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

Suggested Supplementary Texts

Writing about Quantitative Analysis

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


More Advanced Methods Texts for Specialized Techniques


General Stata Texts

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


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.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>HW Dates</th>
<th>HW Topic</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Class: Jan 17</td>
<td>Intro to Course &amp; Stats Review</td>
<td>HW #1 Assigned, Dues: Feb 2</td>
<td>univariate analysis - describing variables</td>
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<td>Lab: Jan 23</td>
<td>Intro to Stats &amp; constructing variables</td>
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<td>Week 2</td>
<td>Class: Jan 24</td>
<td>Bivariate regression - Introduction</td>
<td>HW 2, in-class exercise</td>
<td>hand calculation of bivariate regression coefficients</td>
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<td></td>
<td>Lab: Jan 30</td>
<td>Constructing &amp; describing variables continued</td>
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<td>Week 3</td>
<td>Class: Jan 31</td>
<td>Bivariate regression - Estimation &amp; interpretation</td>
<td>HW #3 Assigned, Due: Feb 16</td>
<td>estimation and interpretation of bivariate regression models</td>
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<td>Lab: Feb 6</td>
<td>Bivariate regression</td>
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<td>Week 4</td>
<td>Class: Feb 7</td>
<td>Bivariate regression - Hypothesis testing</td>
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<td>Lab: Feb 13</td>
<td>Bivariate regression continued</td>
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<td>Week 5</td>
<td>Class: Feb 14</td>
<td>Multiple regression - Introduction &amp; model building</td>
<td>HW #4 Assigned, Due: Feb. Mar 2</td>
<td>estimation and interpretation of multiple regression models</td>
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<td>Lab: Feb 20</td>
<td>Multiple regression</td>
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<td>Week 6</td>
<td>Class: Feb 21</td>
<td>Multiple regression - Dummy variables &amp; nonlinear functions</td>
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<td>Lab: Feb 27</td>
<td>Multiple regression continued</td>
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<td>Week 7</td>
<td>Class: Feb 28</td>
<td>Multiple regression - Diagnostics, Confounding &amp; Mediation</td>
<td>Mid-term Assigned, Due: March 23</td>
<td>Putting it all together</td>
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<td>Lab: Mar 6</td>
<td>Multiple regression cont’d &amp; review for mid-term</td>
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<td>Week 8</td>
<td>Class: Mar 7</td>
<td>Interaction effects (moderation) w/continuous DVs</td>
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<td>Lab: Mar 20</td>
<td>Interaction effects w/continuous DVs</td>
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<td>Week 9</td>
<td>Class: Mar 21</td>
<td>Interaction effects - continued</td>
<td>HW #5 Assigned, Due: March 30</td>
<td>Interaction effects w/continuous outcomes</td>
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<td>Lab: March 2</td>
<td>Interaction effects continued</td>
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<td>Week 10</td>
<td>Class: Mar 28</td>
<td>Binary dependent variables</td>
<td>HW #6 Assigned, Due: April 20</td>
<td>Binary outcomes and interaction effects w/binary outcomes.</td>
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<td>Lab: Apr 3</td>
<td>Binary dependent variables</td>
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<td>Week 11</td>
<td>Class: Apr 4</td>
<td>Binary dependent variables - continued</td>
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<td>Lab: Apr 10</td>
<td>Binary dependent variables - continued</td>
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<td>Week 12</td>
<td>Class: Apr 11</td>
<td>Interaction effects with binary DVs</td>
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<td>Lab: Apr 17</td>
<td>Interaction effects with binary DVs</td>
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<td>Week 13</td>
<td>Class: Apr 18</td>
<td>Categorical (and other) dependent variables</td>
<td>Final assigned, Due: May 4</td>
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<td>Lab: Apr 24</td>
<td>Categorical DVs</td>
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<td>Week 14</td>
<td>Class: Apr 25</td>
<td>Advanced methods Introduction</td>
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<td>Lab: May 1</td>
<td>Review for final assignment</td>
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<td>Week 15</td>
<td>Class: May 2</td>
<td>Student presentations</td>
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<td>NO LAB</td>
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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:
http://science.sciencemag.org/content/349/6251/aac4716.full


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)


Other Supplementary Reading – Just for Fun

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.**

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**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).


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**Week 4: February 7, 2017**
**Topics:** Bivariate regression continued: Hypothesis testing; Rescaling and transforming variables

**Required Readings:**

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**)

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*Sample papers*

**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**


**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**

**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).


**Sample papers**

**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


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).


Sample papers


**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:**


**Sample papers**


### 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**

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:**


Chapter 2: Exploring Longitudinal Data on Change (p. 16 – 44)
Chapter 3. Introducing the Multilevel Model for Change (p. 51 - 74).


**Sample Empirical Papers**


**Supplementary Readings**


**Week 15: May 2, 2017**

STUDENT PRESENTATIONS OF FINAL ASSIGNMENT