



Course Syllabus

PubH 6450
Biostatistics I
4 credits
Spring 2017

Location:

Lecture: Bruininks 530A (<https://campusmaps.umn.edu/robert-h-bruininks-hall>)
Lab: Mayo C381 (<http://campusmaps.umn.edu/mayo-building-additions>)

Instructors: Eric Weber and Julian Wolfson

Eric's Office: A-466 Mayo Building
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Julian's E-mail: jwolfson@umn.edu

TAs: Andrew DiLernia and Brandon Koch

Andrew's Email: diler001@umn.edu
Brandon's Email: kochx402@umn.edu

Office Hours:

See Moodle for details.

Course Description

Descriptive statistics. Gaussian probability models, point/interval estimation for means/proportions. Hypothesis testing, including t, chi-square, and nonparametric tests. Simple regression/correlation. ANOVA. Health science applications using output from statistical packages.

Course Prerequisites

College Algebra (e.g. Math 1031), health science grad student, or instructor permission.

Course Goals and Objectives

By the end of the course, students should have a basic understanding of the fundamentals of biostatistical methods. This includes:

- Numerical Summary Measures
- Point/Interval Estimation for Means and Proportions
- Hypothesis testing for Means and Proportions

- Contingency Tables: Odds Ratios, Relative Risk, Chi-Square
- Simple Linear Regression, Correlation
- ANOVA
- Nonparametric tests
- Basic SAS and/or R programming language skills

Methods of Instruction and Work Expectations

- In person lecture except during exam weeks.
- Computer lab sessions – one per week beginning Week 2. Lab assignments will be available in the statistical software packages SAS and R. Students may use one or both of those packages, or are welcome to use any other statistical software of their choosing. Course staff will not be able to support any other software except SAS and R. Certain degree programs may require use of particular software. Students are strongly encouraged to consult with their program or intended program for such requirements.
- Eleven weekly quizzes
- Two programming exams (each with a take-home and in-class portion)
- In class data analysis exercise in last week of class

Course Web Page

- The course web page, or Moodle page, is available through Moodle: <https://moodle.umn.edu>
- Click “Login” in the upper right hand corner and log in using your X500. You should see a link for this class.

Course Communication

- Course-related **announcements** (changes to the schedule or due dates, topics covered on exams, etc.) will be made available on the class Moodle page in the Course Q&A forum. It is your responsibility to be aware of any announcements made. All students are subscribed to this forum and will receive copies of all posts by email.
- Communications during the online course consist of email and discussion forums:
 - o The **Discussion Forums** on the Moodle page are the **primary mechanism for interaction** between students and the instructor and TAs, as well as among students outside of class. All of the students, the teaching assistants and the instructor can read all of the postings in the General Q&A Forums. Normally, someone initiates a topic and others reply to this topic. **Please use thoughtful subject headings if you initiate a topic.** This will help cut down on starting redundant or duplicate topics on the same question and help everyone find the topic at a later date. Because the instructor and the TAs check the forums regularly on a rotating basis, **asking a question in the Forums is the quickest way** to get an answer to your question. You may also subscribe to any forum in order to receive emails of each post. This setting is available on the left hand side of the page after clicking on a forum link.
 - o **Email** is available as a secondary method of contact. Email is best used for specific questions about grades or grading of assignments. We strongly prefer questions on course material or routine administrative matters be asked in the forums so that everyone can benefit from the answer to the question and the instructors and TAs do not receive multiple emails asking the same question. However, if you would be more comfortable asking a question about material in private, then email is encouraged and an appropriate way to do this. Generally, your question (without your name) and the answer will be added to the forums as a thread afterwards.
 - o You **MUST** use your **University of Minnesota email address** (X.500 address) for email. All course communication will be sent to your email account. If you have not yet initiated your U of M email account, you will need to do so at <http://www.umn.edu/initiate>. The instructor and TAs cannot respond to emails sent from other accounts.
- **In-person contact.** Anyone may make an appointment for meeting by telephone. Students located in the area may make appointments to see your instructor or TA during regular business hours. Per University policy, we cannot support face-to-face in-person meetings when the University offices are closed.

Course Text and Readings

- **Required:**
SAS and R: Data Management, Statistical Analysis, and Graphics, Second Edition.

