

Public Policy 291A: Tools for Causal Inference

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1 Course Information

- **Instructor:** Darin Christensen¹
- **Schedule & Location:** MW, 2-3:15p in Bunche 3143
- **Course Website:** <https://bruinlearn.ucla.edu/courses/111747>
- **Prerequisites:** This course assumes knowledge of multiple regression and a statistical software program (e.g., R or Stata).

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2 Course Objectives

Everyone wants evidence-based policy. Yet, that's not a very precise bar: nearly every policy argument is based on some evidence. The more important and difficult question is determining whether (or under what assumptions) the evidence presented is credible. **The primary goal of this course is to make you a more critical consumer of empirical evidence.**

We accomplish that goal in several steps. After reviewing the purpose and objectives of impact (or program) evaluation, we briefly discuss common approaches: cross-sectional, before-after comparisons, and case studies of program beneficiaries. We discuss the strong assumptions that these methods require and how they are often violated in practice. Lest you become hopeless about our ability to evaluate impact, we then cover a suite of experimental and quasi-experimental approaches: randomized controlled trials, matching, regression discontinuities, difference-in-differences, and instrumental variables. These research designs rely on more defensible assumptions and, thus, permit more confident conclusions about what works. Time permitting, we end the course by discussing issues that affect all of these methods, including attrition, spillovers between comparison groups, and external validity.

We start by spotting problems with common approaches and end by exploring methods that help to solve these problems. That sequence is intentional. As this course proceeds, I will expect you to not just offer criticisms, but also ideas about how to improve the studies we read. Your future colleagues will appreciate your input more if you not only spot problems, but also help solve them.

3 Learning Goals

By the end of the quarter, you should be able to:

1. Identify and describe a selection problem;
2. Explain the intuition behind different experimental and quasi-experimental approaches to identifying causal effects;
3. Implement simple experimental or quasi-experimental designs in R or Stata; and
4. Apply the research designs we cover to your own research questions.

The first goals are ranked in order of importance — I care more about your ability to spot and articulate a selection problem than your coding skills.

4 Books

4.1 Required

- Joshua D Angrist and Jörn-Steffen Pischke. *Mastering 'Metrics: The Path from Cause to Effect*. Princeton University Press, December 2014²
- Paul J Gertler, Sebastian Martinez, Patrick Premand, Laura B Rawlings, and Christel M J Vermeersch. *Impact Evaluation in Practice*. World Bank Group, September 2016 [[Link](#)]

² As of November 2021, this was available for less than \$25 on Amazon.

4.2 Optional

- Ethan Bueno de Mesquita and Anthony Fowler. *Thinking Clearly with Data: A Guide to Quantitative Reasoning*. Princeton University Press, 2021
- Scott Cunningham. *Causal Inference: The Mixtape*. Yale University Press, 2021 [[Link](#)]³

³ This is an excellent resource and includes code snippets. However, it is more technical than our primary texts.

5 Software

You can use R or Stata. However, Stata users should anticipate that there are some questions/issues that I will not be able to resolve on the fly. This course assumes you already know the basics of R or Stata, e.g., you can load and manipulate data, generate summary statistics and graphs, and can run a linear regression.

6 Assignments and Grading

6.1 Participation (10%)

I expect that you'll attend and participate in lecture and do the required readings in advance. Your participation grade will be based on engagement in lecture, office hours, and on our course website.

6.2 2 "Blog" Posts (15%)

[~250 words each] In these short posts, I expect you to dissect a news article or report.⁴ Your post should (1) identify the causal claim made by the author, (2) what comparisons were used as evidence, and (3) what concerns do you have about selection bias (i.e., why might the author be wrong to infer a causal relationship).

⁴ You can select an academic article, but I would caution against doing so.

Due Dates: 01/12, 01/24; posted to the appropriate discussion board on the course website by 11:59p. These will be evaluated on a scale of {✓-, ✓, ✓+}.

Abridged Example: An article reports that barefoot runners experience less knee pain (Causal Claim). The counter-factual for a barefoot runner is the knee pain experienced by the same runner had they worn shoes. The underlying study surveyed 25 shoe-wearing and 25 barefoot runners and asked them to report their knee pain on a scale from 1-10. The researchers found that pain was 10% lower among barefoot runners (Evidence). You, however, are concerned because barefoot runners may have higher baseline pain tolerances. (They are, after all, running barefoot.) Second, you worry that barefoot running is more popular among young runners, who are less likely to report pain regardless of their footwear or lack thereof (Your Concerns).

6.3 3 Problem Sets (25%)

These problem sets allow you to apply the reasoning and coding skills we cover in class.

