Rutgers, The State University of New Jersey
School of Social Work
Advanced Statistical Methods II:
Applied Regression and Related Multivariate Methods
19:910:639, Spring 2017

Class

Instructor: Lenna Nepomnyaschy, Associate Professor
Email: lennan@ssw.rutgers.edu
Time: Tuesdays 9:15 – 11:40 am
Location: Social Work Annex – Seminar room

Required Lab

Instructor: Louis Donnelly, Post-Doctoral Scholar, Princeton University
Email: louisjd@princeton.edu
Time: Mondays 5:00 – 6:00 pm
Location: Social Work Annex – Seminar room

Course Overview

This course, the second of the statistics sequence for social work doctoral students, will focus on applied regression analysis and related multivariate methods. Linear regression will be covered in depth, including regression assumptions, model specification, and diagnostics. Methods for dichotomous and categorical dependent variables, including logistic, probit, and multinomial regression will also be covered. Advanced methods including multi-level models, survival analysis, fixed and random effects models, and others will be introduced. Students will learn to use the Stata statistical package for all analyses and class assignments.

Required Software:

This course requires that students learn and use the Stata Statistical Software Package for hands-on data analysis and statistics applications for class assignments.

- Stata is available to all students in any Rutgers computer lab as well as the Doctoral Student Computer lab in the SSW Annex
- Stata is available for all employees (GRAs, staff, faculty) for free download from the OIRT software portal: https://software.rutgers.edu/
- Students may also purchase their own version of Stata at discounted rates through the Rutgers Office of Instructional Technology: http://www.stata.com/order/new/edu/gradplans/gp-direct.html

Required Texts

Gordon, Rachel A. 2015. *Applied Statistics for the Social and Health Sciences*. New York: Routledge.

Lewis-Beck, C. & Lewis-Beck, M. 2016. *Applied Regression: An Introduction (2nd edition)*. Newbury Park, CA: Sage Publications.

Suggested Supplementary Texts

Writing about Quantitative Analysis

Miller, Jane E., 2013. *The Chicago Guide to Writing about Multivariate Analysis (2nd Edition)*. The Chicago Guides to Writing, Editing, and Publishing. University of Chicago Press. Study guide: http://www.press.uchicago.edu/books/miller/multivariate/index.html
THIS IS SUPER HELPFUL
See Jane Miller's website for pdfs, videos and other material: http://policy.rutgers.edu/faculty/miller/

Other Useful Statistics and Data Analysis Books

Jaccard, J. & Turrisi, R. 2003. *Interaction Effects in Multiple Regression* (2nd Edition). Thousand Oaks, CA: Sage Publications. ISBN: 0761927425.

Treiman, Donald J. 2009. *Quantitative Data Analysis: Doing Social Research to Test Ideas.* San Francisco, CA: Jossey-Bass (Wiley Imprint).

Hardy, Melissa. 1993. *Regression with Dummy Variables*. Newbury Park, CA: Sage Publications.

Pampel, Fred. 2000. *Logistic Regression: A Primer.* Thousand Oaks, CA: Sage Publications.

Kahane, Leo. 2008. *Regression Basics.* Thousand Oaks, CA: Sage Publications. 2nd Edition.

More Advanced Methods Texts for Specialized Techniques

Singer & Willett. 2003. *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence.* New York: Oxford University Press.

Rabe-Hesketh, S. and Skrondal, A. (2012). Multilevel and Longitudinal Modeling Using Stata (3rd Edition). College Station, TX: Stata Press.

Kreft, I. & De Leeuw. 2000. *Introducing Multilevel Modeling.* London: SAGE Publications.

General Stata Texts

Long, S.J. 2009. *The Workflow of Data Analysis Using Stata*. College Station, TX: Stata Press.

Kohler, U. & Kreuter, F. 2009. *Data Analysis Using Stata* (2nd ed). College Station, TX: Stata Press.

Mitchell, M. 2010. *Data Management Using Stata: A Practical Handbook*. College Station, TX

Course Requirements

Students will be evaluated on the following course requirements (detailed instructions to follow).