- **Optional books (SAS and R software – also note free online tutorials available below):**
 - The Little SAS Book, by L. Delwiche & S. Slaughter, SAS Institute. ISBN 978-1599947259
 - 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 Brian S. Everitt and Torsten Hothorn. Chapman & Hall/CRC. ISBN 978-1-4200-7933-3
 - SAS and R: Data Management, Statistical Analysis, and Graphics, by Ken Kleinman and Nicholas J. Horton. Chapman & Hall/CRC. ISBN 978-1-4200-7057-6

Recommended alternative sources:

- SAS tutorials at UCLA: <http://www.ats.ucla.edu/stat/sas/>
- R tutorials at UCLA: <http://www.ats.ucla.edu/stat/r/>
- Introduction to R: <http://cran.r-project.org/doc/manuals/R-intro.pdf>

Software

Students will require a personal computer and statistical software to complete homework assignments and exams in the course. This course will be taught using SAS and R. Students may choose to use one or both of these programs. R is free and open source. SAS is available for a nominal fee under the University’s site license; however, when you are no longer enrolled at the University, the site license and the software will eventually expire. More information on choosing between R and SAS (or using both) is given on the course Moodle page. Students are free to use any software, but instructional staff can only support SAS and R. Some programs within the University of Minnesota may require either SAS or R for students in their program. You will need to consult with your degree program (or intended program) for their requirements.

Course Outline

W	Begin Date	Coding Topics	Quiz / Exam	a) Conceptual Topics b) Textbook Sections (reading should be done by start of lab each week)
1	1/16	- Software installation	No quiz in Week 1	Concepts of variability and randomness
2	1/23	Lab 1 - Reading in data - Basic commands and functions	Quiz 1 – 10 points Quiz 2– 10 points	Concepts of why sampling is needed, and of sampling variability
3	1/30	Lab 2 - Plots - Tables - Numerical summaries	Quiz 3 – 10 points	Estimation: confidence intervals for proportions in a single sample, margin of error. Use of confidence intervals for inference (one group).
4	2/6	Lab 3 - Confidence intervals	Quiz 4 – 10 points	Sampling distribution of a mean, CLT, expected values, SE, Use of CIs for comparing groups: means, proportions.
5	2/13	Lab 4 - Central limit theorem	Quiz 5 – 10 points	Motivation and concepts of hypothesis testing
6	2/20	Lab 5 - Subsetting data - Creating new variables	Quiz 6 – 10 points	Hypothesis testing for differences

7	2/27	Lab 6 - Basics of hypothesis testing - Hypothesis testing for differences	Quiz 7 – 10 points	Type I and II error, Power, Sample size calculations
8	3/6	- No lab	Programming Exam 1	- In person exam on Monday March 6 - Take home portion due through Moodle by Wednesday March 8 at 11:55pm Central ** No Class on Wednesday, March 8 **
Spring Break: March 13-March 17 (No Class)				
9	3/20	Lab 7 - Power calculations - Sample size calculations	Quiz 8 – 10 points	Categorical data: 2x2 tables, chi-square test, odds ratios, relative risk
10	3/27	Lab 8 - Relative risk - Odds ratios	Quiz 9 – 10 points	Categorical data: 2x2 tables, chi-square test, odds ratios, relative risk
11	4/3	Lab 9 - Chi-square tests - Exact tests	Quiz 10 – 10 Points	Simple Linear Regression
12	4/10	Lab 10 - Simple linear regression and correlation	Quiz 11 – 10 points	Prediction and Regression Diagnostics
13	4/17	Lab 11 - Regression diagnostics	No quiz this week	Multiple Linear Regression
14	4/24	Monday: No lab Wednesday: Use lab to work on project	Data analysis project	- Introduce project on Monday April 24 - Project work time on Monday and Wednesday
15	5/1	Monday: Use lab to work on project Wednesday: No lab	Data analysis project	- Project work time on Monday - Presentations in class on Wednesday

Evaluation and Grading

Quizzes (40%)

There will be quizzes each worth 10 points that are due by Sunday at 11:55pm (beginning at the end of Week 2). We will drop your lowest score before computing your quiz total for the semester. The quizzes are intended to assess your good faith effort in working on and understanding the material for that week. Quizzes will ONLY cover material from the two lectures during the week. It is imperative that if you are not able to attend lecture, you are able to get detailed notes from those who were there. Quizzes MUST be taken individually. No collaboration is allowed.

Quizzes will be submitted through the Moodle page for the course. Quizzes may not be submitted late, unless in case of exceptional and unexpected circumstances.

You are NOT required to use SAS or R to do the problems that require statistical software; you may use another statistical

software package of your choosing. However, course staff cannot offer assistance with any other package besides SAS and R.

Quizzes: 100 points total (lowest score dropped)

Midterm Programming Exam (20%)

You will have one programming exam in this course. It focuses on programming either in R or SAS. The test is expected to be a complement to the weekly quizzes, which focus primarily on content knowledge. The exam will have an in-class component and a take-home component. Each component is worth 25 points, for 50 points for the exam.

Exams: 50 points total (25 in class, 25 take-home)

Data Analysis Project (30%)

In the two weeks of class, you will work in small teams on short-term data analysis projects. You will be assigned the dataset and overall task on Monday at the beginning of lecture, and will present your findings on Wednesday of the following week in class. You will also submit a write up of your approach and findings. This project is intended to mimic the short turnaround sometimes expected for providing substantive insight into data.

