STAT 212: Biostatistics

Fall 2025 | Full Semester | MWF 11-11:50am (L1) & 12-12:50pm (L2) | Wohler's 141 (in person) | 3 credit hours

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1. Student Learning Outcomes

After completing this course, students should be able to…

- Recognize statistics as a scientific approach to **making decisions from data** while **acknowledging the uncertainty** that arises from a variety of factors.
- Frame a **scientific question** into the form of a basic **statistical investigation.**
- Apply foundational statistical methods, namely **z-tests**, **t-tests** and **linear models**, to draw insights from basic statistical investigations.
- Identify and calculate common measures of **risk comparison** (like relative risks and odds ratios) and **test accuracy** (like sensitivity and positive predictive value) to make sense of biomedical data.
- Interpret **standard errors**, **p-values** and **confidence intervals** to make population-level claims and evaluate our uncertainty in a variety of data and methodological contexts.
- Recognize different design choices that researchers make and how those choices affect the **causality** and **generalizability** arguments that can be made from statistics.
- Glean key methods and findings from the abstract, tables, and figures of a **bio-medical research paper** to defend or critique the arguments being made.
- Use **RStudio** as a **coding tool** for data visualization, basic data wrangling, statistical testing, and modeling ***and* be adept** at **teaching yourself** new things using generative AI tools or online resources.

2. Course Description (list of topics covered)

This is an *introduction* to biostatistics that covers Descriptive Statistics, Basic Data Visualizations, Confidence Intervals, One and Two-Sample Hypothesis Tests for means and proportions, Test Accuracy measures, Relative Risk & Odds Ratios, Interpretation of Hazard Ratios and Survival Curves, Simple and Multiple Linear Regression, Experimental and Observational Design, Sampling, and Strategies for Reading Biomedical Research Papers. This course will also introduce the R programming language with RStudio to allow MCB and IB students to meet department recommendations to engage with statistical computing.

Prerequisites: Basic understanding of algebra assumed. No prior programming or statistics coursework necessary.

Special Note: Credit is not given for both STAT 212 and STAT 200

General Education: This course satisfies the General Education criteria for Quantitative Reasoning I

3. Tips for Succeeding in STAT 212

The time you will need to succeed in this course will vary from person to person, but **most students should plan to dedicate up to 6 hours *outside* of class time on STAT 212 each week**. See Chapter 0 for more tips to succeed, but I will highlight a few points here in the syllabus.

Attendance

- Do your best to come to class regularly, turn off distractions, and engage fully in both the lecture and discussion times. **Attendance is encouraged but not required**.
- If missing class, watch the **published class recordings** on the STAT 212 channel linked on the home page. *If you are falling behind in the course due to extenuating circumstances, please reach out to me!*

Making the Most of the Class Notes

- In addition to reading through the notes on your own, please check out the **reflection questions** at the end of each section to help review. These are purposefully more open-ended. I don't have answers posted for these because I want to incentivize you to grapple with them first. But you are *always* welcome to talk through them with us at office hours!
- There are also some **additional practice questions** at the end of each chapter if you think you need it. For most of these, I have created a video on canvas that you can reference if you're stuck.

Succeeding on Labs

- For most Lab assignments, there is often **Pre-lab Work** (videos, tutorials, practice questions) to cover new software features. **Schedule about 30 min - 1 hour** to complete these ***before*** starting the Lab.
- **Start early and/or take Advantage of Lab Days.** Lab Days are dedicated class times where you may come to ask questions and work on your Lab assignment. If you are anxious about coding, I would encourage you to come work with us so we can help you if you get stuck! *Note: you will get the most benefit from lab day or office hours if you have completed the pre-lab work and started the first question or two.*

Preparing for Exams

- **Try the practice exam *as if you were taking a real exam***. Use the exam guide on the assessment overview page, time yourself, and try not to use your notes—this will help you gauge your readiness. Consider doing your first attempt of each homework like this to get more "test-taking practice."
- **Office Hours** are times when me or the course assistants are available to help you! You can just show up, but you will get more out of the experience if you prepare a bit. **Do your best to organize your questions ahead of time**, or highlight what topics in the notes you want to discuss more! We **cannot** answer any variation of "**Is this correct?**" or "**Can you check my work?**" Ask a *targeted* question. Tell us how you were thinking about it, or tell us what part/term is confusing you. The more detailed you can get and the more you can articulate your thinking, the more we can help you out!