Homework Assignments (6 total) = 50%

There will be **SIX (6)** homework assignments, which will be based on the skills and concepts introduced during the previous class and on the required readings. Assignments will include

hands-on application of statistical formulas to basic data, writing syntax to create Stata output from a dataset, creating tables and graphs from output, interpreting output, and writing up methods and results of analyses. Assignments will build on one another leading to the mid-term and final assignment that will include most of the previous elements.
Homework #1: Selecting and describing variables – univariate analysis
***Homework #2 (in-class exercise): Calculating and interpreting bivariate regression coefficients by hand*
Homework #3: Estimating, interpreting, and predicting parameters for bivariate regressions
Homework #4: Estimating and interpreting results from a series of multiple regression models
Homework #5: Interaction effects (moderation) with continuous dependent variables
Homework #6: Estimating and interpreting results from regressions with binary outcomes, including interaction effects

Mid-term Assignment = 20%
The mid-term assignment will be the first part of the final assignment. Students will formulate a question, select and construct appropriate variables for inclusion in a multiple regression model with a continuous dependent variable, present basic descriptive characteristics of the variables, estimate a number of multiple regression models, and interpret their results. This assignment will build on the elements of the weekly homework assignments.

Final Written Assignment = 20%
The final assignment will consist of a complete data analysis project which will build on the mid-term assignment and all prior weekly homework assignments. Analyses will be extended to include estimation of interaction effects, and a variety of models with binary dependent variables. The written assignment will take the form of the methods and results sections of a journal-style quantitative empirical paper. Students will describe their measures and analytic strategy, describe the sample characteristics, interpret results from their bivariate and multivariate models, and provide a brief discussion of the answer to their question.

Presentation of Final Assignment = 5%
Students will present their final assignment to the class in a powerpoint presentation (10 minutes maximum, similar to a conference presentation) on the last day of class.

Peer-reviewed article submission and discussion = 5%
Each student will find a peer-reviewed scholarly article that utilizes multiple regression estimation for the class to discuss. All students are expected to read each article to discuss in a specific class. Articles must be submitted one week prior to discussion date.

It goes without saying that students are expected to attend every class, arrive on time and participate in class discussions and exercises. While there is not specific course credit associated with attendance and participation, absences, being late to class, and lack of preparation will impact students' overall grades.

Applied Regression, Spring 2017: Outline of Class & Lab Topics & Homework Due Dates

Week	Date	Topic	HW Dates	HW Topic
Week 1	Class: Jan 17	Intro to Course & Stats Review	**HW #1 Assigned; Due: Feb 2**	univariate analysis - describing variables
	Lab: Jan 23	*Into to Stata & constructing variables*		
Week 2	Class: Jan 24	Bivariate regression - Introduction	HW 2, in-class exercise	hand calculation of bivariate regression coefficients
	Lab: Jan 30	*Constructing & describing variables continued*		
Week 3	Class: Jan 31	Bivariate regression - Estimation & Interpretation	**HW #3 Assigned, Due: Feb 16**	estimation and interpretation of bivariate regression models
	Lab: Feb 6	*Bivariate regression*		
Week 4	Class: Feb 7	Bivariate regression - Hypothesis testing		
	Lab: Feb 13	*Bivariate regression continued*		
Week 5	Class: Feb 14	Multiple regression - Introduction & model building	**HW #4 Assigned, Due: Feb. Mar 2**	estimation and interpretation of multiple regression models
	Lab: Feb 20	*Multiple regression*		
Week 6	*Class: Feb 21*	*Multiple regression - Dummy variables & nonlinear functions*		
	Lab: Feb 27	Multiple regression continued		
Week 7	Class: Feb 28	Multiple regression - Diagnostics, Confounding & Mediation	**Mid-term Assigned, Due: March 23**	Putting it all together
	Lab: Mar 6	*Multiple regression cont'd & review for mid-term*		
Week 8	Class: Mar 7	Interaction effects (moderation) w/continuous DVs		
		SPRING BREAK - NO CLASS (March 14) - NO LAB (March 13)		
	Lab: Mar 20	*Interaction effects w/continuous DVs*		
Week 9	Class: Mar 21	Interaction effects - continued	**HW #5 Assigned, Due: March 30**	Interaction effects w/continuous outcomes
	Lab: March 2	*Interaction effects continued*		
Week 10	Class: Mar 28	Binary dependent variables	**HW #6 Assigned, Due: April 20**	Binary outcomes and interaction effects w/binary outcomes.
	Lab: Apr 3	*Binary dependent variables*		
Week 11	Class: Apr 4	Binary dependent variables - continued		
	Lab: Apr 10	*Binary dependent variables - continued*		
Week 12	Class: Apr 11	Interaction effects with binary DVs		
	Lab: Apr 17	*Interaction effects with binary DVs*		
Week 13	Class: Apr 18	Categorical (and other) dependent variables	**Final assigned, Due: May 4**	
	Lab: Apr 24	*Categorical DVs*		
Week 14	Class: Apr 25	Advanced methods introduction		
	Lab: May 1	*Review for final assignment*		
Week 15	Class: May 2	**Student presentations**		
	NO LAB			

