

# SOC 504: Social Statistics

## Spring 2008, TTh 10:30-12:00 165 Wallace Hall

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### Objectives

Research using quantitative methods is pervasive in contemporary sociology, constituting more than two-thirds of papers published in top journals. Almost all of this research involves some type of regression modeling; that is, statistical analyses in which at least one variable is modeled as a function of other variables plus error. The linear regression model is the most basic of such models, and this course provides an in-depth investigation of the theory and application of the model before showing how (and why) it can be altered and extended.

Unlike many undergraduate statistics courses, in which the emphasis is on the rote application of various “tests,” a key goal of this course is to provide a solid understanding of the process of statistical thinking in general, and its application in regression modeling in particular. To that end, this course covers probability theory and modeling in-depth from both classical and Bayesian perspectives.

### Format and Requirements

The course follows a lecture format but with considerable student involvement and discussion. I expect everyone to attend and to contribute to discussion throughout the semester. We will have regular homework assignments, and your grade will be determined based on your performance on them. Some assignments will require the use of a computer; some will not. When performing computer-based work, you may use any statistical package with which you are comfortable. Notes for each lecture will be available on my website or will be provided. Given the notes, the books listed below are not required. However, I strongly encourage you to buy at least Fox’s book, because (1) the depth of coverage in that book is greater than we will reach in the course, and (2) it is always useful to have a basic regression text available for future reference.

#### Books

Fox, John. (1997). *Applied Regression Analysis, Linear Models, and Related Methods*. Thousand Oaks, CA: Sage.

Lynch, Scott M. (2007). *Introduction to Applied Bayesian Statistics and Estimation for Social Scientists*. New York: Springer.

## Course Schedule (Homework TBA)

Date	Topic	Readings
Feb 5	Calculus and Matrix Algebra Review	Fox C1-2, p. 524-39 Lynch App. A
Feb 7	No class	
Feb 12	Probability Theory and Distributions	Fox C3, p. 540-558 Lynch C2, p. 9-35
Feb 14	The Central Limit Theorem and Classical Statistics	Lynch C1, Appendix B
Feb 19	Stata, R, and Other Software	no readings
Feb 21	Maximum Likelihood Estimation	Lynch C2, p. 35-45
Feb 26	Another View: Bayes Theorem and Simple Modeling	Lynch C3
Feb 28	Logic of Bayesian Estimation	Lynch C4
Mar 4	Simple Linear Regression	Fox p. 85-96
Mar 6	Continued	Fox p. 112-119
Mar 11	Multiple Regression: Classical and Bayesian	Fox p. 97-111 Lynch C7
Mar 13	Dummy variables, Interactions, and Nonlinearity	Fox p. 135-54, C4, p. 388-404
Mar 18	SPRING BREAK	
Mar 20	SPRING BREAK	
Mar 25	Model Assessment (incl. some Bayesian)	Fox p. 120-34 Lynch C6
Mar 27	Problems: Outliers and Influential Cases	Fox C11
Apr 1	Problems: Multicollinearity, Nonnormal Errors, and Heteroscedasticity	Fox C12-13
Apr 3	Alternative Estimation Techniques	Fox C14, p. 405-437, C16
Apr 8	Missing Data	handout
Apr 10	Continued	
Apr 15	Generalized Linear Models	handout (Lynch C8)
Apr 17	No class (PAA annual meeting)	
Apr 22	Continued	
Apr 24	Hierarchical, Fixed, and Random Effects Models	handout (Lynch C9)
Apr 29	Continued	
May 1	Multivariate Models (incl. Structural Equations)	handout (Lynch C10)