Course Syllabus

Lecture: Tuesdays and Thursdays 3:00-4:20p.m
Location: 4430 Social Sciences Building

Professor Sam Trejo
Office: 307 Observatory Hill Office Building
Office Hours: Fridays 12-1:30pm
Email: sam.trejo@wisc.edu

"To one with a hammer, everything looks like a nail."

Course Description

Does having health insurance make a person live longer? Do environmental exposures in childhood affect health later in life? Does wearing a mask reduce the spread of infectious disease? Assessing the causal effects of policies and practices is a fundamental goal of research in the social sciences. This course introduces the key conceptual and methodological tools used in public program evaluation, with an emphasis on understanding the forces that shape health and disease as well as various policy solutions.

Students will be introduced to the *Potential Outcomes Framework*, also known as the *Rubin Causal Model*, and taught to distinguish causation from correlation using counterfactual thinking. This framework for thinking about cause and effect is widespread in the field of economics and has recently begun to influence quantitative research in sociology, political science, education, and public health. We will explore a wide variety of experimental and quasi-experimental research methods used to estimate causal effects, including randomized experiments, regression, matching, instrumental variables, fixed effects, regression discontinuity, difference-in-differences, and synthetic control.

Many of the causal inference methods that we discuss require statistical and computational training in order to implement. However, this course focuses on the non-technical conceptual, theoretical, and intuitive underpinnings of these methods that are most salient to policymakers. Class meetings will typically be divided into lecture, student presentations, and group discussions. Questions and comments are highly encouraged throughout.

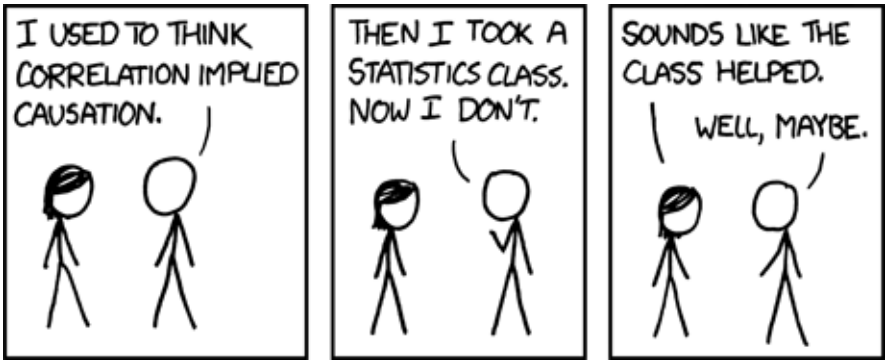
Requisites: None
Course Designations and Attributes: Social Science Breadth Attribute (S)
Instructional Mode: Classroom (Face-to-Face)

Learning Objectives

After completing this course, students will be able to:

- distinguish causal from correlational evidence in both general and academic texts
- use the *Potential Outcomes Framework* to identify relevant counterfactuals
- interpret the external and internal validity of an estimated causal effect
- conceptually apply quasi-experimental methods to health policy issues
- communicate the strengths and weaknesses of previous research into the causal effects of various health interventions

More broadly, my hope is that this course will allow students to sharpen the skills required to distinguish true empirical reality from attractive falsehood. I hope that you will feel able to explain the concepts and techniques we discuss to your friends, from the first week on. Most of all, I hope the course helps you see how using counterfactual thinking to distinguish causation from correlation can impact how you see the world around you and choose to live your life.



Prerequisites

There are *no prerequisites* for this course, apart from being an curious seeker of truth.

Course Website

I will post all course materials, including lecture slides and required readings to the course Canvas website. The address is https://canvas.wisc.edu/courses/423423.

Credit Hours

This course counts for **3 credits**.

Course Structure

This class meets for two, 75-minute class periods each week over the fall/spring semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc) for about 3 hours out of the classroom for every class period. This syllabus contains information about meeting times and expectations for student work.

Preparing for Class

You are expected to listen to required the podcasts and read the required texts *before* the class period which they are discussed. Lectures will follow the material presented in the readings.

