

# School of Public Health

## Syllabus and Course Information



UNIVERSITY OF MINNESOTA  
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### PubH 6451-001 Biostatistics II Spring 2015

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**Credits:** 4  
**Meeting Days:** MW  
**Meeting Time:** 10:10am-12:05pm  
**Meeting Place:** MoosT 2-620

**Course Web Page:** <http://www.moodle.umn.edu>

**Co-Instructors:** Robert Leduc, Ph.D.

**Office Address:** A-454-1 Mayo Building (During Office Hours Only)  
Division of Biostatistics

University Office Plaza #200  
221 University Ave SE

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**Office Hours:** TBA

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#### I. 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, 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).

## II. Course Prerequisites

[[[6420, 6450] or [6414, 6415]] with grade of at least B, health sciences grad student] or instr consent

## III. Course Goals and Objectives

Present methods for comparing study groups based on outcome measures that are continuous or binary, and methods for adjusting the comparison. Students will critique papers from health science journals illustrating these methods, to develop their understanding of these statistical approaches and their limitations. Students will use SAS or R to apply each method and will be able to understand and use the output produced.

## IV. Methods of Instruction and Work Expectations

Lectures, online discussion forums, in-class exams, weekly online homework and quizzes, and a semester-long group project.

The University expects the average student to spend two hours outside of class for every credit, so anticipate an average of eight hours per week outside of class in addition to attending class. Here is a breakdown of weekly work expectations for class:

- **Preceding class:** Obtain the course notes from the Moodle page. These will be available at least 24 hours in advance of class.
- **In Class:** Attend lectures; participate in class questions/activities.
- **Readiness Quiz:** Between Wednesday and Friday, take the Readiness Quiz on the Moodle page for that week. Review areas of the notes relating to missed questions on the quiz. Readiness Quizzes may be taken up to 3 times. A final score of 80% (usually 4/5 questions) is required to pass. Grades are recorded as Pass or Fail.
- **Complete Homework:** Homework will be due the following week, usually but not always on Wednesdays. Homework must be turned in at the start of class on the due date. You should address weaknesses highlighted by the Readiness Quiz before getting too far into the homework.

Additionally, throughout the semester we will work in small groups on a final course project to conduct an observational medical or public health study in a virtual environment known as The Islands ([https://learnandteachstatistics.wordpress.com/2015/07/27/the\\_islands/](https://learnandteachstatistics.wordpress.com/2015/07/27/the_islands/)). Your group will work with a TA assigned to you as a statistical consultant on aspects of the study process (e.g. developing a research question, methodology, analysis). This project will go on all semester and require you to consider statistical issues learned in class. The culmination of the project will be a presentation of your team's results to your peers and outside guests in the last week of class.

Materials for class will be distributed through the course Moodle page. You will receive an email invitation to log in to the course Moodle page sent to your UMN X.500 email account. You are required to check your X.500 email account at least daily for course announcements.

In addition to asking questions in class or during office hours for instructors and TAs, discussion forums will be available on the course Moodle page. We will attempt to reply to all questions in the discussion forums within 24 hours of posting. We will not answer questions about course material sent by email, except as part of consulting on individual Island projects. However, email is a valid medium to use to ask questions concerning your grade or how your assignment was graded, and for other private matters such as absences for medical reasons, etc. Instructors and TAs can only respond to emails sent from a student's UMN X.500 email account for reasons of privacy and security.

**Computing.** The course will include examples of data analysis from SAS, version 9.4 and R. You will need SAS **OR** R output to complete your homework. The course Moodle page contains information on where to obtain the software.

You may work with a group of students on the homework, and share SAS or R output. I don't insist that every student run programs, but **every student must write their own homework paper**.

## V. Course Text and Readings

Course notes will be distributed on the course Moodle page. **On reserve at the Biomed Library:**

Moore and McCabe: *Introduction to the Practice of Statistics*, (6th ed.) (text from PubH 6450)

Dawson and Trapp: *Basic and Clinical Biostatistics* (4th ed)

Delwiche and Slaughter: *The Little SAS Book* (4th ed.)

Everitt and Hothorn, *A Handbook of Statistical Analyses using R* (2<sup>nd</sup> ed.)

## VI. Course Outline/Weekly Schedule

<i>Date</i>	<i>Topics</i>
<i>January</i>	18 Review: <i>t</i> -tests, <i>p</i> -values, standard errors
	23 One-way ANOVA
	25 <i>Post hoc</i> pairwise tests and multiple comparisons
<i>February</i>	• 30 Displaying significant differences between means (tables, graphs)
	1 Fisher's Least Significant Difference and Analyzing data on the log scale
	6 Two-factor ANOVA
	• 8 Two-factor ANOVA; adjusting comparisons using strata
	13 Adjusting with strata
	• 15 Simple linear regression (one predictor), Intro to multiple linear regression
	20 Multiple linear regression
	• 22 ANCOVA: Adjusting comparison of groups with regression
	29 Adjusting a comparison with observational data: Framingham Study
<i>March</i>	• 1 Issues in adjusting comparisons; comments on regression; review
	6 Estimating sample size, calculating power
	8 <b>Test 1</b>
	<i>Spring Break, 13-17 March</i>
	20 Review: tables of counts, chi-square test, odds ratio, relative risk
	22 Adjusted comparison of odds: CMH test; logistic regression
	27 Logistic regression: adjusting the comparison of odds
	• 29 Logistic regression: adjusting the comparison of odds; conditional logistic regression
<i>April</i>	3 Logistic regression examples
	• 5 Survival analysis: Survivor function and the Kaplan-Meier estimate
	10 Comparing survivor functions: log-rank and Wilcoxon tests
	• 12 Survival analysis examples; review
	17 Hazard function
	• 19 Proportional hazards regression: adjusting the comparison of hazards
	24 Proportional hazards regression examples
	• 26 Poisson regression: adjusting the comparison of rates
<i>May</i>	1 <b>Test 2</b>
	3 Wrap up; Island presentations

• homework assignment due at the start of class

## VII. Evaluation and Grading

Your final grade will be determined by:

- Weekly Work (35%)
  - Readiness Quizzes (10%)
  - Homework (25%)
- Two Midterm Exams (15% Each)
- Island Project (35%)
  - Final Study Presentation (20%)
  - Island Milestone Activities (12.5%)
  - Peer Rating of Participation in Island milestones and activities (2.5%)

The curve for final grades will be: A = 93–100; A- = 90–<93; B+ = 87–<90; B = 83–<87; B- = 80–<83; C+ = 77–<80; C = 73–<77; C- = 70–<73; D= below 70, F= below 60. For those registered S/N, S = 70-100. Depending on how the final course averages turn out, we may lower some grade lines, but we will not raise them.

**Homework is due at the start of the class noted by the • symbol on the calendar above.** Late homework will not be accepted without prior arrangement with the instructors before the due date. In the event of unavoidable or legitimate circumstances, make-up exams will be offered as per the University's policy on makeup work for legitimate absences (see *Makeup Work for Legitimate Absences* in Section VIII below). Per policy, students must notify the instructors of the circumstances as soon as possible and will be required to provide documentation, if requested.

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](http://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](http://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](http://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](http://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](http://onestop.umn.edu).

### **Course Withdrawal:**

Students should refer to the Refund and Drop/Add Deadlines for the particular term at [onestop.umn.edu](http://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](mailto: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](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](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](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](mailto: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:**

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.