**Sociology SOC:6180:0001, Linear Models in Sociological Research**
Spring 2018, 11:00am - 12:15pm MW W113


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| Instructor: | Erik Westlund |
| Office: | Seashore Hall, W30 |
| Email: | erik-westlund@uiowa.edu |
| Office Hours: | M 9:45-10:45am, W 8:45-10:45am, and by appointment |
| Phone: | 319-467-1240 (office) |


This course is a graduate level survey of linear regression methods used in sociology. It builds directly on the material covered in SOC:6170, *Introduction to Sociological Data Analysis*.

In this course, we will learn:

- The mechanics of bivariate and multiple regression and the fundamentals of statistical inference and model building.
- How to estimate and interpret linear models with categorical predictors and interaction terms
- The properties and assumptions of the OLS estimator and what to do when these assumptions are violated.
- The basics of generalized linear models (e.g. logit models, multilevel models).
- The basics of causal inference (e.g., regression, potential outcomes, matching).
- How to clean data and write code to enable others to understand and reproduce our analyses.

The emphasis throughout will be on sociological applications and implementation.

*Note*: The prerequisite for this course is SOC:6170 or an equivalent course. Basic knowledge of the following topics is assumed: (1) sampling and measurement, (2) measures of central tendency and variability, (3) probability theory and probability distributions, (4) point and interval estimation, (5) hypothesis testing, and (6) bivariate linear regression and correlation.

**Requirements**

The objective of this course is to develop your ability to conduct and critique multivariate statistical analyses of sociological data. The course is designed to help you learn (1) how to manipulate data systematically to allow for others to reproduce your analyses, (2) the purpose of a multivariate statistical model, (3) how to execute a multivariate regression analysis using a software package, (4) how to interpret results, and (5) when and why OLS regression modeling is (not) appropriate. Your progress in this course will be evaluated as follows:

- Problem Sets 1−4 (10% each, 40% of final grade)
- Problem Set 5 (20%)
- Midterm Exam (15%)
- Final Exam (25%)

The material in this course is difficult. You cannot do well without carefully reading all course materials, taking notes while reading and in class, diligently completing problem sets, and participating in class discussion.

If you need to miss class for an approved reason (e.g., because of illness, religious observation, or jury duty), please let me know in advance so we can make a plan for you learning the missed material.

**Textbooks**

Fox, John. 2016. *Applied Regression Analysis and Generalized Linear Models*. 3rd Edition. Sage Press ISBN: 9780761930426.

Gelman and Hill. 2006. *Data Analysis Using Regression and Multilevel/Hierarchical Models.* Cambridge. ISBN-13: 978-0521686891.

You do not need to buy the Gelman. It is available for free online through the library.

**Course Logistics**

This course will meet twice a week for 75 minute periods. Typically, each class period will begin with a lecture on the topic material, which will be followed by a discussion of applications using sociological data. Step-by-step examples will be provided in Stata. Where appropriate, examples using the open-source (free) R language will also be provided (see below).

We will meet periodically in Seashore Hall ITC (W13) to work on sociological applications in Stata. All class materials will be posted weekly on the course website on ICON.

**Grading**

*Problem sets 1−4* (10% each) will be graded using a 3 point scale. You are welcome and encouraged to learn from other students, but you must complete assignments on your own and turn in your work. The University of Iowa code for academic honesty and related policies can be found here: http://clas.uiowa.edu/students/handbook/academic-fraud-honor-code

*Problem Set 5* (20%) will be graded using a 100 point scale. This assignment requires that you develop a theoretically informed research question and conduct a multivariate regression analysis using the ELS:2002 data set. Other data sets may be used with my approval. Problem Set 5 will be discussed in detail closer to the due date.

**Exams.** Both exams will be cumulative and graded on a 100 point scale. The mid-term will be worth 15%; the final, 25%. Students will be allowed to use textbooks, notes, and calculators during the exam.

Final grades will be calculated using the following scale:

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| A+ | 99-100 | B+ | 87-89.99 | C+ | 77-79.99 | D+ | 67-69.99 | F | ≤ 59.99 |
| A | 93-98.9 | B | 83-86.99 | C | 73-76.99 | D | 63-66.99 | | |
| A- | 90-92.9 | B- | 80-82.99 | C- | 70-72.99 | D- | 60-62.99 | | |

# Schedule

Note: This is a living document. Many of the topics in this course build on each other, so it may sometimes be necessary to spend extra time on a topic before moving on. When this happens, I will update the syllabus and let the class know.

**Week 1**

W 1/17 **Introduction**

**Week 2**

M 1/22 **Reviewing the basics**
Gelman & Hill, ch. 2, pp. 13-27 (ICON)
Gelman: "Stupid-ass statisticians don't know what a goddam confidence interval is"
http://andrewgelman.com/2017/12/28/stupid-ass-statisticians-dont-know-goddam-confidence-interval/
Fox, ch. 1

W 1/24 **Data Craft: Whipping ELS02 into Shape**

*Problem set 1 released*

**Week 3**

M 1/29 **Linear Relationships, Examining Data**
Fox, chs. 2-3, skim 4
Gelman and Hill, pp. 53-68

W 1/31 **Introducing Ordinary Least Squares (OLS) Regression: Bivariate Models**
Gelman & Hill, Part 1A, pp. 31-32
Fox, ch. 5.1

