

**UNIVERSITY OF COLORADO, DEPARTMENT OF SOCIOLOGY, FALL 2003**

**SOCIOLOGY 5601 ~ ADVANCED DATA ANALYSIS**

**GENERALIZED LINEAR AND MIXED MODELING TECHNIQUES**

Room: Ketchum 117  
Time: Wednesdays 2-5 pm  
Office Hours: Monday 10-11

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**OVERVIEW**

The Department of Sociology offers several graduate seminars on Advanced Data Analyses that emphasize the *application* of statistical analyses (e.g., *using* statistics on *real* data). Each course is intended to describe a group of multivariate techniques for different types of outcome variable (e.g., continuous, categorical, count, etc.). Students bring their own quantitative data set to these classes and analyze it using the techniques covered during the semester and for those without their own data, the Social Science Data lab provides access to the cumulative files of the General Social Survey (GSS). Whereas previous courses have relied on STATA and SPSS, this course will use the SAS System on the UNIX machines in 117 Ketchum Hall to run all analyses. After reviewing traditional multivariate techniques we will emphasize mixed modeling techniques (e.g., multilevel modeling) that are used to analyze data obtained from multiple levels such as neighborhoods, schools, and families. These models can be extended to repeated measures analyses on data from longitudinal studies (e.g., growth models). We will then discuss mixed-modeling techniques for categorical outcome variables.

The course is structured around the following three areas:

- (1) Generalized Linear Models ~ Multivariate techniques used to evaluate nominal, ordinal, and continuous outcomes ~
- (2) Mixed Models ~ Multivariate techniques used to evaluate continuous outcomes from observations nested within discrete social environments ~
- (3) Generalized Linear and Mixed Models ~ Multivariate techniques used to evaluate categorical outcomes from observations nested within discrete social environments ~

## ASSESSMENT

The final grade is based on the preparation and presentation of an original research manuscript. Collaborative efforts among students is acceptable and at times encouraged and collaboration across courses is encouraged as well.

- (1) Final Paper (75%): All papers should be prepared according to the submission guidelines of any scholarly publication in the social sciences. Please provide a copy of the submission guidelines with your paper. Papers are by 12 pm on Friday, December 12.
- (2) Presentation (15%): All students will present their papers in the final two weeks of the course. Presentations should be structured around a standard framework of your discipline and sub-discipline and should be treated as a professional presentation.
- (3) Assignments (10%): Periodically I will ask the students to perform statistical analyses on their own and to answer questions about the output. Failure to complete the assignments will result in the loss of 10% of your final grade.

## TEXTBOOKS

We will be using the following three textbooks in this course.

1. Little et al. 2002. *SAS for Linear Models, Fourth Edition*. Cary, NC: SAS Institute, Inc.
2. Little et al. 1996. *SAS System for Mixed Models*. Cary, NC: SAS Institute, Inc.
3. Snijders and Bosker. 1999. *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. London: Sage Publications.

I will also assign articles throughout the course. These articles will be designed to provide a substantive example of the models that we are discussing in any particular week. These will be posted to the course website. If you are unable to attend a session you must contact the instructor to find out the assigned readings

## TOPICS

Week 1: August 27 ~ An Introduction to SAS: Data entry, recodes, and descriptive statistics.

Week 2: September 3 ~ Review of Basic Multivariate Linear Models (OLS)

Week 3: September 10 ~ Generalized Linear Modeling: Continuous Outcomes.

Week 4: September 17 ~ Generalized Linear Modeling: Categorical Outcomes.

Week 5: September 24 ~ Generalized Linear Modeling: Count Outcomes.

Week 6: October 1 ~ Mixed Modeling: Random Intercepts

Week 7: October 8 ~ Mixed Modeling: Random Slopes

Week 8: October 15 ~ Mixed Modeling: Random Slopes: Covariance Estimates

Week 9: October 22 ~ Mixed Modeling: Growth Models

Week 10: October 29 ~ Mixed Modeling: Growth Models continued

Week 11: November 5 ~ Generalized Linear and Mixed Modeling: Binary

Week 12: November 12 ~ Generalized Linear and Mixed Modeling: Count

Week 13: November 19 ~ Generalized Linear and Mixed Modeling: Non-linear growth

**-Note: No class on November 26**

Week 14: December 3 ~ Presentations

Week 15: December 10 ~ Presentations