School of Public Health
Syllabus and Course Information

UNIVERSITY OF MINNESOTA
Driven to Discover℠

PubH 6414: Biostatistical Literacy
Spring 2015
Online Sections

Meeting Days: Online

Credits: 3

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Course website: http://ay14.moodle.umn.edu

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COURSE DESCRIPTION

PubH 6414 Biostatistical Literacy has the primary goal of developing student ability to read and interpret statistical results in the primary literature of their specific scientific field of interest.

This course will involve minimal calculation and offer no formal training in any statistical programming software.

Biostatistical Literacy will cover the fundamental concepts of

- study design,
- descriptive statistics,
- hypothesis testing,
- confidence intervals,
- odds ratios,
- relative risks,
- adjusted models in multiple linear,
- logistic and proportional hazards regression, and
- survival analysis.

The focus will be when to use a given method and how to interpret the results, not the actual computation or computer programming to obtain results from raw data.

COURSE PREREQUISITES

The course presupposes a basic knowledge of mathematics (including algebra). A Math Refresher website has been created by the University of Minnesota School of Public Health to help you review these concepts (http://www.sph.umn.edu/ce/tools/math/). It is entirely up to you whether you utilize the review site. However, it's there to help you feel confident of the basic mathematical operations that may be referred to in the course.

COURSE GOALS AND OBJECTIVES

At the conclusion of the course, students will be able to:

1. Ask questions. Read study results with a critical eye and ask questions about how they were obtained and what they mean.

2. Find answers. Be able to find answers to the questions in the original study article.

3. Look for limitations. Look critically at the study's strengths and limitations and assess how strong the evidence is for the claimed result.

METHODS OF INSTRUCTION AND WORK EXPECTATIONS

The emphasis in this class will be on learning by doing. Collaborative groups are used both to facilitate learning and to obtain experience in collaborating with others on a research team. Weekly learning activities will focus on exploring the concepts and applying them to reading the research literature. Students will read and critically analyze at least one article from the medical or public health literature each week. Students will also work in

groups to design, analyze and report a research study, in order to develop a deeper understanding of what is involved in designing and carrying out a study.

NOTE: **The online section is not self-paced.**

Here is the breakdown of the weekly work expectations:

- **Preceding weekend / early part of the week**: Students are expected to prepare for the week by reading several selections from the textbook and viewing several short (10-20 minute) online presentations. An online readiness quiz covering the basic terms and definitions from the readings and lecture material will be **due each Wednesday by 11:55pm**. Students are encouraged to work with other students on the readiness quizzes.

- **During the week / later part of the week**: The week will be devoted to working collaboratively in small and large groups to explore and apply the concepts. Your learning experience is thus dependent–to some extent–on your classmates and vice versa. Because of this, it is essential that you not only participate in the activities and discussions, but that you show up prepared having completed the preceding weekend tasks. The exploration (concept) and application (literature) activities are best carried out with a partner or study group in real time, either in person or via teleconference, chat, Skype, FaceTime, Google Hangouts, or similar means, but you may also work independently if you prefer. Plan to spend 2 – 3 hours per week working on the learning activities, alone or with your study group. We will also work collaboratively online as a class to create the answer keys for the concept and literature activities. Each student is expected to contribute at least once to each key each week. The learning activity worksheets as well as the contributions to the collaborative keys are all **due each Sunday by 11:55pm.**

- **At the end of the week**: An online end-of-week quiz covering the concept and literature activities of the week, as well as concepts from earlier weeks, will be **due each Sunday by 11:55pm**. Students are expected to complete the end-of-week quizzes independently.

In the Island Project, you will also be experiencing the learn-by-doing approach. You will work in groups to design and carry out a medical or public health study in order to develop a deeper understanding of the process for research studies. To ease the process of collecting "human" data while still maintaining the flavor of conducting research, you will be using a virtual world called *the Island* (http://escholarship.org/uc/item/2q0740hv). Your group will work with a statistical consulting team comprised of students from the STAT 4893W consulting course during the semester in all aspects of the study process (e.g., research question, methodology, analysis). This project will be semester-long and will require you to apply the concepts learned in the course at a higher level. The culmination of the project will be a presentation of the results of the study to your peers during the last week of class.

Course Communication: You must use your U of M email address! All course communications will be sent to your University of Minnesota 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.

COURSE TEXT AND READINGS

There is a **required textbook** for the course:

Harvey Motulsky's Intuitive Biostatistics: A Nonmathematical Guide to Statistical Thinking (Oxford University Press, 3rd edition, 2014).

