SCHOOL OF
PUBLIC HEALTH
UNIVERSITY OF MINNESOTA

PUBH 6451 SECTION 320

Biostatistics II
Fall 2019

COURSE & CONTACT INFORMATION

Credits: 4 credits
Meeting Day(s), Time, and Place: This course is entirely web-based, delivered via Canvas at http://canvas.umn.edu.

Contact Type	Contact Information	Role	When to Contact
Instructor	**Baolin Wu** baolin@umn.edu	Primary instructor for this course. Sole responsibility for course administration. Responds to student questions in the Canvas forums and Collaborative Keys. Sole responsibility for assigning grades for programming assignments. Assigns grades for a portion of quiz questions.	Contact immediately by phone or email for questions or concerns about course deadlines, grades, or serious issues. Contact through the Canvas forums for questions on course material.
Teaching Assistant(s)	**Zachary Brown**, brow4261@umn.edu **Boyang Lu**, lu000083@umn.edu	Respond to student questions in the Canvas forums and Collaborative Keys. Assign grades and provides individual feedback on assignments	Questions or concerns about the course material or assignments. TA's cannot answer questions about assignment deadlines.
Technical Support	Technical support options are available on the SPH website. https://z.umn.edu/sphquickhelp	Troubleshoots technical issues related to the course site or course content.	Technical issues with the course site, media, quizzes or assignments.

Please save this contact information to your computer or print it. That way, you can still contact us in the event that you have difficulty connecting to the Internet or accessing the syllabus.

Communication in Online Courses

Communication is especially important in an online course. The course site announcement forums/discussions are the primary method of communication, along with comments in the Collaborative Keys. Students should post questions concerning course material to the Canvas discussion forums. Students should read the course forums as part of the learning process, and feel free to post responses or follow-up questions as desired.

Students should only email the instructor concerning questions about deadlines or grades that require confidentiality. Instructors will use email to communicate with students about course deadlines or announcements. You are responsible for reading all course-related emails sent to your University email account and contacting us in a timely manner with any questions you may have. We strongly recommend that you check your U of M email daily. Our goal is to respond to forum posts and emails within 24 hours. The fastest response will be made to questions posted in the Canvas discussion forums.

When using email, students **must** use their University of Minnesota X.500 email account. Instructors cannot respond to external email addresses (e.g. gmail, etc.) for reasons of confidentiality.

COURSE DESCRIPTION

PubH 6451 is the second semester of an introduction to biostatistics, statistical methods applied in the health sciences. This course covers a broad range of methods, with a focus on their practical use and interpretation in clinical trials and observational studies. The theme of the course is statistical adjustment of comparisons of study groups. In each homework assignment, students read an assigned paper from a health-science journal, repeat the analysis in the paper and critique the methods and results. Computations will be illustrated in SAS and/or R, with discussion of basic programming elements and output for the homework. The course covers methods for working with continuous measurements (t-tests, linear regression, ANOVA), measurements in categories (risk, rates, odds, logistic and Poisson regression), and measurements of time until an event occurs (survival data, proportional hazards regression).

Acknowledgments

The contents of PubH 6451 have been developed with the contributions of numerous instructors. Dr. Leduc, the current instructor, has been involved with the majority of recent content and modifications. Current and Former faculty/instructors, including Dr. Andy Mugglin, Dr. Lynn Eberly, Dr. Ann Brearley, Dr. Laura Le, and Susan Telke M.S., all had roles in either the conceptual development or actual content of the current course, and are acknowledged for their contributions. The SPH Office of E-Learning Services has been instrumental in the online implementation of the course content, including in development of online resources of materials originally designed for classroom use.

COURSE PREREQUISITES

PubH 6450 Biostatistics I with grade of at least B or instr consent

COURSE GOALS & OBJECTIVES

At the conclusion of the course, students should be able to compare study groups based on outcome measures that are continuous, binary, or time-to-event while adjusting for one or more variables. Students will use SAS or R to apply each method and should be able to understand the output produced by SAS or R.