4. Required and Recommended Course Materials, Equipment, and Software

- **Learning Management System:** This course will use **Canvas** as our learning management system**:** https://canvas.illinois.edu/
- **Course Notes:** Everyone should either use the (free) digital chapter pdfs posted on Canvas or buy a hard copy from the Illini Union bookstore of the complete course notes. This is the "textbook" for the course.
- **Basic calculator:** Students should have a calculator to complete basic functions (arithmetic, square roots, and exponents). Note that for exams in the CBTF, you will have access to a TI-34 calculator.
- **R and RStudio:** This is a statistical programming software that we'll use for many of our Lab assignments. Most devices will let you install it on your computer for free (instructions for downloading provided later!). You may also find it sufficient to use RStudio Cloud online for 25 hrs/month free.
- **Microsoft Excel:** Students will also need to use Microsoft Excel. Students may use their university access to Office 365 to use Excel online or to download Excel to a personal computer.

5. Grading Breakdown and Final Letter Grades

Course assignments and their respective weight in final grades can be summarized as follows:

- Homework: 12% (120 points)
- Labs: 28% (280 points)
- Exams: 60% (600 points)

Your course grade is taken out of 1,000 points (earning 1,000 points equates with getting a 100% for the course). Your score is associated with your grade as shown below. **Grades won't be curved at the end of the semester.** If you see a possible grading mistake on any of your assignments, it is *your* responsibility to inform Kelly **within 2 weeks of the score being posted**. At the end of the semester, you may not request a re-grade on assignments from the middle of the semester.

Grading Scale

A+ = 970+ or 97+%	B+ = 870-899 or 87-89.9%	C+ = 770-799 or 77-79.9%	D+ = 670-699 or 67-69.9%
A = 930-969 or 93-96.9%	B = 830-869 or 83-86.9%	C = 730-769 or 73-76.9%	D = 630-669 or 63-66.9%
A- = 900-929 or 90-92.9%	B- = 800-829 or 80-82.9%	C- = 700-729 or 70-72.9%	D- = 600-629 or 60-62.9%
			F = <600 or <60%

6. Assignments

Homework (120 pts): There will be 15 weekly Homework questionnaires (each worth 10 points) available on PrairieLearn to cover material from the previous chapter. These are scored like the exams, where you get two attempts on each question group—one for full credit and one for half credit. However, you can always make new instances of the homework up until the deadline to improve your score!

- **3 homework scores will be dropped** (can include missed homeworks). 12 will count (120 point max). *Homework drops will be applied in the gradebook near the end of the semester.*
- **Late Assignment Policy:** Homeworks may **not** be completed late for credit. *Exception only in the case that you have an emergency, which may require a letter from the college or other official source (e.g., The Student Assistance Center or DRES) requesting flexibility due to excusable circumstances.*

Labs (280 pts): There will be 9 Lab assignments (each worth 35 points) during the semester that provide you with more practical experience applying the content we are learning. These assignments have more ***open-ended*** questions. Lab assignments typically involve coding in RStudio, basic use of Excel, or reading a research paper that uses statistical methods we have recently learned.

- **1 Lab score will be dropped** (may include missed lab). Only 8 will count (280 point max). *The Lab drop will be applied in the gradebook at the end of the semester once all lab grades are in.*
- Labs may be completed individually, or in groups of 2 or 3.
- **Late Assignment Policy:** Labs may be turned in late, with a penalty of 2pts off per 24 hour period (e.g., 1 minute late is -2pts; 24 hours and 1 min late is -4pts, etc.). Submissions more than 7 days late will **not** be accepted. *Exception only in the case that you have an emergency, which may require a letter from the college or other official source (e.g., The Student Assistance Center or DRES) requesting flexibility due to excusable circumstances.*

Midterm Exams (450 pts): There will be 3 midterm exams during Weeks 5, 9, and 12. All 3 of these exams are worth 150 points each. Exams are similar to homework questions and questions throughout the notes, and there is a practice exam on prairie learn for you to try as well. There will be a reference sheet provided on the exam with any relevant formulas.

