

**SYLLABUS E10.2012: Advanced Topics in Quantitative Methods: Causal Inference - Methods for Program Evaluation and Policy Research
Spring 2009, 3 credits**

Course Time and Location:

Friday 9:30-12:10

ROOM

Instructor: Jennifer Hill

Office Hours: TBD

Course Goals and Prerequisites:

The goal of this course is to provide students with a basic knowledge of how to perform some more advanced statistical methods useful in answering policy questions using observational or experimental data. It will also allow them to more critically review research published that claims to answer causal policy questions. The prerequisite is the first two semesters of quantitative methods (E10.2003, E10.2004) or the equivalent as approved by the instructor.

Course Description:

Course provides students with a basic knowledge of both how to perform analyses and critique the use of some more advanced statistical methods useful in answering policy questions. While randomized experiments will be discussed, the primary focus will be the challenge of answering causal questions using data that do not meet such standards. Several approaches for observational data including propensity score methods, instrumental variables, difference in differences, fixed effects models and regression discontinuity designs will be discussed. Examples from real public policy studies will be used to illustrate key ideas and methods.

Course Timing:

The course will start meeting with Professor Hill on February 27th. Before that time, students will be required to attend a 2 hour Stata tutorial, which will be pre-arranged with NYU's ITS faculty. By the first class the students are also required to have successfully completed the online assignment that reviews the most important Statistics material they need to have mastered to understand the course material.

Grading:

Grading will be based on approximately 5 homeworks (totaling 70%), and one final project or final exam (30%) that will involve both data analysis and a thoughtful description of both the analysis and the findings. One homework will involve a class presentation. Depending on the size of the class, some assignments may be done in groups.

Reading materials

There is no required textbook for the course. The required readings are either available through e-journals through the library or will be posted on Blackboard. The following two texts are recommended, however:

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

Gelman, Andrew and Hill, Jennifer (2006) *Data Analysis Using Regression and Multilevel/Hierarchical Models*, Cambridge University Press

Outline of course topics and readings:

The following outline describes the topics that will be covered along with anticipated associated readings. It corresponds roughly to the course weeks though we may end up adjusting time spent on each topic as we go. Readings highlighted with an * are recommended, not required. All readings not available on the web will be put on electronic reserve through Bobst library (BL). Web addresses for the others are provided.

1) Motivation: What's all the observational vs. randomized fuss about? Simple randomized experiments (theory and practice) and the Rubin Causal Model

Morgan & Winship, Chapter 1

Leamer, Edward (1983) "Let's take the con out of econometrics", *American Economic Review*, 73(1): 31-43 [Available at www.jstor.org]

*Hill, J., Reiter, J., and Zanutto, E. (2004) "A comparison of experimental and observational data analyses" *Applied Bayesian Modeling and Causal Inference from an Incomplete-Data Perspective*. Edited by Andrew Gelman and Xiao-Li Meng. West Sussex, England: Wiley. [Available on Blackboard under Lecture 1]

*Holland, Paul W. (1986), "Statistics and causal inference (with discussion)", *Journal of the American Statistical Association*, 81: 945-970 [Available at www.jstor.org]

2) Randomized experiments (including Randomized Block and Matched Pairs Designs) and complications that make them look like observational studies

Rosenbaum, P. (2002) *Observational Studies*, 2nd ed., New York: Springer, Chapter 2

Katz, L.F., Kling, J.R., and Liebman, J.B. (2001) "Moving to Opportunity in Boston: Early Results of a Randomized Mobility Experiment" *The Quarterly Journal of Economics* 116: 607-654. [available on Blackboard under Lecture 2](#)

*Imbens, G., Rubin, D., and Sacerdote, B. (2001) "Estimating the Effect of Unearned Income on Labor Earnings, Savings and Consumption: Evidence from a Survey of Lottery Players" *American Economic Review* 91(4): 778 (available through e-journals)

*Rubin, D. (1990) "Formal modes of statistical inference for causal effects" *Journal of Statistical Planning and Inference* 25: 279-292. ([available through e-journals](#))

*Sobel, Michael E. (1996), "An introduction to causal inference", *Sociological Methods and Research*, Vol. 24, Iss. 3; p. 353-379 (LL) ([available through e-journals](#))

3) Observational Studies and simple ways of adjusting for covariates

Gelman, Andrew and Hill, Jennifer (2006) Chapters 9 and 10 of *Data Analysis Using Regression and Multilevel/Hierarchical Models* in press at Cambridge University Press ([will be handed out in class](#)) **Chapter 9**

Rosenbaum, P. (2002) *Observational Studies*, 2nd ed., New York: Springer, Chapter 1
[available on Blackboard under Chapter 3]

Donohue, J. J., and S.D. Levitt (2001) "The impact of legalized abortion on crime" *The Quarterly Journal of Economics*, 116(2): 379-420
[Available through e-journals]

*Winship, Christopher and Michael Sobel (2004) "Causal Inference in Sociological Studies" in *Handbook of Data Analysis* edited by Melissa Hardy and Alan Bryman, London: Sage Publications, 36-38 ([available on Blackboard](#))

*Rubin, D. (1977) "Assignment to Treatment Groups on the Basis of a Covariate" *Journal of Educational Statistics*, 2: 1-26

*LaLonde, R. (1986) Evaluating the Econometric Evaluations of Training Programs, *American Economic Review*, 76: 604-620 [Available at www.jstor.org]