Specifically, students should be able to:
- Determine the appropriate test to use based on how the data were collected and on the outcome variable of interest, and be able to interpret results from that test.
- Use a statistical software tool (SAS or R) to analyze data including:
    - Hypothesis Testing for Means
    - ANOVA (One and Two-way)
    - Simple and Multiple Linear Regression
    - Sample Size Estimation and Power Considerations for Comparisons of Means
    - Logistic Regression
    - Survival Analysis, including Proportional Hazards Regression
    - Poisson Regression

METHODS OF INSTRUCTION AND WORK EXPECTATIONS

Course Workload Expectations

PubH 6451 Biostatistics II is a 4-credit course. The University expects that for each credit, you will spend a <u>minimum</u> 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 a <u>minimum</u> of 12 hours per week in order to earn an average grade. This course is entirely online. Therefore, time you would otherwise be in class will be incorporated into work for the course in the form of online discussions, lectures, etc.

Technology

You will use the following technology tools in this course. Please make yourself familiar with them.
- Either SAS or R, to be used for statistical computing. Installation instructions are on the course page. Instruction is provided in the course software labs. Additional tutorial resources may be found at the following sites:
    - SAS tutorials at UCLA: http://www.ats.ucla.edu/stat/sas/
    - R tutorials at UCLA: http://www.ats.ucla.edu/stat/r/http://www.ats.ucla.edu/stat/r/
    - Introduction to R: http://cran.r-project.org/doc/manuals/R-intro.pdf
- Google Docs, training is available via OIT https://it.umn.edu/self-help-guide/google-drive-work-files-folders.]
- *Note: if you need assistance compiling this list or require a resource that does not exist for a specific technology, please visit http://www.sph.umn.edu/academics/academic-technology/guides.*

Course Organization:

The course is organized as eight sections, each lasting one or two weeks. For each section, there are:
- Online lecture slide sets and occasional supplemental readings.
- Software labs for learning how to use statistical software (SAS or R).
- Problem sets (to be worked on as a class via a collaborative key).
- End-of-Section quiz.

You are encouraged to work together on the problem sets. However, the end-of-section quizzes MUST be taken individually. Evidence of collaboration or cheating on the quizzes will not be tolerated and will be referred to the University for the disciplinary process.

In addition to problem sets and quizzes, there are also two programming activities. The first programming activity is to be completed independently; the second programming activity will be completed in small groups.

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).

COURSE TEXT & READINGS

There are no required texts to purchase for this course. The course will make use of journal articles with references provided on the course page. It is good practice to use a citation manager to keep track of your readings. More information about citation managers is available at https://www.lib.umn.edu/pim/citation.

Additional Texts for Optional Reference:
- *OpenIntro Statistics, (3rd ed.),* by D. Diez, C. Barr, and M. Çetinkaya-Rundel. Openintro.org. https://www.openintro.org/stat/textbook.php?stat_book=os **(A freely available e-textbook in pdf format)**
- *Primer of Biostatistics* by S. Glantz. McGraw-Hill Medical. ISBN 978-0071781503. **(A freely accessible e-book is available via the University of Minnesota (UMN) Libraries website)**
- *Basic & Clinical Biostatistics (4th ed)* by B. Dawson and R. Trapp. Lange Medical Books/McGraw-Hill. ISBN 978- 0071410175. **(A freely accessible e-book is available via the UMN Libraries website)**
- *Essentials of Medical Statistics, (2nd ed)* by B. Kirkwood and J. Sterne. Wiley-Blackwell. ISBN 978-0865428713.
- *The Little SAS Book*, by L. Delwiche & S. Slaughter, SAS Institute. ISBN 978-1599947259. **(An older edition is available as a freely accessible e-book through the UMN Libraries website)**
- *Logistic Regression Using the SAS System: Theory and Application* by P. Allison. Wiley-SAS. ISBN 978- 0471221753. **(A freely accessible e-book is available via the UMN Libraries website)**
- *Modeling Survival Data in Medical Research* by D. Collett. Chapman and Hall/CRC. ISBN 978-1584883258.
- *Applied Statistics and SAS Programming Language,* by R. Cody & J. Smith. Prentice-Hall Inc. ISBN 978- 0131465329.
- *A Handbook of Statistical Analyses Using R*, by B. S. Everitt and T. Hothorn. Chapman & Hall/CRC. ISBN 978-1-4200-7933-3. **(Also a freely accessible e-book is available via the UMN Libraries website)**
- *SAS and R: Data Management, Statistical Analysis, and Graphics*, by K. Kleinman and Nicholas J. Horton. Chapman & Hall/CRC. ISBN 978-1-4200-7057-6. **(A freely accessible e-book is available via the UMN Libraries website)**

COURSE OUTLINE/WEEKLY SCHEDULE

This course has specific deadlines. All coursework must be submitted via the course site before the date and time specified on the site. Note: assignments are due by 11:55pm CST unless indicated otherwise. In addition to the listing below, weeks without programming activity include online lectures and software labs (in SAS or R).