- If you ***miss*** a midterm for a ***non-excused*** reason (by choice, forgot to sign up for an exam slot and no slots were left, missed a reservation due to confusion over time/date, non-school-sponsored travel, non-documentable illness, etc.), then that will count as a 0 in the gradebook. *See Midterm replacement policy below.*
- If you ***miss*** a midterm for an ***excusable*** reason (DRES-related reasons, sports/school functions, documented illness, funeral, or some documentable circumstance), you might be eligible for a make-up.
    - A make up exam depends on 1) Letting me know early enough (no later than 24 hours after the exam window ends), and 2) Satisfactory homework progress for that unit (at least 80% average on that unit's homework *excluding* any due after your emergency or conflict occurred).
    - If it's too late for a make-up exam, but the reason and late timing of notification is valid, we can discuss pro-rating your Final Exam for this midterm (i.e., double Final Exam replacement).

Final Exam (150 pts): The Final Exam will take place during Finals week and is "semi-cumulative" (specific topics to focus on will be provided near the end of the semester). There will be a reference sheet provided on the exam with any relevant formulas. Please also note that the Final Exam window begins on Reading Day and extends through the following Thursday. If you have an emergency spanning *several* days of this period that prevents you from taking the Final Exam, please let me know as soon as possible to see if we can work out a solution.

Midterm replacement policy: If your Final Exam score is higher than your lowest midterm score (including a missed midterm), then your Final Exam score will *replace* that score.

- **Exam 1: 135, Exam 2: 115, Exam 3: 145, Final Exam: 140**. Your Final Exam replaces Exam 2's score! Your exam scores count essentially as 135, 140, 145, 140.

Please note, however, that your ***highest Midterm*** exam ***will not*** replace your ***Final Exam score***—your Final Exam score counts no matter what.

- **Exam 1: 135, Exam 2: 125, Exam 3: 145, Final Exam: 120**. Since your Final Exam score is lower than all 3 midterm exams, then all four exams count as is and no replacement is made.
- **Exam 1: 135, Exam 2: 125, Exam 3: 145, Final Exam: 0.** Don't do this. The 0 will count!

Extra Credit (max of 20): Students can earn some extra points by completing opportunities posted on Canvas or via special in-class extra credit opportunities.

- There will be more than 20 points of opportunity, but your **extra credit maxes at 20 points.**
- Note that there will be bonus points associated with particular labs (e.g., early-turn in) or exams (more than 150 points possible). These count *additional* and are just added into that lab or exam score.

7. Computer-Based Testing Facility

This course uses the Grainger College of Engineering's Computer-Based Testing Facility for its exams. Review all instructions on the CBTF website before your first exam. I'll highlight a few here:

- If you have accommodations identified by the Division of Rehabilitation-Education Services (**DRES**) for exams, please submit your **Letter of Accommodations (LOA) here** *before* you make your first exam reservation. Note that this must be done **each semester** you use the CBTF. **It *could* take up to 5 days** for your LOA to be processed, and if you make a reservation before your LOA has been processed, that reservation will not include your testing accommodations (meaning you may have to cancel and reschedule).
- **If you know that you won't be able to show up for your reservation...**please cancel that reservation before the time comes (at least 1 hour before if at all possible). This helps open seats for others and avoids you needing to cancel a missed reservation in person.

- **If you miss a reservation…**you will need to go to one of the CBTF labs**--in person--**to have a front desk assistant cancel it for you. You will not be able to make a new reservation until this happens. *Kelly **cannot** help you cancel your reservation*.
- **Bring your physical i-card with you to your exam.** If you do not have a physical i-card, you may also show your school photo ID through the Illinois App.
- **You'll need to remember your username and password** to login to the CBTF computers.
- I**f you have any issue during an exam...**inform the proctor immediately. Work with the proctor to resolve the issue at the time before logging off. If you do not inform a proctor of a problem during the test then you forfeit all rights to redress.

