Draft syllabus
Sociology 598:
Introduction to causal inference

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Spring 2008
Tuesday 2:30-5:30
190 Wallace Hall

Introduction

This mini-seminar will offer students a six-week introduction into the problems of causality and causal inference. Prominent approaches in the literature will be discussed and illustrated with examples. Limitations, as well as strengths, will be emphasized. Throughout the course we will attempt to balance philosophical, statistical, and practical considerations. Each class will consist of a general discussion of a specific approach followed by student presented examples. Students are expected to come to class prepared for discussion as well as present a few articles during the course of the semester. There will be no exam, but students will be expected to complete a final paper or project.

There will be one required text for this class:

- Morgan, S. L. and Winship, C. (2007). *Counterfactuals and Causal Inference: Methods and Principles for Social Research*. Cambridge University Press, New York

We will also draw from Paul Rosenbaum's 2002 book *Observational Studies*, but this book will not be required. The remaining articles will be available either online or on blackboard.

Lecture schedule

1 Introduction and overview (March 25)

In this first class we will cover a broad overview of questions concerning causal inference emphasizing the counterfactual framework. The relationship between smoking and cancer will be a useful case study.

For general discussion

- Taubes, G. (2007). Do we really know what makes us healthy? *New York Times Magazine*
- Rosenbaum (Chapter 1)
- Morgan and Winship (Chapters 1 & 2)
- Abbott, A. (1998). The causal devolution. *Sociological Methods Research*, 27(2):148–181

- Freedman, D. (1999). From association to causation: Some remarks on the history of statistics. *Statistical Science*, 14(3):243–258
- Rosenbaum (Chapters 11 & 12)

Case study: Smoking and cancer

- Gail, M. H. (1996). Statistics in action. *Journal of the American Statistical Association*, 91(433):1–13 (Section 3)
- Cornfield, J., Haenszel, W., Hammong, E. C., Lilienfeld, A. M., Shimkin, M. B., and Wynder, E. L. (1959). Smoking and lung cancer: Recent evidence and a discussion of some questions. *J Natl Cancer Inst*, 22(1):173–203

Further reading

- Holland, P. W. (1986). Statistics and causal inference. *Journal of the American Statistical Association*, 81(396):945–960
- Sobel, M. E. (2000). Causal inference in the social sciences. *Journal of the American Statistical Association*, 95(450):647–651
- Rothman, K. J. and Greenland, S. (2005). Causation and causal inference in epidemiology. *American Journal of Public Health*, 95(S1):S144–S150
- Rubin, D. B. (2007). The design versus the analysis of observational studies for causal effects: Parallels with the design of randomized trials. *Statistics in Medicine*, 26(1):20–36
- Stolley, P. D. (1991). When genius errs: R. A. Fisher and the lung cancer controversy. *Am. J. Epidemiol.*, 133(5):416–425

2 Field experiments and social experiments (April 1)

Experiments are generally the best way to make causal statements, but the their implementation often introduces practical problems such as noncompliance. In this class we will consider the strengths and weaknesses of real-world experiments for making causal claims in the social sciences. We will make a qualitative distinction between field experiments, that can generally be conducted by individual researchers, and social experiments, that generally require the involvement of the government or other large institution.

For general discussion

- Heckman, J. J. and Smith, J. A. (1995). Assessing the case for social experiments. *The Journal of Economic Perspectives*, 9(2):85–110
- Duflo, E., Glennerster, R., and Kremer, M. (2006). Using randomization in development economics research: A toolkit

For presentation

- Pager, D. (2003). The mark of a criminal record. *American Journal of Sociology*, 108(5):937–975
  - Pager, D. (2007). The use of field experiments for studies of employment discrimination: Contributions, critiques, and directions for the future. *The ANNALS of the American Academy of Political and Social Science*, 609(1):104–133

- Clampet-Lundquist, S. and Massey, D. S. (2007). Neighborhood effects on economic self-sufficiency: A reconsideration of the Moving To Opportunity experiment. *Working paper*
  - Ludwig, J., Liebman, J. B., Kling, J. R., Duncan, G. J., Katz, L. F., Kessler, R. C., and Sanbonmatsu, L. (2007). What can we learn about neighborhood effects from the Moving To Opportunity experiment? A comment on Clampet-Lundquist and Massey. *Working paper*
- Gerber, A. S. and Green, D. P. (2000). The effects of canvassing, telephone calls, and direct mail on voter turnout: A field experiment. *The American Political Science Review*, 94(3):653–663
  - Imai, K. (2005). Does get-out-the-vote calls reduce turnout? the importance of statistical methods for field experiments. *American Political Science Review*, 99(2):283–300
  - Gerber, A. S. and Green, D. P. (2005). Correction to Gerber and Green (2000), replication of disputed findings, and reply to Imai (2005). *American Political Science Review*, 99(2):301–313