The book is available through the University of Minnesota bookstore.

The literature articles used in this course will be available via the course website.

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Course Outline/Weekly Schedule

Unit	*Course Dates* *(Monday - Sunday)*	*Topics, Lectures and Textbook Readings*	*Weekly Assignments and Quizzes* *(deadlines Wednesday and Sunday nights)*	*Island Proje* *PubH 6414 students* *"Investigato* *(deadlines Saturday evenings)*
1.	**2015** Jan. 20 - 25 (Tues-Sun)	**INTRODUCTION TO BIOSTATISTICS** **Textbook Readings:** ● Ch 1. Statistics and Probability are not Intuitive ● Ch 2. The Complexities of Probability ● Ch 3. From Sample to Population **Online Lectures:** ● Biostatistical Literacy ● Cycle of Research ● Sampling Methods ● Study Designs	Readiness Quiz (due **SATURDAY** by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	
2.	Jan. 26 – Feb. 1	**CONFIDENCE INTERVAL FOR A PROPORTION** **Textbook Reading:** ● Ch 4. Confidence Interval of a Proportion **Online Lectures:** ● Types of Variables ● Confidence Interval for Proportion	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	Instructor wil Island investig teams. Teams briefly to disc roles and communicatio Explore the Is
3.	Feb. 2 - 8	**CONFIDENCE INTERVALS FOR SURVIVAL DATA** **Textbook Reading:** ● Ch 5. Confidence Interval of Survival Data **Online Lecture:** ● Survival Data	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	Island researc question due t consulting tea **SATURDAY 5pm**. Instruct approve via re email.
4.	Feb. 9 – 15	**SUMMARIZING CONTINUOUS VARIABLES**	Readiness Quiz (due Wednesday by 11:55pm)	(Consultants: question and l review prior t

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		Textbook Readings: ● Ch 7. Graphing Continuous Data ● Ch 9. Quantifying Scatter **Online Lecture:** ● Summarizing Continuous Data	Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	**Meeting 1** wi **instructor [la** discuss roles a discuss and re brainstorm po checklist will
5.	Feb. 16 – 22	**CONFIDENCE INTERVAL FOR A MEAN** **Textbook Readings:** ● Ch 10. The Gaussian (Normal) Distribution ● Ch 12. Confidence Interval of a Mean ● Ch 14. Error Bars **Online Lecture:** ● Confidence Interval for a Mean	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	Carry out sma study. Write Introdu section of you report. Email both to consulting tea **SATURDAY** **5pm**.
6.	Feb. 23 – Mar. 1	**HYPOTHESIS TESTING** **Textbook Readings:** ● Ch 15. Introducing P-values ● Ch 16. Statistical Significance and Hypothesis Testing ● Ch 17. Relationship Between Confidence Intervals and Statistical Significance ● Ch 18. Interpreting a Result that is Statistically Significant ● Ch 19. Interpreting a Result that is not Statistically Significant ● Ch 20. Statistical Power **Online Lecture:** ● Hypothesis Testing	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	(Break)
7.	Mar. 2 - 8	**CHALLENGES IN STATISTICS** **Textbook Readings:** ● Ch 22. Multiple Comparisons Concepts ● Ch 23. The Ubiquity of Multiple Comparisons ● Ch 24. Normality Tests ● Ch 25. Outliers ● Ch 26. Choosing a Sample Size **Online Lectures:** ● Multiple Comparisons ● Normality ● Outliers ● Sample Size	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	**Meeting 2: C** **with consulti** study design, sample size, d analysis meth Methods secti Moodle **SATU**

8.	Mar. 9 – 15	**STATISTICAL TESTS, PART 1** **Textbook Readings:** ● Ch 27. Comparing Proportions ● Ch 28. Case-Control studies **Online Lectures:** ● Comparing Proportions: Odds ● Comparing Proportions: Risks	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	Carry out you data collectio
	Mar. 16 – 22	**SPRING BREAK!**		
9.	Mar. 23 – 29	**STATISTICAL TESTS, PART 2** **Textbook Readings:** ● Ch 29: Comparing Survival Curves ● Ch 30. Comparing Two Means: Unpaired T-Test ● Ch 31. Comparing Two Paired Groups **Online Lectures:** ● Comparing Survival Curves ● Comparing Two Means ● Comparing Paired Groups	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	Complete you study data collection. Clean up the dataset. Clean study d due to consult team **WEDNES (note differe by 5pm**.
10.	Mar. 30 – Apr. 5	**COMMUNICATING RISK** **Textbook Readings:** ● (Lecture) Communicating Risk: Absolute, Relative, Natural Frequencies ● Ch 42. Sensitivity, specificity and ROC curves. **Online Lecture:** ● Screening Tests	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	(Break)
11.	Apr. 6 - 12	**CORRELATION AND REGRESSION** **Textbook Readings:** ● Ch 32. Correlation ● Ch 33. Simple Linear Regression **Online Lectures:** ● Correlation ● Simple Linear Regression	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	(Break)