Lesson	Topic	Activities/Assignments
Lesson 1 **September 3 - 8**	• **Review of Hypothesis Testing for Means, One- Way ANOVA**	• **Install SAS or R** • **Lesson 1 Problem Set** • **Lesson 1Quiz**
Lesson 2 **September 9 - 22**	• **Analysis of Variance**	• **Lesson 2 Problem Set** • **Lesson 2 Quiz**
Lesson 3 **September 23 - 29**	• **Linear Regression**	• **Lesson 3 Problem Set** • **Lesson 3 Quiz**
Lesson 4 **September 30 – October 13**	• **Multiple Linear Regression**	• **Lesson 4 Problem Set** • **Lesson 4 Quiz**
Lesson 5 **October 14 - 20**	• **Sample Size**	• **Lesson 5 Problem Set** • **Lesson 5 Quiz**
Programming Activity 1 **October 21 - 27**	• **Programming Activity I**	• **Programming Activity**
Lesson 6 **October 28 – November 10**	• **Logistic Regression**	• **Lesson 6 Problem Set** • **Lesson 6 Quiz**
Lesson 7 **November 11 – November 24**	• **Survival Data and Analysis**	• **Lesson 7 Problem Set** • **Lesson 7 Quiz**
Lesson 8 **November 25 – December 1**	• **Poisson Regression**	• **Lesson 8 Problem Set** • **Lesson 8 Quiz**
Programming Activity 2 **December 2 – 11**	• **Programming Activity II**	• **Programming Activity 2 (small groups)**

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/. 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 grading is the course is as follows:
- Quizzes (50% of final grade): Eight quizzes, each worth
- Programming Activity 1 (10% of final grade) and Programming Activity 2 (20% of final grade): each worth 100 points
- Active and timely participation in the problem sets by contributing to the collaborative answer keys (20% of your final grade): each worth 1 point

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:

% In Class	Grade	GPA
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).

Evaluation/Grading Policy	Evaluation/Grading Policy Description
Scholastic Dishonesty, Plagiarism, Cheating, etc.	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 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. 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).
Late Assignments	Late assignments are not accepted, except as outlined in the policy on Makeup Work for Legitimate Reasons, below.
Attendance Requirements	As this course is delivered online, there are no mandatory attendance requirements. However, the course does have weekly deadlines for completion of course materials.
Makeup Work for Legitimate Reasons	If you experience an extraordinary event that prevents you from completing coursework on time and you would like to make arrangements to make up your work, contact your instructor within 24 hours of the missed deadline if an event could not have been anticipated and at least 48 hours prior if it is anticipated. Per University policy, legitimate reasons for making up work may include: - illness - serious accident or personal injury - hospitalization - death or serious illness within the family - bereavement - religious observances - subpoenas - jury duty - military service - participation in intercollegiate athletic events Because this course is entirely online and all materials are available to students from the first day of the term, we expect students to plan accordingly if travels or access to internet will cause them to miss a deadline. Note that our deadlines are generally set for 11:55 p.m. CST, so traveling to a different time zone will require additional planning. Further, circumstances that qualify for making up missed work will be handled by the instructor on a case-by-case basis; they will always be considered but not always granted. For complete information, view the U of M's policy on Makeup Work for Legitimate Absences (http://z.umn.edu/sphmakeupwork).
Extra Credit	Extra credit is not offered to individual students.
Saving & Submitting Coursework	**Documents that students submit are considered final;** students may not submit more than one version or draft of each assignment.

Technical Issues with Course Materials	You are expected to submit all coursework on time and it is your responsibility to ensure that your work is submitted properly before the deadline.
	
	 If you experience technical difficulties while navigating through the course site or attempting to submit coursework:
	
	 • Go to Quick Help: http://z.umn.edu/sphquickhelp.
	 • Connect with the appropriate person or office within 30 minutes of the problem's occurrence.
	     o Provide as much information as possible, so the tech team can best help you as soon as possible.
	     o You can expect a response within 1-2 business days to help resolve the problem.

CEPH COMPETENCIES

Competency	Learning Objectives	Assessment Strategies
Evidence-based Approaches to Public Health	As listed in Learning Objectives	As listed in Evaluation and Grading