8. Academic Integrity

The official University of Illinois policy related to academic integrity can be found in Article 1, Part 4 of the Student Code. Section 1-402 in particular outlines behavior which is considered an infraction of academic integrity. Below are specific policies I have for this class:

- **Generative AI and coding policy**
    - Generative AI ***may*** be used to help write **code**, but you should be a critical consumer of what it produces. You may be asked at any time in the course to explain what different lines of code are contributing to the output, or what might be edited to change the output a certain way. Also be aware that **Generative AI commonly *fabricates data*** to demonstrate what you ask it to do. Any lab assignment that uses fabricated data to answer any question **will result in a 0** on the entire assignment. Multiple instances of this may result in an academic integrity violation.
- **Generate AI and writing policy**
    - When answering any written questions on our lab assignments, students **shouldn't** feed any part of the **assignment questions** to a **Generative AI** tool to answer. Any clear evidence in your lab assignment that you have done this will result in a 0 on the assignment and may be subject to an academic integrity violation.
    - That said, it is **perfectly fine** in this class to feed a Generative AI tool **your *own* written ideas** and responses and ask it for suggestions to improve your grammar or clarity. Feel free to have a conversation with the tool to learn more, or invite it to ask you questions too. Just don't copy the assignment question at any point.
- Students **shouldn't send out answers to homework questions**
    - **Ideal:** Helping someone individually or in a small group to understand a question without feeding them the answer directly.
    - **Problematic:** Intentionally sending an individual a list of homework answers, or posting multiple answers to a public forum or large group (FAIR violation territory).
- If working on a lab as a group, **all group members must be *involved* in *all* parts of the assignment.**
    - **Ideal:** Everyone should work through all questions on a report (perhaps together, perhaps separately) and use their teammates to help, offer feedback, and improve the final product. Perhaps different members take the lead for different questions, but everyone should cognitively engage with each question.
    - **Slightly problematic:** Everyone contributes disjoint parts and offers little or no feedback to one another. This is not a great long-term strategy because as the labs build on material, you may be skipping some important coding principles--making later a labs a much bigger struggle.
    - **Very problematic:** Putting someone's name on a report who contributed little to nothing. If someone pushes you to do that, tell them no. Everyone can take a lab drop, so a one-time

situation will not hurt their grade. Trust me on this—if you let it happen once, they will absolutely ask you to do it again.

- If working on a lab, **do not plagiarize or facilitate plagiarism with others whom you are not in a group with.**
    - **Ideal:** Feel free to help others troubleshoot their code or show where in the tutorials that is covered. You may also discuss ideas to an open-response question.
    - **Problematic:** Sending someone (or receiving someone's) completed/working code, full written responses, or lab file. Helping others should be centered on their code or their written response, or pointing them to the tutorials. I will issue a violation in clear cases of plagiarism for *both* parties.
- **Students should not break any CBTF rules while taking their exams, nor should they share any specific exam question information until after exam solutions are released.**
    - The policies of the CBTF are the policies of this course, and academic integrity infractions related to the CBTF are infractions in this course.
    - Since exam questions/orderings/numbers are randomized, it is difficult to share exam question specifics with others outside the CBTF successfully. Still, you should not attempt to do this until after exam results and solutions are released a week later.

9. Students with Disabilities

If you have already obtained a DRES letter of accommodation, be sure to email it to me at kfindley@illinois.edu. If you do not currently have a letter, but think you might qualify, please contact Disability Resources and Educational Services (DRES) at (217) 333-4603 or at disability@illinois.edu. If you are concerned you might have a disability-related condition that is impacting your academic progress, visit the DRES website and select "Sign-Up for an Academic Screening" at the bottom of the page. Accommodations are not retroactive to the beginning of the semester but begin the day you contact your professor with a current DRES letter of accommodation.