Detailed Course Outline

Please note*: In addition to the required readings for each week, there are sample empirical articles listed. I will be adding (or substituting) relevant peer-reviewed empirical papers that use the various methods that we are covering as we go, including those submitted by students. Thus, each week there will be alternate journal articles that students will be required to read.*

Week 1: January 17, 2017

Topics: Introduction to course, Concepts, Examples, Terminology, Variables

HW #1 assigned: Univariate Analysis, Describing variables, DUE: February 2

Required Readings:

Open Science Collaboration. 2015. Estimating the Reproducibility of Psychological Science. *Science* 349(6251) **(READ ABSTRACT)**
http://science.sciencemag.org/content/349/6251/aac4716.full

> Flaherty, Colleen. 2015. Why Replication Matters. *Inside Higher Ed*. August 28, 2015. https://www.insidehighered.com/news/2015/08/28/landmark-study-suggests-most-psychology-studies-dont-yield-reproducible-results
>
> Achenbach, Joel. 2015. Many Scientific Studies Can't Be Replicated. That's a Problem. *The Washington Post*. August 27, 2015. https://www.washingtonpost.com/news/speaking-of-science/wp/2015/08/27/trouble-in-science-massive-effort-to-reproduce-100-experimental-results-succeeds-only-36-times/

Gordon, Chapter 1: Examples of Quantitative Research in the Social and Health Sciences (p. 5-7). **Pick One Literature excerpt to discuss in class**.

Gordon, Chapter 5: Basic Descriptive Statistics (p. 97 – 135), **SKIM & REVIEW:** Types of Variables: Nominal, Ordinal, Interval (and the ways in which each should be described)

Supplementary Readings, Statistics Review:

Gordon, Chapter 6, Sample, Population, and Sampling Distributions (p. 143 – 188)

Gordon, Chapter 7: Bivariate Inferential Statistics (p. 196 – 230).

Other Supplementary Reading – Just for Fun

Ioannidis, John P.A. 2005. Why Most Published Research Findings Are False. *PLoS Medicine*, 2(8): 696-701.

Week 2: January 24, 2017

Topics: Introduction and overview of regression analysis, Calculating bivariate regression coefficients

HW #2 (in-class exercise): Calculating bivariate regression coefficients

Required Readings:
Lewis-Beck & Lewis-Beck, Chapter 1: Bivariate Regression: Fitting a Straight Line (p.1 – 22)

Gordon, Chapter 8: Basic Concepts of Bivariate Regression (p. 241 – 256). **STOP at 8.4.4**

Examine the descriptive tables (Table 1, generally) and how the authors "narratively describe" the variables in these TWO papers:

Fomby & Cherlin. 2007. Family Instability and Child Well-being. *American Sociological Review*. **Page 191, Results, Descriptive Results and Table 1**.

Nepomnyaschy, Magnuson & Berger. 2012. Child Support and Child Development. *Social Service Review*. **Page 16, Results, Sample Description and Table 1.**

Week 3: January 31, 2017

Topics: Bivariate regression analysis (continued): Regression Assumptions, Interpreting Coefficients

HW #3 assigned: Estimating and interpreting bivariate regression models, DUE: February 16

Required Readings:
Lewis-Beck, Chapter 2: Bivariate Regression: Assumptions and Inferences, **1st PART ONLY** (p. **23 – 29**).

Studenmund, Chapter 4: The Classical Model (p. 93 – 110).

Moksony, Ferenc. 1999. Small is Beautiful. The Use and Interpretation of R-Squared in Social Science Research. *Review of Sociology*.

White, L. 2005. Writes of Passage: Writing an Empirical Journal Article. *Journal of Marriage and Family* 69: 791-798.

Week 4: February 7, 2017

Topics: Bivariate regression continued: Hypothesis testing; Rescaling and transforming variables

Required Readings:
Lewis-Beck, Chapter 2: Bivariate Regression: Assumptions and Inferences: **2nd PART ONLY,** (p. **29 – 53**).

