

Introduction to Biostatistics

University of Iowa
171:161 (BIOS:5110)
Spring 2014
Credit: 3 s.h.

Lecture:	9:30 a.m - 10:50 a.m. Tuesday & Thursday CPHB N110	Instructor:	Prof. Patrick Breheny
		Office:	N336 CPHB
		Phone:	384-1584
		e-mail:	patrick-breheny@uiowa.edu
		Office hours:	Wed. 1:00 p.m. – 3:00 p.m. Thur. 11:00 a.m. – 12:00 p.m.
Section A01:	11:00 a.m - 11:50 a.m. Tuesday CPHB C201	TA:	Ryan Miller
		e-mail:	ryan-e-miller@uiowa.edu
		Office hours:	Mon. 8:30 a.m. – 10:00 a.m. Wed. 11:30 a.m. – 12:30 p.m. Wed. 3:00 p.m. – 4:30 p.m.
Section A02:	11:00 a.m - 11:50 a.m. Tuesday CPHB C401	TA:	Kaitlin Lockhart
		e-mail:	kaitlin-lockhart@uiowa.edu
		Office hours:	Mon. 11:30 a.m. – 12:30 p.m. Tue. 4:30 p.m. – 5:30 p.m.
Section A03:	3:00 p.m - 3:50 p.m. Wednesday CPHB C401	TA:	Joseph Moen
		e-mail:	joseph-moen@uiowa.edu
		Office hours:	Mon. 10:00 a.m. - 11:00 a.m. Wed. 11:00 a.m. – 12:00 p.m.

All TA Office hours will be held in CPHB S249. If you are unable to make it to office hours, feel free to contact one of us to set up an appointment.

Course description: This is an introductory course that covers the primary statistics concepts and methods used in medicine, public health, and the biological sciences. The objectives for this course are for you to be able to:

- Think statistically – to understand the importance of collecting data and using appropriate statistical methods in order to test hypotheses, estimate unknown quantities, and conduct research
- Recognize the strengths and limitations of basic statistical techniques
- Conduct analyses using those techniques
- Better comprehend journal articles containing statistical analyses
- Have the necessary background to enroll in 171:162 (BIOS:5120).

Suggested text: No text is required in this course; the notes are self-sufficient. Many students, however, like to purchase a textbook for (a) additional problems/exercises/examples or (b) another perspective or explanation of a topic. I suggest the following two texts:

- Daniel, W. (2009): *Biostatistics: A Foundation for Analysis in the Health Sciences (Ninth Edition)*. Wiley.
- Motulsky, H. (2010): *Intuitive Biostatistics (Second Edition)*. Oxford University Press.

The book by Daniel provides hundreds of additional examples and problems. In my opinion, it is the best book for purpose (a) above. The book by Motulsky attempts to get across the ideas of statistics using verbal explanations and examples rather than equations, and is the best book I know of for purpose (b) above. The book does not, however, have problems, solutions, and exercises.

Prerequisite: College algebra.

Course website: The course notes, assignments, data sets, and other relevant materials will be made available on the course web site:

<http://myweb.uiowa.edu/pbreheny/161/s14>

Grades, solutions, copyrighted articles, and other things that cannot be posted to the web will be made available via ICON: <https://icon.uiowa.edu>

Homework: There will be one homework assignment per week, due the following week at the beginning of class on Tuesday. Graded assignments will be returned in lab. Solutions will be posted to ICON on Tuesday afternoons. Clearly, no homework can be accepted after that (see the section on grading for ramifications).

You are encouraged to work in groups of two or three, and turn in one copy of the homework per group. I have found this to work very well in the past, as group discussions are valuable for retention and understanding of the material, and working well in a group is a vital part of being a professional. If you would like help in finding a group, please send your TA an e-mail.

Computing: Homework for this course will occasionally involve the use of a computer for data analysis. You may use any statistical software you would like for this analysis, although the software packages that will be covered in lab are SAS and R. R is free and open-source. SAS is not; if you would like to use SAS outside the lab, you will have to either use Virtual Desktop or purchase a student license.

Quizzes: There will be four quizzes in this class. Quizzes will replace the last half-hour of lecture on the following dates:

- Quiz 1 February 13
- Quiz 2 March 6
- Quiz 3 April 10
- Quiz 4 May 1

You will be asked to perform calculations on these quizzes, so bring a calculator with you.

Final exam: There will be a comprehensive final exam in this class; time and date to be determined.

