School of Public Health
Syllabus and Course Information

UNIVERSITY OF MINNESOTA
Driven to Discover℠

PubH 6450- 001- 007
Biostatistics I (In person course)
Fall 2017

Credits:	**4**
Meeting Days:	**T TH**
Meeting Time:	**1:25 pm – 3:20 pm**
Meeting Place:	**PWB 2-470**
Instructor:	**Robert Leduc**
Office Address:	**Teaching Office:** TBD, Beginning Week 2 **Personal Office:** 2221 University Ave SE, Suite 200, Minneapolis, MN 55414 **Division of Biostatistics Office:** A460 Mayo Building, open Mon-Fri 8:00 am – 4:30 pm
Office Phone:	**612-626-8618**
Fax:	**612-626-9054; Mark cover page with ATTN: Rob Leduc**
E-mail:	**leduc006@umn.edu**
Moodle page:	**https://moodle.umn.edu**
Office Hours:	**TBD**

Teaching Assistants: Meghana Bhimarao, Sandra Castro-Pearson, Meredith Hyun, Ziyu Ji, Benjamin Mayhew, Claire Smith.

TA Office Hours: **TBD**

I. 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. Effective: Fall 2005

II. Course Prerequisites

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

III. 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

- Gaussian Probability Models
- 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

IV. Methods of Instruction and Work Expectations

- Twice weekly lectures
- 13 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.
- Three midterm exams
- 12 homework assignments completed weekly, except in exam weeks.
- Weekly online "Readiness Quizzes"

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. Although this is an in-person course, the Moodle page will be used to distribute materials and store grades.

Course Communication

- In person contact: In class, at office hours, in labs (TAs), and by appointment.
- Discussion forums (aka bulletin boards) on the course Moodle page.
- **Email policy:** I cannot keep up with email questions about course material because of the number of students. Please ask questions in person or post in the discussion forums described above. Email is appropriate for emergencies or for private conversations such as questions about grades.
- Please use your **University of Minnesota email address** (X.500 address) for email. FERPA privacy regulations require that the TAs and I not send any academic information to a non X.500 address. If you have not yet initiated your X.500 email account, you will need to do so at http://www.umn.edu/initiate.

V. Course Text and Readings

Required: *OpenIntro Statistics, 3rd Edition* by Diez, Barr and Çetinkaya-Rundel
https://www.openintro.org/stat/textbook.php

The book is available for **free download** in .pdf format. If you choose, you may purchase a printed bound copy from the University Bookstore or from Amazon at the links on the book website. There are many other materials on the author's website to explore.

Optional books available ONLINE through the UMN Library:

To access these sources online, go to http://www.lib.umn.edu. Click on "Sign In". Search for the book title in the MNCat search line. Click on the resulting link for the book – it should say "Online Access" below the right

version of the book. In the resulting window, click on "Open Source in New Window" in the middle of the page. You can do this from anywhere, but must log in with your X.500 account first.

Basic and Clinical Biostatistics, 4th edition. by B. Dawson & R. Trapp. McGraw-Hill. ISBM 0-07-141018-X.

The Little SAS Book, 5th edition. by L. Delwiche & S. Slaughter, SAS Institute. ISBN 978-1612903439

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 computing resources:

SAS tutorials at UCLA: https://stats.idre.ucla.edu/sas/

R tutorials at UCLA: https://stats.idre.ucla.edu/r/

Introduction to R by CRAN: http://cran.r-project.org/doc/manuals/R-intro.pdf

Software

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 and free to students in a School of Public Health Degree Program; however, when you are no longer enrolled at the University, the site license and the software will eventually expire and an individual license is very expensive. Both software applications will be available on the computers provided for lab sessions, in the SPHere lounge and at Coffman Union. 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 and only these programs are available during the computer lab. We do **NOT** support SAS on Apple computer systems in any form. We do **NOT** support the so-called "University Edition" of SAS, which requires installation of additional virtual machine software on your computer.

Some degree programs within the University of Minnesota may advise one of SAS or R for students in their program. You will need to consult with your degree program (or intended program) for their requirements.