Studenmund, Chapter 5: Hypothesis Testing (p. 121 – 150, 159 – 166)

Gordon, Chapter 8: Basic Concepts of Bivariate Regression (p. 260 – 281, **STOP at 8.5**)

Sample papers

Nepomnyaschy, L. & Garfinkel, I. 2011. Nonresident Father Involvement and Children's Material Hardship. *Social Service Review* 85(1):3-38. *(***skim literature review, closely read and be familiar with data and methods and descriptive results, and table 1, through p. 21)**

Week 5: February 14, 2017

Topics: Multiple regression, Model specification

HW #4 assigned: Estimation and interpretation of multiple regression models, DUE: March 2

Required Readings:

Gordon, Chapter 9: Basic Concepts of Multiple Regression (p. 294 – 330)

Lewis-Beck, Chapter 3: Multiple Regression (p**. 55 – 74**).

Studenmund, Chapter 6: Choosing the Independent Variables (p. 167 – 190).

Sample papers

Nepomnyaschy, L. & Garfinkel, I. 2011. Nonresident Father Involvement and Children's Material Hardship. *Social Service Review* 85(1):3-38. *(***read closely and be familiar with: pages 21- bottom of 25, and table 2)**

Joo, M. (2008). The impact of availability and generosity of subsidized childcare on low-income mothers' work hour. *Journal of Policy Practice, 7*(4), 298-313.
(**look at OLS results, Table 3**).

Week 6: February 21, 2017

Topics: Multiple Regression (cont'd): Dummy Variables, Nonlinear Relationships

Required Readings

Gordon, Chapter 10: Dummy Variables (p. 334 – 372**, UP TO 10.5**)

Gordon, Chapter 12: Nonlinear Relationships (p. 434 – 456)

Miller, Chapter 9: Quantitative Comparisons for Multivariate Models (**p. 193 – 199 ONLY**)

Miller, Chapter 10: The Goldilocks Problem in Multivariate Regression (p. 211 – 229)

Sample papers

Nepomnyaschy, L., Hegyi, T., Ostfeld, B. & Reichman, N. 2012. Developmental Outcomes of Late-Preterm Infants at 2 and 4 Years. *Maternal and Child Health Journal*. 16:1612-1624. **(read up to p. 1615, focus only on ols models in table 3)**

Nepomnyaschy, Magnuson & Berger. 2012. Child Support and Child Development. *Social Service Review*. (**read through middle of p. 23, results from table 2)** (OLS, standardized outcomes, model-building).

Suggested Readings:
Hardy, M. 1993. *Regression with Dummy Variables*, Chapters 1, 2, and 3 (p. 1 – 28)

Week 7: February 28, 2017
Topics: Multiple Regression continued: Regression Diagnostics, Confounding, and Mediation

MID-TERM assigned, DUE: March 23 (after spring break)

Required Readings:
Gordon, Chapter 14: Outliers, Heteroskedasticity, and Multicollinearity (p. 481-520).

Lewis-Beck. Chapter 4: Multiple Regression: Special Topics (p. 75-95)

Gordon, Chapter 13: Indirect Effects and Omitted Variable Bias (p. 461 – 480)

Miller, Chapter 3: Causality, Statistical Significance and Substantive Significance (p. 34 – 48)

Studenmund, Chapter 11: Running Your Own Regression Project, Practical Advice for Your Project (p. 383 – 393).
AND A Regression User's Checklist and Guide, (p. 395 – 400).

Baron, R. & Kenny, D. 1986. The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology* 51(6): 1173-1182. (classic text – 30,000 citations).

Sample papers
Springer, K. 2009. Childhood Physical Abuse and Midlife Physical Health: Testing a Multi-Pathways Life Course Model. *Social Science & Medicine*, 69:138-146. (Mediation, **focus on OLS models**)

Week 8: March 7, 2017
Topic: Interaction (moderation) effects w/continuous dependent variables

Required Readings:
THESE READINGS WILL BE COVERED OVER THE NEXT TWO WEEKS

Gordon, Chapter 11: Interactions (p. 381-425).

Miller, Chapter 16: Writing About Interactions (p. 339 – 365).

Sample papers
Greenfield, E. & Marks, N. 2010. Sense of Community as a Protective Factor against Long-Term Psychological Effects of Childhood Violence. *Social Service Review* 84(1): 129-147. (interaction effects)

Bzostek, Sharon. 2008. Social Fathers and Child Well-Being. *Journal of Marriage and Family*, 70:950-961.

Supplementary Reading – BUT very helpful – strongly recommended
Jaccard & Turrisi, *Interaction Effects in Multiple Regression*: Chapters 1 and 2, (p. 1 - 43).