Grading: Your grade will be based on a weighted average of homework (26%), quizzes (37%), and the final exam (37%). Each homework assignment is worth 2% of your grade. If you fail to turn in a homework assignment, that 2% of weight is added to the quizzes and final exam (each getting 1%). For example, suppose you only turn in 11 of the 13 homework assignments; in that case, homework would be worth 22% of your final grade, and quizzes and the final exam each worth 39%.

In the event that a grade on a homework assignment is lower than your quiz/final average, that homework will be automatically dropped – *i.e.*, turning in homework cannot hurt your final grade in this course.

Attendance: Regular attendance in this course is expected. No direct penalty will be applied for missing lectures. However, assignments, quizzes, and the final will be based entirely on lecture material, so skipping lecture is likely to hurt your grade (and, of course, your understanding of the material).

Corrections: Despite my best efforts, my notes occasionally have mistakes. If you spot a mistake, I very much want you to let me know about it so that I can correct it. I will award 1 bonus point (to be added to your homework total) for pointing out a typographical error and three bonus points for an error in content. Corrections will be made to the online version of the notes and described on the course home page. Once an error has been corrected online, no more bonus points for that mistake are available.

Electronic communication: I will occasionally send notices to the class through e-mail (to your `uiowa.edu` account), so please check that account regularly.

Academic misconduct: You are allowed (encouraged, actually) to work together on homework assignments. In addition, quizzes and the final exam are open-book, open-note. However, you are not allowed to copy off another student during exams, or use a cell phone or any device capable of messaging, texting, or accessing the internet. Any of these actions will be considered cheating. The University of Iowa takes cheating on examinations very seriously, and has in place a number of rather severe academic sanctions, a guide to which may be found at <http://dos.uiowa.edu/policy-list/current/student-responsibilities-6/academic-misconduct-6>.

Complaints: Students with suggestions or complaints should see me first, and if we cannot come to an agreement, I will direct you to the head of the department, Prof. Kathryn Chaloner, N332A CPHB, kathryn-chaloner@uiowa.edu. Students may also contact the Associate Dean for Education and Student Affairs in the College of Public Health or the Office of the University Ombudsperson. If a complaint cannot be resolved at the departmental and/or collegiate level, students may file a formal complaint utilizing the procedure specified in the Operations Manual (II-29.7)

Disabilities: If anyone has a disability requiring special accommodations, please let me know as soon as possible, so that these arrangements can be made.

Administrative Home: This course is given by the College of Public Health. This means that class policies on matters such as requirements, grading, and sanctions for academic dishonesty are governed by the College of Public Health. Students wishing to add or drop this course after the official deadline must receive the approval of the Associate Dean for Academic and Student Affairs in the College of Public Health. Details of the University policy of cross enrollments may be found at: <http://www.uiowa.edu/~provost/deos/crossenroll.doc>.

Sexual Harassment: Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Operations Manual for the full University Policy: <http://www.uiowa.edu/~our/opmanual/ii/04.htm>.

Severe Weather: In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit <http://hawkalert.uiowa.edu>.

Public Health Competencies: Successful students in this course will learn to do the following:

1. Describe the role of biostatistics in the Public Health discipline
2. Describe basic concepts of probability, random variation and commonly used statistical probability distributions.
3. Describe preferred methodological alternatives to commonly used statistical methods when assumptions are not met.
4. Distinguish among the different measurement scales and the implications for selection of statistical methods to be used based on these distinctions.
5. Apply descriptive techniques commonly used to summarize public health data.
6. Apply common statistical methods for inference.
7. Apply descriptive and inferential methodologies according to the type of study design for answering a particular research question.
8. Apply basic informatics techniques with vital statistics and public health records in the description of public health characteristics and in public health research and evaluation.
9. Interpret results of statistical analyses found in public health studies.

Course schedule (Subject to change):

Week of	Topics
January 23	Introduction; study design
January 30	Hypothesis tests and confidence intervals
February 6	Observational studies and confounding Descriptive statistics and graphics
February 13	Correlation and regression
February 20	Probability
February 27	The binomial distribution One-sample categorical data
March 6	The normal distribution
March 13	The central limit theorem
March 20	Spring break – no class
March 27	Applying the central limit theorem Approximate inference for one-sample categorical data
April 3	One-sample continuous data Power and sample size
April 10	Two-sample categorical data (start)
April 17	Two-sample categorical data (end) Two-sample continuous data (start)
April 24	Two-sample continuous data (end)
May 1	Multiple comparisons and ANOVA
May 8	Survival analysis
May 15	Final exam

Bold denotes the dates of quizzes and tests – note that the date for the final exam has not yet been set by the University.

I look forward to getting to know you, and I hope that we have a great semester together.