VI. Course Outline/Weekly Schedule

Week	Week Starts	Text Sections (3rd edition)	Homeworks and Labs	Topics
1	9/4	1.2-1.7	Homework 1 Install Software Lab 0 at home	• Introduction, Types of Data, Data Summaries: Graphical Summaries (Bar Charts, Pie – Charts, Stem-Plots, Histograms, Box-Plots); Numerical Summaries (Measures of Central Tendency, Measures of Dispersion) • Study designs
2	9/11	2.1-2.3, 2.5	Homework 2 Lab 1/2 combined.	• Overview of Sampling Variability • Probability, Probability Models and Distributions, Conditional Probability and Diagnostic Testing. Diagnostic Testing (Sensitivity, Specificity) is not covered in the text. See Dawson and Trapp, Chapter 12.
3	9/18	3.1, 3.2, 3.3.1, 3.4	Homework 3 Lab 3	• Probability Distributions for Discrete and Continuous Variables, The Normal Distribution, The Binomial Distribution
4	9/25	2.4 4.1, 4.2, 4.4	Homework 4 Lab 4	• Random Variables, Expected Value (Mean) and Variance of a Random Variable. Sampling Distribution of the Mean and the Sample Proportion, The Central Limit Theorem • One-sample: Moving from Point Estimates to Interval Estimates, Confidence Intervals.
5	10/2		Lab 5	• *Catch up and Review* • ***Exam 1 (Thursday October 5)***
6	10/9	4.3.1, 4.3.4, 4.3.5, 4.5, 5.1	Homework 5 Lab 6	• Confidence Intervals When Sigma is Unknown, Student's T Distribution • Introduction to Hypothesis Testing When Sigma is Known and When Sigma is Unknown
7	10/16	4.3.2, 4.3.3, 5.1, 5.2	Homework 6 Lab 7	• Type I and II Errors and Power for Hypothesis Testing • Linking Confidence Intervals and Hypothesis Testing; Matched Pairs t-test
8	10/23	5.3, 6.1	Homework 7 Lab 8	• Two-Sample t-tests and Two-Sample Confidence Intervals • Confidence Intervals and Hypothesis Testing for One Proportion
9	10/30	6.2	Homework 8 Lab 9	• 2 by 2 Tables: Confidence Intervals and Hypothesis Testing for the Difference in Two Proportions

Week	Week Starts	Text Sections (3rd edition)	Homeworks and Labs	Topics
				• 2 by 2 Tables: Confidence Intervals and Hypothesis Testing for Odds Ratios and Relative Risks (See Dawson and Trapp, Chapter 3)
10	11/6		Lab 10	• *Catch-up and review* • ***Exam II (Thursday November 9)***
11	11/13	6.3, 6.4	Homework 9 Lab 11	• Contingency Tables: Simpson's Paradox; Chi-Square Test • 2 by 2 Tables: McNemar's Test for Matched Pairs in the Binomial Setting
12	11/20 (short week)	Review 1.6.1 7.1, 7.2	Homework 10 Lab 12	• Relationships Between Quantitative Variables: Correlation, Scatterplots • Simple Linear Regression, Residuals, and Cautions
13	11/27	7.1.3, 7.3, 7.4, 8.3	Homework 11 Lab 13	• Simple Linear Regression: Inference, Predictions, and Diagnostics
14	12/4	5.5	Homework 12 Lab 14	• Analysis of Variance (ANOVA) • Nonparametric Methods (time permitting)
15	12/11 (short week)			• ***Exam III (Tuesday, December 12)***

VII. Evaluation and Grading

Homework

- There will be 12 homework assignments. Homework is to be written up and submitted on an individual basis, however it is permissible to work with other students and discuss problems. However, all submitted work must be written in your own words or it will be considered plagiarism. *If all homework is turned in with a ''good faith' effort to solve the problems, then we will drop your two worst weekly scores before computing your homework total for the semester*. The average percentage on homework will represent 30% of your final grade.