Data Analysis Exercise: 80 points total (50 points report, 30 points presentation)

Attendance and Active Participation (10%)

When you are in class, be present. We expect you to ask questions, respond to others' questions and be an active group member when appropriate both in lecture and in lab. Your active engagement with your group in the final weeks of the course on the data analysis project is important for this portion of your course grade.

Active Participation: 20 points total

Labs

There will be lab sessions, one per week **beginning in Week 2**. Please note in the syllabus the weeks in which we may not have lab. By completing the lab exercises, you will learn how to program your own statistical data summaries and analyses using the SAS statistical package (www.sas.com) or the R statistical package (www.r-project.org). Students may use SAS and/or R, or are welcome to use any other statistical software. Course staff will not be able to support any other software except SAS and R. Only SAS and R are installed for this course in the SPH Computer Lab. **Students in the Division of Epidemiology are required by their degree program to use SAS.**

The lab exercises will NOT be graded. You do NOT need to turn them in. However, understanding the labs is important and critical for doing well on the programming exams.

The grading scale for the course is based on the total percentage achieved of the 250 available points:

93-100 A	77-79 C+
90-92 A-	73-76 C
87-89 B+	70-73 C-
83-86 B	60-69 D
80-82 B-	Below 60 F

For additional information, please refer to:

<http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html>.

Course Evaluation

The SPH will collect student course evaluations electronically using a software system called CoursEval:

www.sph.umn.edu/courseeval. The system will send email notifications to students when they can access and complete their course evaluations. Students who complete their course evaluations promptly will be able to access their final grades just as soon as the faculty member renders the grade in SPHGrades: www.sph.umn.edu/grades. All students will have access to their final grades through OneStop two weeks after the last day of the semester regardless of whether they completed their course evaluation or not. Student feedback on course content and faculty teaching skills are an important means for improving our work. Please take the time to complete a course evaluation for each of the courses for which you are registered.

Incomplete Contracts

A grade of incomplete "I" shall be assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., documented illness or hospitalization, death in family, etc.), the student was prevented from completing the work of the course on time. The assignment of an "I" requires that a contract be initiated and completed by the student before the last official day of class, and signed by both the student and instructor. If an incomplete is deemed appropriate by the instructor, the student in consultation with the instructor, will specify the time and manner in which the student will complete course requirements.

Extension for completion of the work will not exceed one year (or earlier if designated by the student's college). For more information and to initiate an incomplete contract, students should go to SPHGrades at: www.sph.umn.edu/grades.

University of Minnesota Uniform Grading and Transcript Policy

A link to the policy can be found at onestop.umn.edu.

Other Course Information and Policies

Grade Option Change (if applicable)

For full-semester courses, students may change their grade option, if applicable, through the second week of the semester. Grade option change deadlines for other terms (i.e. summer and half-semester courses) can be found at onestop.umn.edu.

Course Withdrawal

Students should refer to the Refund and Drop/Add Deadlines for the particular term at onestop.umn.edu for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw.

Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Office of Admissions and Student Resources at sph-ssc@umn.edu for further information.

Student Conduct Code

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University, you are expected adhere to Board of Regents Policy: Student Conduct Code. To review the Student Conduct Code, please see: http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf.

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

Scholastic Dishonesty

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. (Student Conduct Code: http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see: <http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html>.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <http://www1.umn.edu/oscai/integrity/student/index.html>. If you have additional questions, please clarify with your instructor for the course. 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.

Makeup Work for Legitimate Absences

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>.

Appropriate Student Use of Class Notes and Course Materials

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: <http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html>.

Sexual Harassment

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: <http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>

Equity, Diversity, Equal Opportunity, and Affirmative Action

The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf.

Disability Accommodations

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center Student Services is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 or ds@umn.edu to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.

For more information, please see the DS website, <https://diversity.umn.edu/disability/>.

Mental Health and Stress Management

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>.

The Office of Student Affairs at the University of Minnesota

The Office for Student Affairs provides services, programs, and facilities that advance student success, inspire students to make life-long positive contributions to society, promote an inclusive environment, and enrich the University of Minnesota community.

Units within the Office for Student Affairs include, the Aurora Center for Advocacy & Education, Boynton Health Service, Central Career Initiatives (CCE, CDes, CFANS), Leadership Education and Development – Undergraduate Programs (LEAD-UP), the Office for Fraternity and Sorority Life, the Office for Student Conduct and Academic Integrity, the Office for Student Engagement, the Parent Program, Recreational Sports, Student and Community Relations, the Student Conflict Resolution Center, the Student Parent HELP Center, Student Unions & Activities, University Counseling & Consulting Services, and University Student Legal Service.

For more information, please see the Office of Student Affairs at <http://www.osa.umn.edu/index.html>.

Academic Freedom and Responsibility for courses that do not involve students in research:

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.

* Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".