

Sociology 705 (Spring 2015)  
**Advanced Statistics**  
W 3:00-5:30 (Saunders 541)

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Saunders 216 (956-7116)  
Office Hours: M 3:00-4:00 (or by appointment)

### **Course Description**

This course is for students who understand the basic logic of the linear regression and logistic regression (those who took Soc605 or equivalent). Based on such knowledge, we discuss the following techniques that are used frequently by social scientists:

- Principles of multilevel analysis (with longitudinal data or other multi-level data)
- Introduction to poisson regression (dealing with count outcomes), event history analysis, and quantile regression

We will start with a brief review of linear regression and logistic regression models (including binomial logit, ordered logit, and multinomial logit).

This course emphasizes the application of the techniques to social science research. We will read several published research papers that used the above techniques, and discuss the types of research questions that can be answered by each technique, how to perform the analysis using the statistical package of **STATA**, and how to interpret the results.

Course evaluation will be based on *individual research paper*. It would be desirable if students bring their research agenda and have access to data sets appropriate for their research but, if needed, we will discuss together those issues.

### **Required Text:**

Rabe-Hesketh, S. & A. Skrondal 2012. *Multilevel and Longitudinal Modeling Using STATA* (RS)

\*We will read a few research papers from the current issues of sociological journals.

### **Reference Books:**

Long, J. Scott and Jeremy Freese 2006. *Regression Models for Categorical Dependent Variables Using STATA*, 2nd Edition, Stata Press (Long)

Blossfeld, H., K. Golsch, & G. Rohwer 2007. *Event History Analysis with STATA* (Bloss)

Hao, Lingxin and Daniel Q. Naiman 2007. *Quantile Regression*. Sage Publications #149 (Hao)

Luke, Douglas A. 2004. *Multilevel Modeling*. Sage Publications #143 (Luke)

Retherford, Robert and Minja Kim Choe. 1993. *Statistical Models for Causal Analysis*. New York: John Wiley & Sons, Inc. (RC)

Agresti, Alan and Barbara Finlay. 2009. *Statistical Methods for the Social Sciences*. Prentice Hall. (AF)

## Course Requirement

Attendance: Attendance to all classes (including lab sessions) is required.

Presentation: Students are expected to actively participate in class discussions and make three types of presentations through the semester: (1) the textbook chapter of the week (2) individual research projects—proposal, analysis progress, and final paper, and (3) *experiences with STATA and/or data analysis*. Presentations will comprise 40 % of the final grade.

Research Proposal: A research proposal—3 or more pages—is due by the end of the 6th week. The proposal should: (1) clarify research issues, (2) describe the data, and (3) discuss research design and methods as much as one can, although at this point they may be tentative. The proposal will comprise 10 % of the final grade.

Research Paper: A research paper—about 15 pages—is due by the end of the semester. Important evaluation criteria include: (1) whether appropriate methods and models are chosen to answer the research questions, (2) whether the analysis of data is done thoroughly, and (3) whether the interpretation of results is appropriate. The paper will comprise 50 % of the final grade.

## Course Schedule

■READING the relevant materials BEFORE each class is essential!

Week	Content	Reading
1     Jan 14	Overview Discussion of Research Interests About STATA	Textbooks
2     Jan 21	Review: Multiple linear regression STATA practice (Model specification issues) Polynomial model, interaction effects, etc.	AF Ch 9-14 RS Ch 1 (Long Ch 9)
3     Jan 28	Review: Logit models for binary, ordinal, or nominal outcomes 1 Statistics model 2 Estimation using logit (and probit) 3 Hypothesis testing 4 Interpretation using predicted probabilities 5 Interpretation using odds ratios	AF Ch 15 RC Ch 5 RS Ch 10-12
4     Feb 4	Decomposition Analysis	JMP model Oaxaca model

Week		Content	Reading
5	Feb 11	Quantile Regression	Hao
6	Feb 18	Poisson Regression (Models for Counts)	AF Ch 13 Long Ch 8
7	Feb 25	Event History Analysis Life tables Discrete-time survival Proportional hazard model Continuous-time survival	RC Ch 7-8 (RS Ch 14-15) BGR
		Students: post 1-2 published articles of your interest	
8	March 4	<b>Proposal discussion</b> Introduce your research (with the data to be used) in relation to the articles posted	
		Multi-level Modeling I	Luke
9	March 11	Multi-level Modeling II (Random Intercept Models)	RS Ch 2-3; Luke
10	March 18	Multi-level Modeling III (Random Coefficient Models) Introduction to Longitudinal Modeling	RS Ch 4-5; Luke
11	April 1	Longitudinal Modeling I (Growth-curve models)	RS Ch 5-(6)-7
12	April 8	<b>Research progress report: Preliminary findings</b>	
		Longitudinal Modeling II	RS Ch 5-(6)-7
13	April 15	Multilevel Modeling for Logit	RS Ch 10-12
14	April 22	Multilevel Modeling for Poisson Regression	RS Ch 13
15	April 29	Multilevel Modeling for Event History Analysis	RS Ch 14-15
16	May 6	<b>Final paper presentations</b>	

**Paper** is due May 13 (Wednesday noon)