

Sociology 476: Statistical Methods for Hierarchical and Panel Data Spring 2010

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Office hours: Thursday 2:10 – 3:10 or by appointment

Course meeting: Tuesday and Thursday 11:00 – 12:20, Parkes 222

Overview: This course is an introduction to statistical methods for data with a hierarchical structure and for panel data. The first part of the course will cover random and fixed effects models. The second part will cover multilevel models (random coefficient models). We will focus on the application of these methods to social science data and problems. Models for both continuous and discrete outcomes will be discussed.

Prerequisites: This course assumes competence in the material covered by Sociology 401-1 and Sociology 401-2. This includes working knowledge of elementary statistics, including the general principles of statistical inference (hypothesis testing and confidence intervals), multivariate linear regression, and logistic regression. Basic knowledge of Poisson and negative binomial models would also be helpful. A background through courses other than Sociology 401-1 and Sociology 401-2 that cover the same material is fine.

Statistical Computing: The course will provide support for the use of the Stata and the HLM statistical program for computer-based statistical analysis. I will assume you have a basic background in Stata but no knowledge of HLM. If you do not know any Stata, basic Stata is not difficult to learn if you are familiar with statistical software in general. Alternatively, you may choose to use another statistical package instead. However, I will not provide assistance with programs other than Stata or HLM.

The course will require students to locate their own data for their course paper and read it into these packages. I am happy to help with both of these tasks somewhat, but my assumption is that you can do this with only a bit of help from me.

Both Stata and HLM are available for use on the Northwestern Sheridan Windows NT Network. Information about getting an account is available at <http://www.wcas.northwestern.edu/sheridan/accounts.htm>. You will need to send an e-mail to receive an account, as discussed on the web page indicated. Please do so as soon as you know you intend to take the class (unless you intend to use personal copies of Stata and HLM at home). Use of the Sheridan network is free and you can use the network from home. Once your account is active, you can log on by going to <http://www.wcas.northwestern.edu/sheridan/>. The first time you log on after getting an account, there is a browser plug-in you will need to install. If you are having trouble getting the plug-in to install, you can install it directly from one of the following URLs:

Windows XP, Vista, and Windows 7 computers:

<http://www.citrix.com/English/ss/downloads/details.asp?downloadId=1863803&productId=163057>

OS X computers:

<http://www.citrix.com/English/ss/downloads/details.asp?downloadId=1862769&productId=163057>

Lectures: Lecture notes will be made available as PDF files on the course management website in the “Course Document” folder by 9 PM the day before the lecture. My recommendation is that you print out these lecture notes before class and bring them to class to take supplemental notes.

Assignments: The major assignment for the course is a research paper using hierarchical and/or panel data analysis methods discussed in class. The research paper is not expected to be fully polished, but it should have all the makings of a journal article, such as a clear research question, an appropriate data set, sufficient literature review, justified hypotheses, insightful data analysis, as well as proper interpretation and presentation of the major findings. Students will submit a proposal for the paper early in the quarter as a homework assignment.

The course paper may build upon a prior draft of a paper developed previously, possibly in another course or as a prior B.A. or M.A. thesis. If so, the student is *required* to submit the prior version of the paper to the instructor together with their proposal for the paper. I encourage you to write a paper in a substantive area in which you have some prior knowledge or experience.

There will also be some homework assignments (likely three to five) due during the quarter. Some of these will involve rough drafts or analyses that become part of your course paper. Others will be exercises to provide practice on the basic course materials.

Approximately once a week we will read and briefly discuss articles that analyze statistical or hierarchical data. These articles will be made available on the course management web site. Students are expected to read the article and participate in the discussion.

Feedback: I will require that you submit one comment, question, or suggestion regarding the course every other week for the first eight weeks of the quarter. If your last name begins with A-K, the comment or question is due on the 1st, 3rd, 5th, and 7th weeks of the quarter. If your last name begins with L-Z, the comment or question is due on the 2nd, 4th, 6th, and 8th weeks of the quarter. In addition, you may (but are not required to) submit a comment or question on the off weeks.

A single sentence is sufficient, although longer comments-questions-suggestions are welcome. Questions-comments-suggestions must be submitted by email to Prof. Quillian (e-mail: l-quillian@northwestern.edu) by Friday at 5 PM.

Grades: Grading for the course will be based 65% on the final paper; 25% on homework assignments; and 10% on participation in article discussions, weekly feedback, and attendance.

Texts: There are two required texts. Both are on order at the Norris Center bookstore. They are also available (often for lower prices) at major on-line retailers. These books have been placed on reserve at the main library (but may not yet be available at the very start of the quarter). The

required books are:

Snijders, Tom, and Roel Bosker. 1999. *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. Thousand Oaks, CA: Sage.

Allison, Paul. 2009. *Fixed Effects Regression Models*. Thousand Oaks, CA: Sage.

In addition, some readings will be taken from articles. These articles will be made available on the course website.

Additional recommended texts: These books are recommended for consultation and have been placed on reserve at the main library. You might want to buy them online for alternative or more complete treatment of several topics in the course:

Raudenbush, Stephen and Anthony Bryk. 2002. *Hierarchical Linear Models: Application and Data Analysis Methods*. Thousand Oaks, CA: Sage.

Singer, Judith D. and John B. Willett. 2003. *Applied Longitudinal Data Analysis: Modeling Change and Event Occurrence*. New York: Oxford University Press.

Luke, Douglas A. *Multilevel Modeling*. 2004. Thousand Oaks, CA: Sage Publications.

Course Management System (CMS):

We will use the Course Management System (aka Blackboard) for many of the administrative tasks associated with this class. I will put materials for in-class exercises as well as the data used in the exercises and problems on the CMS site. Assignments will generally be under “assignments” on the site. Lecture notes and data will generally be under “course documents.”

Preliminary Schedule:

Week	Dates (estimated)	Probable Topic
1	3/30, 4/1	Introduction; ANOVA, Intra-Class Correlations, Clustering
2	4/6, 4/8	Random Effects, Differencing and Introduction to Fixed Effects
3	4/13	Fixed Effects, NOTE: NO CLASS on 4/15
4	4/20	Interrupted Time Series, NOTE: NO CLASS on 4/22
5	4/27, 4/29	Fixed Effects Models; Begin Fixed Effects Logistic
6	5/4, 5/6	Fixed Effects Logistic and Fixed Effects Models for Counts
7	5/11, 5/13	Multilevel Models with Random Slopes, I
8	5/18, 5/20	Multilevel Models with Random Slopes, II
9	5/25, 5/27	Multilevel Logistic Regression Models
10	6/1	Possible Catch-Up Lecture or Additional Topic

	6/7	Due date for final course papers
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Reading Assignments:

4/1 and 4/6: Snijders and Bosker, Chapters 1, 2, sections 3.1 to 3.5, and 4.3 “the empty model.”
A PDF copy of this reading is available under “course documents” on the course website. This is to allow time for you to receive a copy of this book from an online retailer.

Later reading assignments will be listed on lecture notes and announced by e-mail.