Further reading

- Berk, R. A. (2005). Randomized experiments as the bronze standard. *Journal of Experimental Criminology*, 1(4):417–433
- Kramer, M. S. and Shapiro, S. H. (1984). Scientific challenges in the application of randomized trials. *JAMA*, 252(19):2739–2745
- Harrison, G. W. and List, J. A. (2004). Field experiments. *Journal of Economic Literature*, 42(4):1009–1055
- Resnick, P., Zeckhauser, R., Swanson, J., and Lockwood, K. (2006). The value of reputation on eBay: A controlled experiment. *Experimental Economics*, 9(2):79–101

3 Conditioning on observables (April 8)

One approach to making causal claims from observational data is to condition on observable information so as to avoid "omitted variable bias." The two most common ways to do this are "controlling" in linear regression and propensity score matching. We will conclude by discussing sensitivity analysis that can strengthen the claims made with these methods.

For general discussion

- Rosenbaum (Chapters 3.1) (posted on blackboard)
- Rosenbaum (Chapters 4.1 & 6.1) (posted on blackboard)
- Morgan and Winship (Chapters 4 & 5)
- Berk, R. A. (2003). *Regression Analysis: A Constructive Critique*. Sage Publications: (Chapters 6 [skim] & 7) (posted on blackboard)

For presentation

- Bingenheimer, J. B., Brennan, R. T., and Earls, F. J. (2005). Firearm violence exposure and serious violent behavior. *Science*, 308(5726):1323–1326
  - Holden, C. (2005). Sociology: Controversial study suggests seeing gun violence promotes it. *Science*, 308(5726):1239a–1240

- Morgan, S. L. (2001). Counterfactuals, causal effect heterogeneity, and the catholic school effect on learning. *Sociology of Education*, 74(4):341–374

- Stack, S. and Gundlach, J. (1992). The effect of country music on suicide. *Social Forces*, 71(1):211–218

  - Maguire, E. R. and Snipes, J. B. (1994). Reassessing the link between country music and suicide. *Social Forces*, 72(4):1239–1243
  - Stack, S. and Gundlach, J. (1994a). Country music and suicide: A reply to Maguire and Snipes. *Social Forces*, 72(4):1245–1248
  - Mauk, G. W., Taylor, M. J., White, K. R., and Allen, S. T. (1994). Comments on stack and gundlach's the effect of country music on suicide: An achy breaky heart may not kill you. *Social Forces*, 72(4):1249–1255
  - Stack, S. and Gundlach, J. (1994b). Psychological versus sociological perspectives on suicide: A reply to mauk, taylor, white, and allen. *Social Forces*, 72(4):1257–1261
  - Snipes, J. B. and Maguire, E. R. (1995). Country music, suicide, and spuriousness. *Social Forces*, 74(1):327–329
  - Stack, S. and Gundlach, J. (1995). Country music and suicide - individual, indirect, and interaction effects: A reply to Snipes and Maguire. *Social Forces*, 74(1):331–335

- Booher-Jennings, J. and Beveridge, A. A. (2007). Does gaming the system affect students' academic achievement? *ISERP Working Paper 07-06*

Further reading

- Frank, K. A. (2000). Impact of a confounding variable on a regression coefficient. *Sociological Methods Research*, 29(2):147–194

4 Cross-sectional methods: Regression discontinuity and instrumental variables (April 15)

We can condition for things that we have measured, but sometimes we can't or haven't measured everything that we might like. In this case, we can attempt to rely on some process to create plausibly exogenous variation. Two approaches within this framework are regression discontinuity designs and instrumental variables.

For general discussion

- Morgan and Winship (Chapter 7)

- Hernán, M. A. and Robins, J. M. (2006). Instruments for causal inference: An epidemiologist's dream? *Epidemiology*, 17(4):360–372 (posted to blackboard)

- Angrist, J. D. and Krueger, A. B. (2001). Instrumental variables and the search for identification: From supply and demand to natural experiments. *The Journal of Economic Perspectives*, 15(4):69–85

- Cook, T. D. and Wong, V. C. (2006). Empirical tests of the validity of the regression discontinuity design (posted on blackboard)

For presentation

- Conley, D. and Glauber, R. (2006). Parental educational investment and children's academic risk: Estimates of the impact of sibship size and birth order from exogenous variation in fertility. *The Journal of Human Resources*, XLI(4):722–737
- Lee, D. S. and Mccrary, J. (2005). Crime, punishment, and myopia. *Working paper*, pages 11491+
- Angrist, J. and Krueger, A. B. (1994). Why do World War II veterans earn more than nonveterans? *Journal of Labor Economics*, 12(1):74–97
  - Small, D. and Rosenbaum, P. R. (2008). War and wages: The strength of instrumental variables and their sensitivity to unobserved biases. *Journal of the American Statistical Association*, in press (skim) (posted on blackboard)