MARCH 14, 2017 SPRING BREAK NO CLASS

Week 9: March 21, 2017
Topic: Interaction Effects Continued

HW #5 Assigned: Interaction effects w/continuous outcomes, DUE: March 30

Week 10: March 28, 2017
Topic, next two weeks: Dichotomous dependent variables: linear probability models, logistic regression, frequency tables, odds ratios.

HW#6 assigned: Binary outcomes and interaction effects w/binary outcomes, DUE: April 20

Required Readings:
THESE READINGS WILL BE COVERED OVER THE NEXT TWO WEEKS

Gordon, Chapter 16: Dichotomous Outcomes (p. 552 – 602).

J.E. Miller and Y.V. Rodgers, 2008. "Economic Importance and Statistical Significance: Guidelines for Communicating Empirical Research." *Feminist Economics*. 14(2):117-149.

Zhang, J. & Yu, K.F. 1998. What's the Relative Risk? A Method of Correcting the Odds Ratio in Cohort Studies of Common Outcomes. *JAMA* 280(19): 1690-1.

Sample papers
Nepomnyaschy, L., Hegyi, T., Ostfeld, B. & Reichman, N. 2012. Developmental Outcomes of Late-Preterm Infants at 2 and 4 Years. *Maternal and Child Health Journal* 16:1612-1624 (**compare the OLS and Logistic Regressions – Table 3**).

Joo, M. (2008). The impact of availability and generosity of subsidized childcare on low-income mothers' work hour. *Journal of Policy Practice, 7*(4), 298-313.
(**compare the OLS and Logistic Regressions – Tables 3 and 4**).

Akincigil, A. et al. 2012. Racial and Ethnic Disparities in Depression Care in Community-Dwelling Elderly in the United States. *American Journal of Public Health* 102(2): 319-328. (logistic regression, model building)

Springer, K. 2009. Childhood Physical Abuse and Midlife Physical Health: Testing a Multi-Pathway Lifecourse Model. *Social Science & Medicine* 69: 138-146. (OLS, % change, logistic regression)

Suggested Readings:
Pampel, *Logistic Regression: A Primer*, Chapters 1, 2, 4 and **SKIM** 3 (p. 1 – 68)

Week 11: April 4, 2017
Topic: Dichotomous dependent variables continued: Logistic Regression, Probit Regression, Marginal Effects, Risk Ratios

Week 12: April 11, 2017
Topic: Interactions with Binary Dependent Variables; Missing Data

Required Readings:
Jaccard, J. 2001. *Interaction Effects in Logistic Regression*: **SKIM**, Chapter 1 Review of Logistic Regression, Probability, Odds, Interactions. **READ**, Chapters 2-6 (p. 18-58). **SKIP** 3-way interactions throughout.

Johnson, D. & Young, R. 2011. Toward Best Practices in Analyzing Datasets with Missing Data: Comparisons and Recommendations. *Journal of Marriage and Family* 73: 926-945.

Sample papers
Williams, K. & Dunne-Bryant, A. 2006. Divorce and Adult Psychological Well-Being: Clarifying the Role of Gender and Child Age. *Journal of Marriage and Family* 68(5):1178-1196. (interactions w/OLS, interactions w/logit, mediation)

Stuart, E. et al.. 2009. Multiple Imputation with Large Data Sets: A Case Study of the Children's Mental Health Initiative. *American Journal of Epidemiology* 169(9):1133-1139.

Week 13: April 18, 2017
Topics: Polytomous dependent variables (categorical, ordered, count),

Final assignment handed out: DUE, May 4

Required Readings:
Gordon, Chapter 17: Multi-Category Outcomes – Multinomial Logit & Ordered Logit, (p. 609-646 **ONLY**).

Sample papers
Viruell-Fuentes, Edna, Morenoff, Jeffrey, Williams, David, & James House. 2011. Language of Interview, Self-Rated Health, and the Other Latino Health Puzzle. *American Journal of Public Health*, 101(7): 1306-1313. (multinomial logit, predicted probabilities)

Bell, Janice & Frederick Zimmerman. 2010. Shortened Nighttime Sleep Duration in Early Life and Subsequent Childhood Obesity. *Archives of Pediatric and Adolescent Medicine*, 164:9(840-845). (ordered logit)

Week 14: April 25, 2107

SOME OF THESE TOPICS WILL BE COVERED
Topics: Introduction to advanced methods: Longitudinal analyses and addressing challenges to causal inference

A. Cross-sectional data: Propensity Score Matching, Difference in Difference Models, Instrumental Variables, Multi-level Models for Grouped data
B. Longitudinal data: Survival Analysis, Fixed Effects, Lagged Dependent Variables, Cross-Lagged Models, Multi-level Models for Longitudinal data

Required Readings:
Lieberson, S. 1985. *Making It Count: The Improvement of Social Research*. Berkeley: University of California Press. Chapters 1 and 2.