10. General Student Accommodations

- **Can I ask for an extension for any general reason?** Sometimes you have 3 or more exams the same week.. Maybe your family is visiting, or you're just not feeling great. You won't be at your best every week, and that's totally ok! But this is where your 3 homework drops, 1 lab drop, and midterm replacement option can come in. Start assignments early and make some strategic decisions for what you can complete. That said, the situations below represent examples that may warrant accommodations.
- **General Conflicts (I have school-related travel, a wedding, ROTC, etc.):** If you have a conflict taking place such that you cannot schedule an in-person exam during an exam window, let me know as early as you can. I can often work with you! I usually don't offer lab and homework extensions for these kinds of things, but I can consider that if appropriate.
- **Moderate Sickness (I have a fever, I'm feeling very nauseous, I'm having bad cold symptoms, I'm too sick to leave my room):** If this happens around your exam time, cancel your exam reservation and let me know. You are never required to take an exam if you are experiencing that kind of sickness. I can often extend your testing window out for a few days, though I might ask you to get a doctor's visit confirmation in some cases. I can also offer a one-time assignment extension if appropriate.
- **A close relative or close friend is in critical condition, or has passed away:** It's ok if you need time away from school under these circumstances. I usually offer students up to a full week of extensions if appropriate, with some additional deadline adjustments the next week to help students ease back into school. In special cases, I might offer more time off, and if near the end of the semester, I can talk to you

about taking an Incomplete and finishing the course next semester. If you require accommodations across your courses, you may wish to contact the Student Assistance Center to have them prepare a formal letter to send to all of your professors.

- **I'm struggling with my mental health, substance or alcohol misuse, food or housing insecurity, domestic abuse, or some other issue and I'm not sure where to turn**: Getting help is the courageous thing to do! I'm happy to listen if you simply need to be heard (with as much or little detail as needed). I can talk to you about the Counseling Center and whether that might be an option for you. You might also wish to contact the Student Assistance Center for additional resources. The Emergency Dean is where you should turn outside of business hours. A variety of screenings are available to you that are covered through your student health fee. Class accommodations will depend on the situation, but I can often provide one or two assignment extensions while you get yourself on more solid footing.
- **I or someone I know is feeling suicidal, in an unsafe situation, or facing an immediate crisis**: Your immediate health and safety should *always* be prioritized over school. The Rosecrance Crisis Line may be reached at (217) 359-4141. If you are experiencing suicidal thoughts, you may reach the Suicide Prevention Lifeline at (800) 273-8255. If you are in **immediate danger,** please call 911. Please talk to me once things are under control, and I can offer an extension or accommodation if appropriate.

11. Other Policies and Statements

Family Educational Rights and Privacy Act (FERPA). Any student who has ***suppressed*** their ***directory information*** pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See the FERPA Website for more information.

Disruptive Behavior: Disruptive behavior that interferes with *classroom activities* may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the Office for Student Conflict Resolution (conflictresolution@illinois.edu; 333-3680) for disciplinary action.

Emergency Response Recommendations: Emergency response recommendations and campus building floor plans can be found at the website linked here. I encourage you to review this website within the first 10 days of class.

Religious Observances: Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices regarding admissions, class attendance, and the scheduling of examinations and work requirements. Students should complete the Request for Accommodation for Religious Observances form should any instructors require an absence letter to manage their absence. To best facilitate planning and communication between students and faculty, students should make requests for absence letters as early as possible in the semester in which the request applies.

Inclusivity Statement: The effectiveness of this course is dependent upon the creation of an encouraging and safe classroom environment.

- In public forums for this course, please refrain from using language that is offensive or intentionally hurtful to one's identity or sincerely held beliefs. Examples include language that is racist, sexist, homophobic, transphobic, language that mocks or degrades differently abled people, language that mocks or degrades people with different religious beliefs, or any other unnecessary degrading comments.
- I would also encourage all students to extend patience with one another and to communicate constructively if another student's language is hurtful. If the language that I use, my course staff use, or

any other student uses is hurtful or inappropriate, I would be happy to listen and understand so that we can address this instance if needed. You may also wish to reach out to a neutral party, such as a campus counselor at wecare.illinois.edu, or through an appropriate organization listed on the Student Success, Inclusion, and Belonging website.

We are all responsible for creating a positive and safe environment that allows all students equal respect and comfort. It is my hope that we can all be committed to help establish and maintain an environment where everyone can contribute without fear of ridicule.

Sexual Misconduct Reporting: First, I would like you to know that Faculty and staff members are *required* to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options. That said, there is a list of designated University employees who (as counselors, confidential advisors, and medical professionals) do not have this reporting responsibility and can maintain confidentiality. Other information about resources and reporting is available at wecare.illinois.edu