*Rosenbaum, P. (2002) "Covariance adjustment in randomized experiments and observational studies", *Statistical Science*, 17(3): 286-327

4) Propensity Score Approaches – Theory

Bingenheimer, J.B., Brennan, R.T., and Earls, F.J. (2005) "Firearm violence exposure and serious violent behavior" *Science* 308: 1323-1326 [Available on Blackboard]

Rosenbaum, PR and D B. Rubin (1985) "Constructing a control group using multivariate matched sampling methods that incorporate the propensity score", *The American Statistician*, 39: 33-38
[Available at www.jstor.org]

*Rosenbaum, Paul R. and Rubin, Donald B. (1984) "Reducing Bias in Observational Studies Using Subclassification on the Propensity Score" *Journal of the American Statistical Association*, 79: 516—524 [Available at www.jstor.org]

5) Propensity Score Approaches – Practice (Stata)

Gelman, Andrew and Hill, Jennifer (2006) Chapters 9 and 10 of *Data Analysis Using Regression and Multilevel/Hierarchical Models* in press at Cambridge University Press ([will be handed out in class](#)) [Chapter 10 read up to the section on regression discontinuity](#)

D'Agostino, R (1998) "Propensity score methods for bias reduction in the comparison of a treatment to a non-randomized control group" *Statistics in Medicine*, 17: 2265-2281.

Hill, J. (2008) "Discussion of research using propensity-score matching: Comments on 'A critical appraisal of propensity-score matching in the medical literature between 1996 and 2003' by Peter Austin" *Statistics in Medicine*, 27: 2055-2061.

*O'Keefe, Suzanne (2004) "Job creation in California's enterprise zones: a comparison using a propensity score matching model" *Journal of Urban Economics*, 55: 131-150.
[available on Blackboard]

*Foster, M. (2003) "Propensity Score Matching: An Illustrative Analysis of Dose Response" *Medical Care* 41: 1181-1192
[Available through e-journals]

*Dehejia, Rajeev H. and Wahba, Sadek (1999) "Causal Effects in Nonexperimental Studies: Reevaluating the Evaluation of Training Programs", *Journal of the American Statistical Association*, 94: 1053—1062 [Available at www.jstor.org]

6) Instrumental Variables Models – Introduction and Theory

Gelman, Andrew and Hill, Jennifer (2006) Chapters 9 and 10 of *Data Analysis Using Regression and Multilevel/Hierarchical Models* in press at Cambridge University Press [Chapter 10 from beginning of IV section through to the end](#)

Gennetian, L., Bos, J., Morris, P. (2002) "Using Instrumental Variables Analysis to Learn More from Social Policy Experiments" Manpower Demonstration Research Corp. working paper
[available on Blackboard]

Angrist, J D., Imbens, G W. and D B. Rubin, (1996) " Identification of Causal Effects Using Instrumental Variables," *Journal of the American Statistical Association*, 91: 444-472 [Available at www.jstor.org]

*Angrist, J D. (1990) "Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records," *American Economic Review*, 80: 313-336 [Available at www.jstor.org]

7) Instrumental Variables Models – Practice (Stata)

Angrist JD, Evans WN (1998), "Children and their parents' labor supply: Evidence from exogenous variation in family size", *American Economic Review* 88(3): 450-77

[available at www.jstor.org]

*E. Michael Foster. (2000) "Is more better than less? An analysis of children's mental health services" *Health Services Research*. Chicago: Vol. 35, Iss. 5; p. 1135

*Levitt, Steven D. 1996. "The Effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation." *Quarterly Journal of Economics*, 111(2): 319-51. [Available at www.jstor.org]

8) Difference in Differences/ Fixed Effects models

Chapter 18 on Panel Data Model in Ashenfelter book *Statistics and Econometrics* (published by Wiley, 2003), pp. 262-273
[available on e-reserves]

Angrist, J. D., and Krueger, A. (1999), "Empirical Strategies in Labor Economics," in Orley Ashenfelter and David Card (eds), *Handbook of Labor Economics*, Vol. 3A, Amsterdam: North-Holland,

A version is available online at <http://www.irs.princeton.edu/pubs/pdfs/401.pdf>

ONLY PP 19-23

*Bogart & Cromwell. "How much is a neighborhood school worth?" *J. Urban Economics* 47

*Card, D. and A. Krueger (1994) "Minimum Wages and Employment: A Case Study of the Fast-food Industry in New Jersey and Pennsylvania," *American Economic Review*, 84(4): 772-784.
[Available at www.jstor.org]

*Meyer, B. (1995) "Natural and Quasi-Experiments in Economics," *Journal of Business and Economic Statistics*, 13(2): 151-161
[Available through e-journals]

*Aaronson, Daniel. (1998) "Using Sibling Data to Estimate the Impact of Neighborhoods on Children's Educational Outcomes" *The Journal of Human Resources*, 33(4): 915-946
[Available through e-journals]

*Korenman and Neumark (1991) "Does Marriage Really Make Men More Productive?" *Journal of Human Resources*, 26(2): 282-307
[available through e-journals]

9) Regression Discontinuity

Brian A. Jacob, Lars Lefgren (2004) "Remedial Education and Student Achievement: A Regression-Discontinuity Analysis" *Review of Economics and Statistics* 86(1)

Shadish, Cook & Campbell (2002) "Regression Discontinuity Designs" Chapter 7 in *Experimental and Quasi-Experimental Designs* Boston: Houghton Mifflin Co. (posted on Blackboard with lecture)

