Introduction to Biostatistics

University of Iowa
BIOS:4120
Spring 2026
Credit: 3 s.h.

Lecture:	9:30a – 10:50a Tuesday & Thursday CPHB N110	**Instructor:** **Office:** **Phone:** **e-mail:** **Office hours:**	Prof. Patrick Breheny N336 CPHB 384-1584 patrick-breheny@uiowa.edu Mon. 2:00p – 3:30p Wed. 1:00p – 2:30p
Section A01:	11:00a – 11:50a Tuesday CPHB C201	**TA:** **e-mail:** **Office hours:**	Hannah Wellens hannah-wellens@uiowa.edu Mon. 9:00a – 10:00a Tue. 8:15a – 9:15a Tue. 2:30p – 3:30p Thu. 8:15a – 9:15a
Section A02:	11:00a – 11:50a Tuesday CPHB C401	**TA:** **e-mail:** **Office hours:**	Joshua Wells joshua-wells@uiowa.edu Mon. 11:30a – 12:30p Tue. 4:20p – 5:00p Wed. 11:30a – 12:30p Fri. 11:30a – 1:00p
Sections A03 and A04:	3:30p – 4:20p Tuesday CPHB C401	**TA:** **e-mail:** **Office hours:**	Joshua Wells joshua-wells@uiowa.edu See above
Section A05:	3:30p – 4:20p Wednesday CPHB C401	**TA:** **e-mail:** **Office hours:**	Hannah Wellens hannah-wellens@uiowa.edu See above

All TA Office hours will be held in CPHB N324. 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
- Analyze data using basic statistical methods

- Recognize the strengths and limitations of those methods
- Better comprehend journal articles containing statistical analyses
- Have the necessary background to enroll in Regression & ANOVA in Health Sciences (BIOS 5120)

Suggested text: No text is required in this course; the notes are self-sufficient. However, some students 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 and Cross, C. (2018): *Biostatistics: A Foundation for Analysis in the Health Sciences (Eleventh Edition)*. Wiley.
- Motulsky, H. (2017): *Intuitive Biostatistics (Fourth Edition)*. Oxford University Press.

The book by Daniel provides hundreds of additional examples and problems. In my opinion, it is a very good 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 a very good book for purpose (b) above. The book does not, however, have problems, solutions, and exercises.

Prerequisite: College algebra.

Course website: The schedule of topics for the course, as well as notes, assignments, labs, data sets, and other relevant materials is available on the course web site: https://pbreheny.org/4120/s26 Assignment scores, solutions, and recorded lectures 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 that we will cover in lecture/lab is `R`. `R` is free, open-source software and runs on all operating systems (Windows/Mac/Linux).

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

Quiz 1	February 12
Quiz 2	March 5
Quiz 3	April 9
Quiz 4	April 30

The final, which will be comprehensive, will take place during finals week, although the University has yet to determine the time and date.

All examinations (quizzes and final) are open-book, open-note. However, you may not use a laptop, cellphone, or any device capable of communication or internet access. Also, you will be asked to perform calculations on these quizzes, so bring a calculator with you (again, your phone is not an acceptable substitute for a calculator during an exam).

In addition, there will be one computational assessment that will take place during lab during the week of **April 21** (sort of like a quiz for being able to analyze data using software).

Grading: Your grade will be based on a weighted average of homework (26%), computational assessment (5%), quizzes (36%), and the final exam (33%). 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, quizzes worth 38%, and final exam worth 35%. 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. The grading scale for the course is as follows:

90–100	A	80–85	B+	70–75	B-	55–65	C
85–90	A-	75–80	B	65–70	C+	≤ 55	F

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 two bonus points (to be added to your homework total) for pointing out a typographical error and five bonus points for an error in content. Corrections will be made to the online version of the notes and (for meaningful errors) 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.

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

Academic misconduct: You are allowed (encouraged!) 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. You can read more about the consequences of academic misconduct at http://dos.uiowa.edu/policies/academic-misconduct.

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.

Concerns: Students with suggestions or complaints should see me first, and if we cannot come to an agreement, I will direct you to the Departmental DEO, Prof. Joseph Cavanaugh, N332 CPHB, joe-cavanaugh@uiowa.edu. Students may also contact the Undergraduate Program Director (if appropriate) or the Associate Dean for Academic Affairs in the College of Public Health. Another resource for students is 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 Section II, Chapter 29.7 of the Operations Manual: http://opsmanual.uiowa.edu.

Accommodations for students with disabilities: If you have a diagnosed disability or any other condition that impacts your ability to complete the course requirements, please inform me as early in the semester as possible, preferably at least two weeks prior to the scheduled activity. For additional information, see https://sds.studentlife.uiowa.edu/students/apply.

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 Affairs in the College of Public Health. Details of the University policy of cross enrollments may be found at: https://www.provost.uiowa.edu/sites/provost.uiowa.edu/files/crossenroll.pdf.

University policies and resources: At the University of Iowa, we strive for a climate that encourages learning while also protecting the freedoms and rights of our students and faculty. Please review the following course policies, expectations, and resources at https://provost.uiowa.edu/student-course-policies. Visit the Dean of Students website for additional student policies and procedures.

- Absences for religious holy days
- Basic needs and support for students
- Classroom expectations
- Free speech and expression
- Mental health
- Nondiscrimination in the classroom
- Sexual harassment/misconduct and supportive measures
- Sharing of class recordings