the-biostatistician/">https://simplystatistics.org/2013/10/08/the-care-and-feeding-of-the-biostatistician/</a></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Assignment 12 (due next week, group assignment):</b> Polish and finalize your short oral presentation about your group's method for a clinical/public health research audience.</li> </ul>
Week 13: 25 Nov (Class moved to Monday??)	<ul style="list-style-type: none"> <li>• <b>Grant support for your dissertation work</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Beth Virnig</b>, Associate Dean for Research and Professor of Health Policy and Management</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">IBS-ENAR Presentation Guidelines</a> (same guidelines as two weeks above)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Assignment 13 (due next week):</b> Spend time <u>not working</u> over the long Thanksgiving weekend. Submit a picture of you <u>not working</u> or of something that demonstrates that you were not working.</li> </ul>
Week 14: 4 Dec	<ul style="list-style-type: none"> <li>• <b>Choosing a dissertation topic and advisor</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Wei Pan</b>, Professor, <b>Haitao Chu</b>, Professor, <b>Julian Wolfson</b>, Associate Professor, <b>Sandra Safo</b>, Assistant Professor</li> </ul>	<ul style="list-style-type: none"> <li>• Schwartz J Cell Science 2008</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Assignment 14</b></li> </ul>
Week 15: 11 Dec	<ul style="list-style-type: none"> <li>• <b>Effective teaching</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Laura Le</b>, Instructor, <b>Marta Shore</b>, Instructor, Biostat TAs (TBN)</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Assignment 15</b></li> </ul>

\* Note that readings shown are DUE on the date shown, not ASSIGNED on the date shown. Links to readings are in the course Canvas site.

\*\* This is only a quick descriptor of the assignment; assignments are fully described in the course Canvas site.

## 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

### Evaluation

Students will be given weekly assignments which will include background reading and learning, and development and reinforcement of skills presented and/or discussed in class. The assignments are described briefly in the Weekly Schedule above; more details are in the class Canvas web site ([canvas.umn.edu](http://canvas.umn.edu)). Some of the 15 assignments will be group assignments. **All students must complete 12 of the 15 assignments with a grade of S and attend a minimum of 6 divisional seminars in order to earn a course grade of "S".** If you receive an N on an assignment, you may revise and resubmit for regrading; sooner is always better (especially if it turns out that you need to revise and resubmit again), but all resubmissions must be turned in prior to midnight on Tuesday 17 December 2019.

### Grading Scale

Your final grade will be "S" or "N." Here is a reminder of University expectations for grade lines:

- 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	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>
<p><b>Late Assignments</b></p>	<p>If illness or travel is going to cause you to miss a deadline, don't surprise me -- send an e-mail message to me or leave a message at the Biostatistics main office (612-624-4655). We can then discuss and agree upon a revised deadline.</p>
<p><b>Attendance Requirements</b></p>	<p>Students are expected to attend every class. If illness or travel is going to cause you to miss a class, don't surprise me -- send an e-mail message to me or leave a message at the Biostatistics main office (612-624-4655). We will then set up a time to discuss the material you missed. Missing more than 3 of the 15 classes without legitimate reason(s) will result in a grade of "N" for the course.</p>
<p><b>Extra Credit</b></p>	<p>None.</p>

## CEPH COMPETENCIES

Competency	Learning Objectives	Assessment Strategies
<p>3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software.</p> <p>and</p> <p>4. Interpret results of data analysis for public health research, policy or practice.</p> <p>and</p> <p>18. Select communication strategies for different audiences and sectors.</p>	<p>Design and implement a simulation to evaluate the statistical properties of an analysis method.</p> <p>Interpret the results of your simulation study.</p> <p>Be aware of the need to assess your audience's backgrounds and research interests; practice tailoring your presentations to those backgrounds and interests.</p>	<p>Homework assignment: use R programming to implement the simulation and put your simulation results and interpretation into a short report (for a statistical audience) that includes background, methods, results, public health/clinical relevance, and discussion sections.</p>
<p>18. Select communication strategies for different audiences and sectors.</p> <p>and</p> <p>19. Communicate audience-appropriate public health content, both in writing and through oral presentation.</p>	<p>Be aware of the need to assess your audience's backgrounds and research interests; practice tailoring your presentations to those backgrounds and interests.</p>	<p>Homework assignment: put your simulation results and interpretation into a poster presentation (for a statistical audience) that includes background, methods, results, public health/clinical relevance, and discussion sections.</p>
<p>18. Select communication strategies for different audiences and sectors.</p> <p>and</p> <p>19. Communicate audience-appropriate public health content, both in writing and through oral presentation.</p>	<p>Be aware of the need to assess your audience's backgrounds and research interests; practice tailoring your presentations to those backgrounds and interests. (This is crucial even for presentations of statistical methods; your new method will not be widely adopted if you cannot 'sell' it to statisticians and collaborators.)</p>	<p>Homework assignment: write two brief oral presentations based on a proposed statistical methodology: one for an audience of peers (statisticians) and one for an audience familiar with conducting clinical research, and reading clinical research literature, but without much (or any) statistical training.</p>