- Homework is posted on the Moodle page in each weekly unit, listing a future due date.

- Homework is to be turned in **at the start of class** on the due date (usually Thursdays). Please **staple** your homework together.

- **Homework may be submitted up to 24 hours late at a 15 percentage point penalty**. Extensions may be requested from the instructor in advance of the original due date and may be granted at the instructor's discretion.

- Please do not email homework to the TAs or instructor. We may get confused and lose track of your work.

- Most homework assignments will be made up of textbook questions AND questions that require learning and using statistical software. Similar problems may be covered step-by-step in the lab in the week before the assignment is due.

Readiness Quizzes

- Following each week's lecture, there will be an online quiz in Moodle (excepting certain "short" weeks) of 5-15 questions.
- The window for taking the quiz will open Thursdays after class and close Sundays at noon, with the exception of the week of Thanksgiving and Exam weeks. You are allowed up to 3 attempts at any time during the window. There is no time limit on individual attempts, other than the Thursday-Sunday window.
- Quizzes are multiple choice and you will receive instant feedback/grading. Your score is based on your best attempt: if you correctly answer at least 80% of the questions, your score for that quiz is 100%. If you get less than 80% of the questions correct, then your score is 0%.
- The average of all of your Readiness Quizzes is 10% of your final grade. Note: This is an entire letter grade of your final grade.

Exams

- Exam 1: Thursday, October 5th in class
- Exam 2: Thursday, November 9th in class
- Exam 3: Tuesday, December 12th in class.

You may use any or all of the following to use during the exams: **textbook, lecture notes and any other lecture materials** (e.g., personal class notes, lecture worksheets, homework and their solutions, labs).

A calculator capable of natural log transformations will be needed ("ln" button) for all of the exams.

You **may not** use an internet-capable device during exams, such as a phone, tablet, iPod or computer. Plan accordingly for your choice of calculator.

Sharing of books, notes, worksheets, homework/solutions, labs, calculators, or verbal or electronic comments is **not** permitted during the exams.

Each exam is worth 20% of your final grade.

Labs

- There will be 13 lab sessions, one per week. **Lab exercises will be posted to the class web site; you may wish to print or have the lab document open as you view the lab video for taking notes or following along with the TA.**

- 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, without doing this work you will find it difficult to complete the homework and will not be in a position to analyze your own data for your degree program.

Grading

To compute your final grade, take your average homework percentage (dropping the two lowest scores if a good faith effort has been made on all 12 assignments), your average percent on the readiness quizzes, and your scores on each of the three exams, and calculate using the formula:

Final Course Percent = 0.20*Homework Average + 0.10 * Readiness Quiz Avg + 0.20*(sum of 3 Exams)

The University uses plus and minus grading on a 4.0 cumulative grade point scale. For this particular course, the following final course percents correspond to certain grades, with GPA given below.

A 93%-100%, A- 90% - <93%, B+ 86%- <90%, B 81%- <86%, B- 75%- <81%, C+ 70%- <75%, C 65%- <70%, C- 60%- < 65%, D+ 55-<60%, D 50%- < 55%, F <50%.

The University utilizes plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following:

A	4.000 - Represents achievement that is outstanding relative to the level necessary to meet course requirements
A-	3.667
B+	3.333
B	3.000 - Represents achievement that is significantly above the level necessary to meet course requirements
B-	2.667
C+	2.333
C	2.000 - Represents achievement that meets the course requirements in every respect
C-	1.667
D+	1.333
D	1.000 - Represents achievement that is worthy of credit even though it fails to meet fully the course requirements
S	Represents achievement that is satisfactory, which is equivalent to a C- or better.

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/courseval. 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.

VIII. 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."

Use of Personal Electronic Devices in the Classroom:
Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference:
http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

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 DRC at 612-626-1333 or drc@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.*

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

Student Academic Success Services (SASS): http://www.sass.umn.edu:
Students who wish to improve their academic performance may find assistance from Student Academic Support Services. While tutoring and advising are not offered, SASS provides resources such as individual consultations, workshops, and self-help materials.