If you're working in R, try to complete your problem sets in R Markdown. If you're working in Stata, you can use markdown or Word to compile your problem sets. **All problem sets should be submitted as PDFs.** These will be evaluated on a scale of {✓-, ✓, ✓+}.⁵

⁵ I will post detailed solutions online but cannot grade every problem. Please attend office hours if you have any questions.

6.4 Midterm on 02/07 (20%)

The midterm exam offers an opportunity to assess your progress on the learning goals. As such, part of the exam will test your problem solving skills; another component will ask you to perform empirical analysis. You will need R or Stata to complete the exam.

6.5 *Research Design (10%)*

[~500 words] The research design gives students an opportunity to apply the tools we cover in this class to their own research interests. Working individually or in small groups, students will compose a two-page memo which outlines their research question, the inferential challenge, what data exists, and then describes how one or more of the tools from the course could be deployed in their project. Students will be called upon to present their ideas as part of an in-class workshop.

Due Date: 03/01. These will be evaluated on a scale of $\{\checkmark-, \checkmark, \checkmark+\}$.

6.6 *Final Exam (20%)*

As with the midterm, this is an opportunity to evaluate your cumulative progress on the learning goals. You will need R or Stata to complete the exam.

7 Course Policies

7.1 Extensions

Late work will not be accepted without prior permission. You should contact me at least 24 hours before any due date to request an extension and provide cause. Makeup exams are, with limited exceptions, not permitted.

7.2 Academic Accommodations

Academic Accommodations. Students needing academic accommodations based on a disability should contact the [Center for Accessible Education](#) (CAE) at (310)825-1501 or in person at Murphy Hall A255. Students should contact the CAE within the **first two weeks** of the term as reasonable notice is needed to coordinate accommodations. For more information visit <http://www.cae.ucla.edu>.

7.3 Academic Integrity

Cheating and plagiarism will not be tolerated. I encourage you to review the [University's policies regarding academic honesty](#). Senate Regulation A-306 requires that all suspected cases of academic dishonesty be reported to the Office of Student Conduct.

PP 291A Collaboration Policy:

- **Blog Posts:** There is no collaboration on the blog posts. You are welcome to discuss ideas with classmates, but originality will be rewarded; very similar answers, penalized.
- **Problem Sets:** You can work with peers (in groups of four or less). However, you must write every line of code and text that appears in any assignment that you submit. In short, never copy code or use other students' words to describe your approach or results.
- **Research Design:** You can work with peers (in groups of four or less), and each group can submit a single assignment.
- **Midterm and Final Exams:** This is an individual assessment that helps us identify any knowledge gaps. I want to know what you know, so there's no collaboration.

7.4 Religious Observances

If you have a religious observance that conflicts with your participation in the course, please contact me *before the end of the second week* of the quarter to discuss accommodations.

8 Student Resources

8.1 Mental Health

There are resources on campus for students to help with study habits, anxiety, stress, and depression. Please check out the [Counseling and Psychological Services \(CAPS\) center at UCLA](#).⁶ In addition to counseling and other psychological and mental health services, they provide additional resources such as readings on dealing with stress and anxiety, group counseling sessions, mindfulness trainings, and other behavioral services. Walk-in hours are Monday-Thursday 8am-4:30pm and Friday 9am-4:30pm in John Wooden Center West. CAPS services are often covered by UC SHIP.

⁶ Crisis counseling is also available 24 hours/day at (310) 825-0768.

8.2 Gender Discrimination

Title IX Resources

UCLA prohibits gender discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking. If you have experienced sexual harassment or sexual violence, there are a variety of resources to assist you.⁷

CONFIDENTIAL RESOURCES: You can receive confidential support and advocacy at the CARE Advocacy Office for Sexual and Gender-Based Violence, 1st Floor Wooden Center West, CAREadvocate@careprogram.ucla.edu, (310) 206-2465. Counseling and Psychological Services (CAPS) also provides confidential counseling to all students and can be reached 24/7 at (310) 825-0768.

⁷ Faculty and TAs are required under the UC Policy on Sexual Violence and Sexual Harassment to inform the Title IX Coordinator — A NON-CONFIDENTIAL RESOURCE — should they become aware that you or any other student has experienced sexual violence or sexual harassment.

NON-CONFIDENTIAL RESOURCES: You can also report sexual violence or sexual harassment directly to the University's Title IX Coordinator, 2241 Murphy Hall, titleix@conet.ucla.edu, (310) 206-3417. Reports to law enforcement can be made to UCPD at (310) 825-1491. These offices may be required to pursue an official investigation.