Further reading

- Imbens, G. W. and Angrist, J. D. (1994). Identification and estimation of local average treatment effects. *Econometrica*, 62(2):467–475
- Angrist, J. D., Imbens, G. W., and Rubin, D. B. (1996). Identification of causal effects using instrumental variables. *Journal of the American Statistical Association*, 91(434):444–455
- Heckman, J. (1997). Instrumental variables: A study of implicit behavioral assumptions used in making program evaluations. *The Journal of Human Resources*, 32(3):441–462
  - Angrist, J. D. and Imbens, G. W. (1999). Comment on James J. Heckman, Instrumental variables: A study of implicit behavioral assumptions used in making program evaluations. *The Journal of Human Resources*, 34(4):823–827
  - Heckman, J. J. (1999). Instrumental variables: Response to Angrist and Imbens. *The Journal of Human Resources*, 34(4):828–837
- Angrist, J. (2006). Instrumental variables methods in experimental criminological research: what, why and how. *Journal of Experimental Criminology*, 2(1):23–44

5 Longitudinal methods: Difference-in-differences and fixed effects (April 22)

When data over time are available additional approaches can be employed to deal with unobservables. Two common approaches are difference-in-differences and fixed-effects models.

For general discussion

- Morgan and Winship (Chapter 9)
- Allison, P. D. (1994). Using panel data to estimate the effects of events. *Sociological Methods Research*, 23(2):174–199
- Halaby, C. N. (2004). Panel models in sociological research: Theory into practice. *Annual Review of Sociology*, 30(1):507–544
- Meyer, B. D. (1995). Natural and quasi-experiments in economics. *Journal of Business & Economic Statistics*, 13(2):151–161

For presentation

- Card, D. and Krueger, A. B. (1994). Minimum wages and employment: A case study of the fast-food industry in New Jersey and Pennsylvania. *The American Economic Review*, 84(4):772–793
  - Neumark, D. and Wascher, W. (2000). Minimum wages and employment: A case study of the fast-food industry in new jersey and pennsylvania: Comment. *The American Economic Review*, 90(5):1362–1396
  - Card, D. and Krueger, A. B. (2000). Minimum wages and employment: A case study of the fast-food industry in new jersey and pennsylvania: Reply. *The American Economic Review*, 90(5):1397–1420
- Card, D. (1990). The impact of the mariel boatlift on the miami labor market. *Industrial and Labor Relations Review*, 43(2):245–257
- Western, B. (2002). The impact of incarceration on wage mobility and inequality. *American Sociological Review*, 67(4):526–546

6 Putting it all together: peer and neighborhood effects (April 29)

The estimation of peer and neighborhood effects on individual outcomes has been plagued by many of the problems we described so far in this class. In the final week we review a number of approaches to address this question using a variety of methods.

For general discussion

- Manski, C. F. (1993). Identification of endogenous social effects: The reflection problem. *The Review of Economic Studies*, 60(3):531–542
- Mayer, S. E. and Jencks, C. (1989). Growing up in poor neighborhoods: How much does it matter? *Science*, 243(4897):1441–1445
- Sampson, R. J., Morenoff, J. D., and Gannon-Rowley, T. (2002). Assessing "neighborhood effects": Social processes and new directions in research. *Annual Review of Sociology*, 28:443–478
- Sobel and Michael, E. (2006). What do randomized studies of housing mobility demonstrate?: Causal inference in the face of interference. *Journal of the American Statistical Association*, 101(476):1398–1407 (Sections 1 & 2)

For presentation

- Hauser, R. M. (1970). Context and consex: A cautionary tale. *American Journal of Sociology*, 75(4):645–664
- Crane, J. (1991). The epidemic theory of ghettos and neighborhood effects on dropping out and teenage childbearing. *The American Journal of Sociology*, 96(5):1226–1259

  - Harding, D. J. (2003). Counterfactual models of neighborhood effects: The effect of neighborhood poverty on dropping out and teenage pregnancy. *American Journal of Sociology*, 109(3):676–719

- Duflo, E. and Saez, E. (2002). Participation and investment decisions in a retirement plan: the influence of colleagues' choices. *Journal of Public Economics*, 85(1):121–148

  - Duflo, E. and Saez, E. (2003). The role of information and social interactions in retirement plan decisions: Evidence from a randomized experiment. *Quarterly Journal of Economics*, 118(3):815–842

- Sacerdote, B. (2001). Peer effects with random assignment: Results for Dartmouth roommates. *The Quarterly Journal of Economics*, 116(2):681–704

- Cipollone, P. and Rosolia, A. (2007). Social interactions in high school: Lessons from an earthquake. *The American Economic Review*, 97(3):948–965

- Christakis, N. A. A. and Fowler, J. H. H. (2007). The spread of obesity in a large social network over 32 years. *New England Journal of Medicine*, 357(4):370–379

Further reading

- Nickerson, D. W. (2008). Is voting contagious? Evidence from two field experiments. *American Political Science Review*, 102(01):49–57