Goldstein, H. 2011. *Multilevel Statistical Models*. London: Wiley & Sons. Chapter 1: Introduction (p. 1 – 12)

Guo, S. 2005. Analyzing Grouped Data with Hierarchical Linear Modeling. *Children and Youth Services Review* 27:637-652. (multilevel models)

Angrist, Joshua & Kreuger, Alan. 2001. Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments. *Journal of Economic Perspectives*, 15(4):69-85.

Singer & Willett, *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*,
Chapter 1: A Framework for Investigating Change over Time (p. 3 – 15)
Chapter 2: Exploring Longitudinal Data on Change (p. 16 – 44)
Chapter 3. Introducing the Multilevel Model for Change (p. 51 - 74).
Chapter 9: A Framework for Understanding Event Occurrence (p. 305 – 324).

Teachman, Jay & Kyle Crowder. 2002. Multilevel Models in Family Research: Some Conceptual and Methodological Issues. *Journal of Marriage and Family*. 64:280-294.

Sample Empirical Papers

Farley, Thomas et al. 2006. The Relationship between the Neighborhood Environment and Adverse Birth Outcomes. *Paediatric and Perinatal Epidemiology*. 20:188-200. (multilevel models)

Leigh, J.P & Schembri, M. 2003. Instrumental Variables Techniques: Cigarette Prices Provided Better Estimate of Effects of Smoking on SF-12. *Journal of Clinical Epidemiology* 57:284-293. (instrumental variables)

Hill, J., Waldfogel, J., Brooks-Gunn, J. & Han. W-J. 2005. Maternal Employment and Child Development: A Fresh Look Using Newer Methods. *Developmental Psychology* 41(6): 833-850. (propensity scores, multiple imputation)

Guo, S., Barth, R. & Gibbons, C. 2006. Propensity Score Strategies for Evaluating Substance Abuse Services for Child Welfare Clients. *Children and Youth Services Review* 28:357-383. (propensity scores)

Pears, K. et al. 2005. The Timing of Entry into Fatherhood in Young, At-Risk Men. Journal of Marriage and Family, 67: 429-447. (survival analysis)

Guo, S & Wells, K. 2003. Research on Timing of Foster Care Outcomes: One Methodological Problem and Approaches to its Solution. *Social Service Review* 77(1):1-24. (event occurrence, AKA: hazard models, survival analysis)

Nepomnyaschy, L. 2007. Child Support and Father-Child Contact: Testing Reciprocal Pathways. *Demography* 44(1): 93-112. (cross-lagged models)

Nepomnyaschy, L. & Garfinkel, I. 2011. Nonresident Father Involvement and Children's Material Hardship. *Social Service Review* 85(1):3-38. (fixed effects, lagged dependent variables, cross-lagged models)

Supplementary Readings

Gibson-Davis, C. & Foster, M.E. 2006. A Cautionary Tale: Using Propensity Scores to Estimate the Effect of Food Stamps on Food Insecurity. *Social Service Review* 80(1):93-126. (propensity scores)

Huang, Chien-Chung, Han, Wen-Jui, and Irwin Garfinkel. 2003. Child Support Enforcement, Joint Legal Custody, and Parental Involvement. *Social Service Review*, 77(2): 255-278. (instrumental variables)

Niu, S.X. & Tienda, M. 2010. The Impact of the Texas Top 10 Percent Law on College Enrollment: A Regression Discontinuity Approach. *Journal of Policy Analysis and Management* 29(1):84-110. (regression discontinuity)

Kim, J. & Joo, M. 2011. Did PRWORA's Mandatory School Attendance Policy Increase Attendance among Targeted Teenage Girls? Children and Youth Services Review 33: 1616-1623. (difference in difference)

Morton, C., Petersen, A.N. et al. 2010. Tobacco Sales in Community Pharmacies: Remote Decisions and Demographic Targets. *Journal of Community Psychology* 38(1):39-48. (multilevel models)

Week 15: May 2, 2017

STUDENT PRESENTATIONS OF FINAL ASSIGNMENT