8.3 Immigration

The [Bruin Resource Center's \(BRC\) Undocumented Student Program](#) offers caring and personalized support to undergraduate and graduate undocumented students.

Even if you are not undocumented, you may be able to get legal help for a family member. The USP office provides immigration legal services to students and their family members through a partnership with the [UC Undocumented Legal Services Center](#).

9 Course Schedule

Legend: ✱: Required; † Skim Abstract/Intro; ● Optional.

Two Notes:

1. Many of the readings are not long, but they are technical. I've assigned fewer pages to give you more time to work through the material.
2. The technical readings often cover the same topics, but use different language or examples to explain the key concepts. It's often helpful to see these concepts explained different ways. The Gertler et al. (2016) chapters tend to be shorter and focus more on the intuition; the Angrist and Pischke (2015) chapters are more thorough and offer more examples, but are also more technical. *You should read both.*

1 *Evaluating Impact* (3 Classes)

1.1 *Impact Evaluation and Evidence-based Policy* (01/03)

- ✱ Ch. 1. "Why Evaluate?" Gertler et al. (2016)
- ✱ Ch. 1. "Think Again, Again." Abhijit Banerjee and Esther Duflo. *Poor Economics*. PublicAffairs, 2012

- Rachel Glennerster. Keynote: "Using Evidence to Inform Policy." <https://www.youtube.com/watch?v=i3CZfu2kwqA>.

1.2 *Counterfactual Thinking: The Potential Outcome Model* (01/05)

- ✱ Ch. 3. "Causal Inference and Counterfactuals." Gertler et al. (2016)
- ✱ Ch. 3. "Causation: What Is It and What Is It Good For?" Ethan Bueno de Mesquita and Anthony Fowler. *Thinking Clearly with Data: A Guide to Quantitative Reasoning*. Princeton University Press, 2021

- Paul J Ferraro. Counterfactual thinking and impact evaluation in environmental policy. In Matthew Birnbaum and Per Mickwitz, editors, *New Directions for Evaluation*, pages 75–84. Wiley Subscription Services, Inc., A Wiley Company, March 2009

1.3 *Individual and Average Treatment Effects* (01/10)

- ✱ Intro, Ch. 1. *only* pp. xi-11. Angrist and Pischke (2015)

2 *Common (Often Confounded) Approaches (2 Classes)*

2.1 *Selection Bias (01/12)*

⊕ **Blog Post 1 (Due 01/12)**

- * Ch. 9. “Why Correlation Doesn’t Imply Causation.” Ethan Bueno de Mesquita and Anthony Fowler. *Thinking Clearly with Data: A Guide to Quantitative Reasoning*. Princeton University Press, 2021
- † Sections 4.3-4.4.1, starts with “Selection Bias.” Gary King, Robert O Keohane, and Sidney Verba. *Designing Social Inquiry: Scientific Inference in Qualitative Research*. Princeton University Press, 1994

2.2 *Common Approaches (01/19)*

- * Paul R Rosenbaum. Dilemmas and Craftsmanship. In *Design of Observational Studies*, pages 3–20. Springer New York, New York, NY, October 2009
- † Michael A Clemens and Gabriel Demombynes. When Does Rigorous Impact Evaluation Make a Difference? The Case of Millennium Villages. *CGD Working Paper*, October 2010
- * NGO Case Study Guides:
 - “How to Create a Nonprofit Case Study”
 - “Writing good case studies: seven top tips”

3 *Randomized Experiments (2 Classes)*

3.1 *Randomized Experiments: Logic (01/24)*

⊕ **Blog Post 2 (Due 01/24)**

- * Ch. 4, “Randomized Assignment.” Gertler et al. (2016)
 - * Ch. 1, “Randomized Trials.” Angrist and Pischke (2015)
- Ch. 11. “Randomized Experiments.” Ethan Bueno de Mesquita and Anthony Fowler. *Thinking Clearly with Data: A Guide to Quantitative Reasoning*. Princeton University Press, 2021

3.2 *Randomized Experiments: Applications (01/26)*

- ★ Alan S Gerber, Donald P Green, and Christopher W Larimer. Social Pressure and Voter Turnout: Evidence from a Large-Scale Field Experiment. *American Political Science Review*, 102(01):33–48, February 2008
- † Benjamin A Olken. Monitoring Corruption: Evidence from a Field Experiment in Indonesia. *Journal of Political Economy*, 115(2):200–249, April 2007
- † Katherine Casey, Rachel Glennerster, and Edward Miguel. Reshaping Institutions: Evidence on Aid Impacts Using a Preanalysis Plan. *Quarterly Journal of Economics*, pages 1755–1812, 2012