12.	Apr. 13 – 19	**MULTIPLE LINEAR REGRESSION** **Textbook Readings:** ● Ch 34. Introducing Models ● Ch 35. Comparing Models ● Ch 37. Multiple Regression **Online Lecture:** ● Multiple Regression	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	**Meeting 3 wi** **instructor**: pr results and fo
13.	Apr. 20 - 26	**LOGISTIC REGRESSION AND PROPORTIONAL HAZARDS REGRESSION** **Textbook Reading:** ● Ch 38. Logistic and Proportional Hazards Regression **Online Lectures:** ● Logistic Regression ● Proportional Hazards Regression	Readiness Quiz (due Wednesday by 11:55pm) Concept Activity Only (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	Write Results Discussion se of your report Communicate follow-up que or requests to consulting tea early in the w
14.	Apr. 27 – May 3	**ANOVA, NONPARAMETRIC TESTS** **Textbook Readings:** ● Ch 21. Equivalence and Non-Inferiority Testing ● Ch 39. Analysis of Variance. ● Ch 40. Multiple Comparisons Tests after ANOVA ● Ch 41. Nonparametric Methods ● Ch 43. Meta-Analysis **Online Lectures:** ● Analysis of Variance (ANOVA) ● Nonparametric Methods	Readiness Quiz (due Wednesday by 11:55pm) Concept and Literature Activities (due Sunday by 11:55pm) Contributions to Collaborative Keys (due Sunday by 11:55pm) End-of-Week Quiz (due Sunday by 11:55pm)	Write your stu abstract and r and finalize y report. Complete Isla study report d Moodle **Satu** **by 5pm.**
15.	May 4 – 10	**ISLAND PROJECT PRESENTATIONS AND REVIEWS**	Biostatistical Literacy Quiz (due Sunday by 11:55pm)	Project presentations Q&A (all wee Peer review o another team' report due Sa by 5pm. Peer ratings d Saturday by 5 Investigators due Saturday 5pm.

EVALUATION AND GRADING

PubH 6414 can only be taken A/F. The S/N option is not available for PubH 6414. Grading is determined by:

- **Weekly work** (Total: 70%)
  - Readiness Quizzes (20%)
  - Active and timely participation in class activities and collaborative keys (10%)
  - End-of-week quizzes (40%)

- **Island Project** (Total: 30%)
  - Methods (10%),
  - Final study report (15%),
  - Active and timely participation, as determined by peer ratings (2.5%)
  - Active and timely participation, as determined by instructor/TA judgment (2.5%)
    - Note: There will be a lateness penalty for missing Island deadlines (highlighted blue).

Late Policy: This course covers a large amount of material in a short time. The group and class activities depend on the active and timely participation of all students. Therefore **late assignments or quizzes will not be accepted**.

Academic Integrity Policy: The goal of this course is to enable students to read and interpret statistical results in the primary literature. I expect that students will complete all quizzes **INDEPENDENTLY,** without assistance from any other people. If I have any reason to suspect that a student gave assistance on a quiz to another student or received assistance on a quiz from another student or a person outside the class, I will file a claim with the Office of Student Conduct and Academic Integrity.

A/F letter grade will be determined by total effort as follows:

A = 93-100%	(4.0) Represents achievement that is outstanding relative to the level necessary to meet course requirements.
A- = 90-92%	
B+ = 87-89%	
B = 83-86%	(3.0) Represents achievement that is significantly above the level necessary to meet course requirements.
B- = 80-82%	
C+ = 77-79%	
C = 73-76%	(2.0) Represents achievement that meets the minimum course requirements.
C- = 70-72%	
F =	Represents failure (or no credit) and signifies that the 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.

***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.

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. Disability Services (DS) 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 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.

Academic Freedom and Responsibility: ***for courses that do <u>not</u> 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. *[Customize with names and contact information as appropriate for the course/college/campus.]*

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

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