SYLLABUS & COURSE INFORMATION

SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF MINNESOTA

PUBH 7405

Biostatistical Inference I
Fall 2024

COURSE & CONTACT INFORMATION

Credits: 4
Meeting Day(s): Mondays and Wednesdays
Meeting Time: 10:10 – 12:05
Meeting Place: Mayo 3-100

Instructor: J. Sunil Rao, Professor of Biostatistics
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Office Phone: 612.258.5917
Fax:
Office Hours: 1:15-2:15 Mondays and Wednesdays
Office Location: University Office Plaza, Suite 233

COURSE DESCRIPTION

The course will cover standard topics including group comparisons, simple and multiple linear regression: models in matrix notation;diagnostics and remedies; ordinary and weighted least squares; model building; biomedical applications.

COURSE PREREQUISITES

This class is intended for graduate students in Biostatistics or related fields.

Statistics: At least one course in applied statistics.

Computing: Some familiarity with the R programming language as this will be the focus of instruction as it relates to computing.

Linear Algebra: Some familiarity with basic matrix notation and operations (multiplication, inverse, transpose). We will review this VERY briefly in the course.

COURSE GOALS & OBJECTIVES

To master the understanding and application of correlation, multiple regression and related topics in biostatistics. Students will understand strengths and limitations of these techniques and be able to apply them to real world datasets. They will be able to communicate written analysis results in a manner appropriate for a scientific publication. Students will be able to clearly present a scientific problem, analysis, and results in a presentation where they will work as a team to study a scientific question using methods learned in this class.

METHODS OF INSTRUCTION AND WORK EXPECTATIONS

Course Workload Expectations

PUBH 7405 is a 4-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 4* 45 hours of effort spread over the course of the term to earn an average grade.

Modality

Instruction consists mostly of formal lectures plus one hour of lab/week primarily focused on implementation of methods using R to biomedical applications. A group project is also an integral part of the class, so learning how to work in a group structure will be important.

Email

Emailed questions should be reserved for questions whose answers are not applicable to your classmates (e.g., personal circumstances). Any questions whose answers are applicable to your classmates (e.g., course content, homework, R) should be posted on the Canvas discussion board, not emailed. I also welcome questions during class, before or after class, and during office hours.

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.

COURSE TEXT & READINGS

The class will mainly rely on course notes which will draw heavily from the recommended textbook *Applied Linear Regression (4th Ed)* by Sanford Weisberg. These notes will be placed on the course Canvas website in organized modules. This book is available via the University Libraries' E-Reserves.

This course also uses journal articles, which are available via the University Libraries' E-Reserves and will be placed on the course Canvas site. 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.

COURSE OUTLINE/WEEKLY SCHEDULE

Tentative schedule of topics and activities by week:

- Introduction to R and review of basic biostatistical concepts (**Week 1,2**: Sept 4, 9)
- Testing via randomization (**Week 2,3**: Sept 11, 16, 18)
- Population models, t-test, two sample tests (**Week 3,4:** Sept 18, 23)
- Confidence intervals and power (**Week 4:** Sept 25)
- Correlation (**Week 5**: Sept 30)
- Simple linear regression (**Week 5,6**: Oct 2, 7)
- Review of matrices and Multiple linear regression (**Week 6,7**: Oct 9, 14)
- Interpretation of main effects and complex regressors (**Week 7:** Oct 16)
- Midterm exam (**Week 8:** Oct 21)
- Analysis of variance (**Week 8:** Oct 23)
- Model variances (**Week 9:** Oct 28)
- Regression diagnostics (**Week 9, 10:** Oct 28, Nov 4)
- Variable selection (**Week 11:** Nov 6)
- Discussion of group projects (**Week 11:** Nov 11)
- Binomial and Poisson regression (**Week 11:** Nov 11, 13)
- Longitudinal data analysis (**Week 12:** Nov 18, 20)
- Buffer (**Week 13:** Nov 25)
- Group Projects (**Week 14, 15**: Dec 2, 4, 9)
- Final exam (**Week 15:** Dec 11)

LAND ACKNOWLEDGEMENT

The School of Public Health at the University of Minnesota Twin Cities is built within the traditional homelands of the Dakota people. Minnesota comes from the Dakota name for this region, Mni Sóta Maḳoce, which loosely translates to the land where the waters reflect the skies.

It is important to acknowledge the peoples on whose land we live, learn, and work as we seek to improve and strengthen our relations with our tribal nations. We also acknowledge that words are not enough. We must ensure that our institution provides support, resources, and programs that increase access to all aspects of higher education for our American Indian students, staff, faculty, and community members.

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

There will be five-six graded homework assignments, distributed roughly every two weeks. Homeworks will be posted on Canvas and the TAs will return graded assignments within one week of the assignment deadline.

There will be a midterm exam at approximately half of the way through the semester. There will be a final exam at the end of the semester. Both will be in-class exams.

Students will also complete a group project worth a total of 100 points. The project grade will be based on several components completed throughout the semester: presentation of problem (20 points), description of statistical analysis (30 points), discussion of results (20 points), discussion of strengths and limitations (20 points), proposal for alternative strategies (10 points).

The final course grade will be determined by weighting the homework, midterm, quizzes, and group project grades:

- 35% homework (each assignment contributes equally)
- 20% midterm
- 25% final
- 20% group project

No make-up work will be allowed for missed homework assignments, project assignments, quizzes, or the midterm. Exceptions will be made for legitimate absences (as defined in the University's policy) and arrangements for these should be made with the instructor as soon as possible. Please refer to the University's policy (https://policy.umn.edu/education/makeupwork) for further details.

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 (https://plagiarism.iu.edu/certificationTests/).
Late Assignments	
Attendance Requirements	
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. University policy recognizes that there are a variety of legitimate circumstances in which students will miss coursework, and that accommodations for makeup work will be made. This policy applies to all course requirements, including any final examination. Students are responsible for planning their schedules to avoid excessive conflicts with course requirements. 1. Instructors may not penalize students for absence during the academic term due to the following unavoidable or legitimate circumstances: illness, physical or mental, of the student or a student's dependent; medical conditions related to pregnancy; participation in intercollegiate athletic events; subpoenas; jury duty; military service; bereavement, including travel related to bereavement; religious observances; participation in formal University system governance, including the University Senate, Student Senate, and Board of Regents meetings, by students selected as representatives to those bodies; and activities sponsored by the University if identified by the senior academic officer for the campus or the officer's designee as the basis for excused absences. 2. Voting in a regional, state, or national election is not an unavoidable or legitimate absence. 3. Instructors are expected to accommodate students who wish to participate in party caucuses, pursuant to Board of Regents resolution (see December 2005 Board of Regents Minutes, p 147.) 4. For circumstances not listed in (1), the instructor has primary responsibility to decide on a case-by-case basis if an absence is due to unavoidable or legitimate circumstances and grant a request for makeup work. 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 (https://policy.umn.edu/education/makeupwork).
Extra Credit	

CEPH COMPETENCIES

Competency	Learning Objectives	Assessment Strategies