Laptop Use

A growing body of evidence suggests that the use of laptops, tablets, and phones in classrooms tends to be detrimental to learning. In general, I discourage their use on during lecture. However, if you want to use a device during class, I ask that you contact me outside of class to make this request. For more context on this policy, see this video.

Required Texts

Mastering 'Metrics: The Path from Cause to Effect by Joshua D. Angrist and Jörn-Steffen Pischke (Princeton University Press, 2015).

Assignments & Grading

The typical UW–Madison grading scale will be used. The maximum score in the course is 100 points: 100-93 = A, 92-88 = AB, 87-83 = B, 82-78 = BC, 77-70 = C, 69-60 = D, <60 = F. Your final grade will weight the assessments as follows, with late assignments counting for only half credit:

In-Class Quizzes	10%
Policy Memos	30%
Group Presentation	10%
Individual Presentation	20%
Final Exam	30%

In-Class Quizzes: There will be four in-class quizzes spaced throughout the semester designed to test each student's understanding of the required podcasts and readings.

Policy Memos: Each student will submit two 700-word policy memos over the course of the semester. In these memos, students will draw on research using the causal inference methods discussed in class to inform understanding of a policy issue of their choice.

Group Presentation: Each week, a pair of students will give an informal 20 minute presentation on the required readings. Presentation pairs and week of presentation will be assigned at the start of the semester.

Individual Presentation: During the last weeks of class, students will give a 10-minute presentation on a policy of interest to them. This presentation should highlight on unanswered policy question in the academic literature and propose a strategy using quasi-experimental methods to advance our understanding of this issue.

Final Exam: The final exam will be a 5-hour long open book and notes take-home exam.

Attendance Policy

You may miss one class without penalty. After that, unless you have an excuse, you will be docked two percentage points out of a hundred on your final grade for each unexcused absence. If an extenuating circumstance causes you miss class more than once, please let me know in advance via e-mail and we will work out a solution. The course will respect all religious holidays; let me know if this affects your attendance or other work in the course.

Academic Integrity

In my class, you must take full responsibility for what you say or write. If you use words or ideas that are not your own in any paper or presentation, cite your sources. I expect students to conform to the highest standards of academic integrity in this course. Put simply, do not lie, do not cheat, and do not pass off someone else's work as your own.

University Statement: *By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct Community Standards for additional review.*

For more information, refer to more information from the Office of Student Conduct and Community Standards here.

Accommodations for Disabilities

If you have a disability, I will happily adapt this course to your needs in accordance with University policy. If any condition limits your ability to participate fully, please request appropriate academic accommodations from the McBurney Disability Resource Center. Please do not be a stranger–I will help the best of my ability.

McBurney Disability Resource Center Statement: *The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.*

Please find more information and resources from the McBurney Disability Resource Center here.

Course Schedule

Week 1, 01/18-01/22: ***Introduction, Causation vs. Correlation***

- Reading
  - Chetty et al. 2016. *The Association Between Income and Life Expectancy in the United States, 2001-2014*. Journal of the American Medical Association.
  - Chetty 2013. *Yes, Economics Is a Science*. The New York Times.

Week 2, 01/25-01/29: ***The Problem of Confounding***

- Reading
  - Cramer 2019. *Another Benefit to Going to Museums? You May Live Longer*. The New York Times.
  - Smith 2018. *How Econ Went From Philosophy to Science*. Bloomberg.
- Listening
  - Podcast 1

Week 3, 02/01-02/05: ***The Potential Outcomes Framework***

- Reading
  - *Mastering 'Metrics* p. xi-17
- Listening
  - Podcast 2
- Quiz 1

Week 4, 02/08-02/12: ***Statistical vs. Causal Inference, Internal vs. External Validity***

- Reading
  - Holland 1986. *Statistics and Causal Inference*. Journal of the American Statistical Association.
  - Roe & Just 2009. *Internal and External Validity in Economics Research*. American Journal of Agricultural Economics.
- Listening
  - Podcast 3