- Johannes Haushofer and Jeremy Shapiro. The Short-term Impact of Unconditional Cash Transfers to the Poor: Experimental Evidence from Kenya. *Quarterly Journal of Economics*, 131(4):1973–2042, 2016
- Raj Chetty, Nathaniel Hendren, and Lawrence Katz. The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Project. *American Economic Review*, 106(4), 2016

4 *Matching (2 Classes)*

4.1 *Matching: Logic (01/31)*

- ⊕ **Problem Set 1 (Due 01/31)**
- ★ Ch. 8, “Matching.” Gertler et al. (2016)
- ★ Ch. 2, “Regression.” Angrist and Pischke (2015)

4.2 *Matching: Applications (02/02)*

- ★ Christopher Blattman and Jeannie Annan. The Consequences of Child Soldiering. *The Review of Economics and Statistics*, 92(4):882–898, November 2010
- † Maya Sen. How judicial qualification ratings may disadvantage minority and female candidates. *Journal of Law and Courts*, 2(1):33–65, 2014

- Carolyn Heinrich, Alessandro Maffioli, and Gonzalo Vazquez. A Primer for Applying Propensity-Score Matching. *IDB Impact-Evaluation Guidelines*, 2010
- PRG, IPIS, SFR, and Ulula. Evaluating Due Diligence Programs for Conflict Minerals: A Matched Analysis of 3T Mines in Eastern DRC, 2020

5 Midterm (02/07)

6 Regression Discontinuity (2 Classes)

6.1 Regression Discontinuity: Logic (02/09)

- * Ch. 6, "Regression Discontinuity Design." Gertler et al. (2016)
- * Ch. 4, "Regression Discontinuity Designs." Angrist and Pischke (2015)

- Ch. 12. "Regression Discontinuity." Ethan Bueno de Mesquita and Anthony Fowler. *Thinking Clearly with Data: A Guide to Quantitative Reasoning*. Princeton University Press, 2021

6.2 Regression Discontinuity: Applications (02/14)

- * Robert S Erikson and Rocio Titiunik. Using Regression Discontinuity to Uncover the Personal Incumbency Advantage. *Quarterly Journal of Political Science*, 10(1):101–119, May 2015
- † Melissa Dell. The Persistent Effects of Peru's Mining Mita. *Econometrica: Journal of the Econometric Society*, 78(6):1863–1903, 2010

- Daniel J Hopkins. Translating into Votes: The Electoral Impacts of Spanish-Language Ballots. *American Journal of Political Science*, 55(4):814–830, October 2011

7 Difference-in-Differences (2 Classes)

7.1 Difference-in-Differences: Logic (02/16)

- * Ch. 7, "Difference-in-Differences." Gertler et al. (2016)
- * Ch. 5, "Difference-in-Differences." Angrist and Pischke (2015)

- Marianne Bertrand, Esther Duflo, and Sendhil Mullainathan. How Much Should We Trust Differences-in-Differences Estimates? *The Quarterly Journal of Economics*, 119(1):249–275, February 2004

7.2 Difference-in-Differences: Applications (02/23)

⊕ Problem Set 2 (Due 02/23)

- * David Card and Alan Krueger. Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania. *American Economic Review*, 84(4), September 1994
- † Arindrajit Dube, Oeindrila Dube, and Omar Garcia-Ponce. Cross-Border Spillover: U.S. Gun Laws and Violence in Mexico. *American Political Science Review*, 107(3):397–417, August 2013

- Jason Lyall. Does Indiscriminate Violence Incite Insurgent Attacks? Evidence from Chechnya. *Journal of Conflict Resolution*, 53(3):331–362, June 2009

8 *Instrumental Variables: Logic* (02/28)

- ★ Ch. 5, “Instrumental Variables.” Gertler et al. (2016)
- ★ Ch. 3, “Instrumental Variables.” Angrist and Pischke (2015)

- Angus Deaton. Instruments, Randomization, and Learning about Development. *Journal Economic Literature*, 48:424–455, June 2010

9 *Research Design Workshop* (03/02)

- ⊕ **Research Design Memo (Due 03/01)**
 - In-class presentations/discussion

10 *Common Problems* (03/07)

- ⊕ **Problem Set 3 (Due 03/07)**
 - ★ Ch. 9, “Addressing Methodological Challenges.” Gertler et al. (2016)
 - ★ Ch. 7, “Threats.” Rachel Glennerster and Kudzai Takavarasha. *Running Randomized Evaluations: A Practical Guide*. Princeton University Press, 2013

11 *Review* (03/09)

12 *Final Exam* (TBD)