STSCI 3900 / INFO 3900 / IRST 3900: Causal Inference.   Fall 2025

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Instructors	**Office Hours**
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TAs

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Where to send questions. Please post questions on Ed Discussion (accessible through Canvas). This includes substantive questions about the material as well as administrative questions about the course. You will get a faster answer because all of the course staff and your peers are on Ed. When possible, use Ed rather than email.

Credits

3.0 Credits, Student Option Grading (Letter, S/U)

Time and Location

Lecture (28 total)
Tues and Thurs 9:05–9:55
Phillips Hall 101

Discussion section (14 total)

W 9:05–9:55	W 10:10–11:00	W 11:15–12:05	W 12:20—1:10	W 1:25–2:15
Hollister 314	Hollister 368	Hollister 312	Hollister 362	Hollister 368

Course description. Causal claims are essential in both science and policy. Would a new experimental drug improve disease survival? Would a new advertisement cause higher sales? Would a person's income be higher if they finished college? These questions involve counterfactuals: outcomes that would be realized if a treatment were assigned differently. This course will define counterfactuals mathematically, formalize conceptual assumptions that link empirical evidence to causal conclusions, and engage with statistical methods for estimation. Students will enter the course with knowledge of statistical inference: how to assess if a variable is associated with an outcome. Students will emerge from the course with knowledge of causal inference: how to assess whether an intervention to change that input would lead to a change in the outcome.

Course objectives. As a result of participating in this course, students will be able to

- define counterfactuals as the outcomes of hypothetical interventions
- identify counterfactuals by causal assumptions presented in graphs
- estimate counterfactual outcomes by pairing those assumptions with statistical evidence

Who should take this course? The course is designed for upper-division undergraduate students.

Prerequisites. An introductory statistics course at the level of STSCI 2110, PAM 2100, PSYCH 2500, SOC 3010, ECON 3110, or similar courses. Students should also be familiar with R, the statistical computing language.

Instructional format. Lecture and discussion section.

Course readings. Readings will be available online for free. Lecture slides will also be posted on the course website. Readings may come from:

> Hernán, M.A., and J.M. Robins. 2020. *Causal Inference: What If?* Boca Raton: Chapman & Hall / CRC. PDF available at hsph.harvard.edu/miguel-hernan/causal-inference-book/.

Typesetting. Problem sets will be typeset using RMarkdown, which is a language that easily embeds code and results in a single reproducible document.

Method of assessing student achievement. Grades will be determined by:

Problem sets	25%
In-class quizzes	35%
Course project	35%
Peer grading	5%

For details, see Assignments.

Assignments

Problem sets. Students will complete problem sets which will involve a combination of conceptual questions, data analysis, visualization of results, and written summaries.

In-class quizzes. In-class quizzes will typically be assigned following problem sets. The quizzes will include content covered in lecture as well as problem sets.

Course project. There will be a group research project which will involve defining a causal question, outlining key assumptions, analyzing a data set, and presenting the findings. Various pieces of the project will be completed throughout the semester and a short write-up will be due by the end of the semester.

Peer grading. A principle on which this course is built is that you will offer feedback to one another. Following this principle, after each problem set is submitted you will be assigned to anonymously grade the problem sets of three peers in Canvas. You will assign points using a rubric and offer constructive comments.

Course Management

Academic integrity. Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. Any work submitted by a student in this course for academic credit must be the student's own work. The explicit use of generative AI (e.g., ChatGPT, Llama, Claude, etc) is not allowed for generating text/code for assignments unless the question explicitly mentions that it is allowed.

Reproducibility. A key principle of science is that we be transparent about the procedures that produced any reported result. In this course, all statistical results will be accompanied by the code that produces them (e.g., via RMarkdown). If a reported result should be generated by code and is clearly not generated by the accompanying code, we will impose a reproducibility penalty by subtracting off 20% of the total possible points on the assignment.

Collaboration. You are encouraged to work together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an email, an email attachment file, or a hard copy.

Late work. 5 total flex days across the semester may be used on problem sets with no questions. After your flex days have been used up, each late day deducts 10% of the assignment's total points, so that the max score after 1 days late is 90% and the max score after 2 days late is 80%. Any assignment turned in more than 5 days late will not be given credit.

Attendance. Attendance in class is expected. However, public health is also important. If you are feeling unwell, please stay home from class and send us an email to let us know.

Students with disabilities.[1] Your access in this course is important to us. Please request your accommodation letter early in the semester, or as soon as you become registered with Student Disability Services (SDS), so that we have adequate time to arrange your approved academic accommodations.

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[1]This statement is based on guidelines from Student Disability Services.

- Once SDS approves your accommodation letter, it will be emailed to both you and me. Please follow up with us to discuss the necessary logistics of your accommodations.

- If you experience any access barriers in this course, such as with printed content, graphics, online materials, or any communication barriers; reach out to us or SDS right away.

- If you need an immediate accommodation, please speak with us after class or send an email message to us and to SDS at sds_cu@cornell.edu.

- If you have, or think you may have a disability, please contact Student Disability Services for a confidential discussion: sds_cu@cornell.edu, 607-254-4545, sds.cornell.edu.

Mental health and wellbeing. Your health and wellbeing are important to us. There are services and resources at Cornell designed specifically to bolster undergraduate, graduate, and professional student mental health and well-being. Remember, your mental health and emotional well-being are just as important as your physical health. If you or a friend are struggling emotionally or feeling stressed, fatigued, or burned out, there is a continuum of campus resources available to you: mentalhealth.cornell.edu/get-support/support-students. Help is also available any time day or night through Cornell's 24/7 phone consultation (607-255-5155). You can also reach out to me, your college student services office, your resident advisor, or Cornell Health for support.