**Week 4**

M 2/5 **Introducing OLS: Multivariate Models**
Gelman & Hill, Part 1A, pp. 32-34
Fox, ch. 5.2

W 2/7 **Statistical Inference, Interpreting Transformations**
Gelman & Hill, Part 1A, pp. 37-42
Fox, ch. 6 (skim)

**Week 5**

M 2/12 **Lab Session**
Reviewing problem set 1

*Problem Set 1 due BEFORE CLASS, submit on ICON*
*Problem Set 2 released*

W 2/14 **Categorical Explanatory Variables**
Fox, 7.1, 7.2, 7.4

**Week 6**

M 2/19 **Interaction Terms, pt. 1**
Fox 7.3

W 2/21 **Interaction Terms, pt. 2.**

**Week 7**

M 2/26 **Model Building**
Gelman and Hill, Part 1A, pp. 68-72
Gelman, Advice on statistical model building
http://andrewgelman.com/2009/05/13/advice_on_stati/
Ainsworth-Darnell & Downey, Assessing the Oppositional Culture Explanation for Racial/Ethnic Differences in School Performance (ICON)

W 2/28 **Lab Session**

M 3/2 *Problem Set 2 due, submit on ICON*

**Week 8**

M 3/5 Review

W 3/7 Mid-term Exam

**Week 9** SPRING BREAK

**Week 10**

M 3/19 **Assumptions of the OLS Estimator**
Fox, 6.0, 6.1, 6.2, 9.3

W 3/21 **Error Terms and Functional Form**
Fox, 6.3, 6.4, 9.7

**Week 11**

M 3/26 **Heteroskedastic, Clustered, and Non-normal Errors**
Fox, 12.0, 12.1, 12.2, skim rest

W 3/28 **Lab Day**

F 3/30 *Problem Set 3 due, submit on ICON*

**Week 12**

M 4/2 **Multicollinearity**
Fox 13.0, 13.1, skim rest

W 4/4 **Unusual Data**
Fox, ch. 11

**Week 14**

M 4/9 **Let's Build A Model And Run Diagnostics**

W 4/11 **Let's Build A Model And Run Diagonstics, cont.**

**Week 14**

M 4/16 **Missing Data, Theory**
Fox, 20.0, 20.1, 20.2
Gelman and Hill, Part 3, ch. 25

W 4/18 **Missing Data, Practice**

**Week 15**

M 4/23 **The Generalized Linear Model (GLM), Logistic Regression**
Fox 14.0, 14.1
Gelman and Hill, Part 1A, pp. 109-110

W 4/25 **Logistic Regression**
Fox 14.0, 14.1
Gelman and Hill, Part 1A, pp. 79-84

*Problem Set 4 due, submit on ICON*

**Week 16**

M 4/30 **Multilevel Models**
Fox, 23.0, 23.1, 23.2, 23.3.1
Gelman and Hill, Part 2A, pp. 237-259

F 5/4 *Problem Set 5 due, submit on ICON*

M 5/7 **Final Exam**
10am-12pm, 161 Van Allen Hall

**Cut from syllabus:**

**Causal Inference**
Barringer, Eliason, Leahey, A History of Causal Analysis in the Social Sciences (ICON)
Freese and Kevern, Types of Causes (ICON)

**Propensity Scores**
Stuart, Matching Methods for Causal Inference, A Review and a Look Forward (ICON)

**Addendum - The Department of Sociology – Spring 2018**

**Department Office:** W140 Seashore Hall
**Department Phone:** 319-335-2502
**Department Director (DEO):** Jennifer Glanville
**DEO Office:** W124 SSH
**DEO e-mail:** jennifer-glanville@uiowa.edu
**DEO Phone:** 319-335-335-2498

**Administrative Home**
The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook at http://clas.uiowa.edu/students/handbook.

**Electronic Communication**
University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences (Operations Manual, III.15.2).

**Accommodations for Disabilities**
The University of Iowa is committed to providing an educational experience that is accessible to all students. A student may request academic accommodations for a disability (which includes but is not limited to mental health, attention, learning, vision, and physical or health-related conditions). A student seeking academic accommodations should first register with Student Disability Services and then meet with the course instructor privately in the instructor's office to make particular arrangements. Reasonable accommodations are established through an interactive process between the student, instructor, and SDS.
See http://sds.studentlife.uiowa.edu/ for information.

**Nondiscrimination in the Classroom**
The University of Iowa is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University's Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity, diversity@uiowa.edu, or visit diversity.uiowa.edu.

**Academic Honesty**
All CLAS students or students taking classes offered by CLAS have, in essence, agreed to the College's Code of Academic Honesty: "I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate

the Code of Academic Honesty." Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).

**CLAS Final Examination Policies**
The final examination schedule for each class is announced by the Registrar generally by the fifth week of classes. Final exams are offered only during the official final examination period. No exams of any kind are allowed during the last week of classes. All students should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar's web site and will be shared with instructors and students. It is the student's responsibility to know the date, time, and place of a final exam.

**Making a Suggestion or a Complaint**
Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

**Understanding Sexual Harassment**
Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Office of the Sexual Misconduct Response Coordinator for assistance, definitions, and the full University policy.

**Reacting Safely to Severe Weather**
In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Department of Public Safety website.

**Absence Policy**
Please visit the Sociology Department webpage for the specific Absence Policy Addendum for our department.

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