Week 5, 02/15-02/19: *Randomized Experiments*

- Reading
  - *Mastering 'Metrics* p. 18-33
  - Baicker et al. 2013. *The Oregon Experiment–Effects of Medicaid on Clinical Outcomes*. New England Journal of Medicine.
  - Krueger 1999. *Experimental Estimates of Education Production Functions*. Quarterly Journal of Economics.
- Policy Memo 1 Due

Week 6, 02/22-02/26: *Regression*

- Reading
  - *Mastering 'Metrics* p. 47-74
- Listening
  - Podcast 4

Week 7, 03/01-03/05: *Matching*

- Reading
  - Segev et al. 2010. *Perioperative Mortality and Long-term Survival Following Live Kidney Donation*. Journal of the American Medical Association.
  - Venkataramani et al. 2018. *Association Between Playing American Football in the National Football League and Long-term Mortality*. Journal of the American Medical Association.
- Listening
  - Podcast 5
- Quiz 2

Week 8, 03/08-03/12: *Instrumental Variables*

- Reading
  - *Mastering 'Metrics* p. 98-139
  - Angrist & Chen 2011. *Schooling and the Vietnam-Era GI Bill: Evidence from the Draft Lottery*. American Economic Journal: Applied Economics.
  - Aizer & Doyle 2015. *Juvenile Incarceration, Human Capital, and Future Crime: Evidence From Randomly Assigned Judges*.

Week 9, 03/15-03/19: *Fixed Effects*

- Reading
  - Domingue et al. 2015. *Polygenic Influence on Educational Attainment: New Evidence from the National Longitudinal Study of Adolescent to Adult Health*. AERA Open.
  - Black et al. 2007. *From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes*. Quarterly Journal of Economics.
- Listening
  - Podcast 6

Week 10, 03/22-03/26: *Regression Discontinuity*

- Reading
  - *Mastering 'Metrics* p. 147-174
  - Almond et al. 2010. *Estimating Marginal Returns to Medical Care: Evidence from At-Risk Newborns*. Quarterly Journal of Economics.
  - Venkataramani et al. 2016. *Regression Discontinuity Designs in Healthcare Research*. BMJ.
- Quiz 3

Week 11, 04/05-04/09: *Differences-in-Differences*

- Reading
  - *Mastering 'Metrics* p. 178-203
  - Rossin-Slater et al. 2019. *"Local Exposure to School Shootings and Youth Antidepressant Use*. NBER Working Paper.
  - Hsiang et al. 2020. *The Effect of Large-Scale Anti-Contagion Policies on the COVID-19 Pandemic*. Nature.
- Policy Memo 2 Due

Week 12, 04/12-04/16: *Synthetic Control*

- Reading
  - Abadie et al. 2010. *Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program*. Journal of the American Statistical Association.
  - Trejo et al. 2020. *The Effects of the Flint Water Crisis on Educational Outcomes*. Working Paper.
- Listening
  - Podcast 7
- Quiz 4

Week 13, 04/19-04/23: *Student Presentations*

- Individual Presentation Due

Week 14, 04/26-04/30: *Slack*

- Take-Home Final Exam

Course Calender

TUESDAY	THURSDAY
Jan 19th **1** Introduction	21st **2** Causation vs. Correlation
26th **3** The Problem of Confounding	28th **4** The Problem of Confounding
Feb 2nd **5** The Potential Outcomes Framework	4th **6** The Potential Outcomes Framework
9th **7** Statistical vs. Causal Inference	11th **8** Internal vs. External Validity
16th **9** Randomized Experiments	18th **10** Randomized Experiments
23rd **11** Regression	25th **12** Regression
Mar 2nd **13** Matching	4th **14** Matching
9th **15** Instrumental Variables	11th **16** Instrumental Variables
16th **17** Fixed Effects	18th **18** Fixed Effects
23rd **19** Regression Discontinuity	25th **20** Regression Discontinuity
30th *-Spring Break-*	Apr 1st *-Spring Break-*
6th **21** Differences-in-Differences	8th **22** Differences-in-Differences
13th **23** Synthetic Control	15th **24** Synthetic Control
20th **25** Student Presentations	22nd **26** Student Presentations
27th **27** Slack	29th **28** Slack