The University of North Carolina at Chapel Hill  
School of Social Work  

SOWO 917  Longitudinal and Multilevel Analysis  
Fall Semester, 2011  

INSTRUCTOR  
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CLASS MEETING TIMES & OFFICE HOURS  
Class meets on Wednesdays 9:00-11:50 am  
Office hours are Tuesdays 10:30 – 12:30 (Room 524j TTK)  

COURSE DESCRIPTION  
This course introduces statistical frameworks, analytical tools, and social behavioral  
applications of three types of models: event history analysis, hierarchical linear modeling  
(HLM), and growth curve analysis.  

COURSE OBJECTIVES  
At the completion of the course, students will have a solid understanding of the  
challenges and problems in longitudinal and multilevel analysis. They will know how to  
choose appropriate statistical analyses that best suit the type of data and research  
questions for a given study. They are expected to be able to run, interpret, and  
communicate results clearly and effectively in writing based on the following models: life  
tables, Kaplan-Meier’s estimate of survivor function, discrete time model, Cox  
proportional hazard model, marginal models handling multilevel event data, two-level  
and three-level hierarchical linear models, growth curve analysis, and analysis of a  
categorical dependent variable using HGLM.  

PRE-REQUIREMENT  
Students are assumed to be familiar with descriptive and inferential statistics as well as  
multiple regression analysis. They should have statistical and statistical software  
background at least equivalent to that provided by SOCI209, PSYC282, EDUC284  
(linear regression), or SOCI211 (categorical data analysis). Students without such  
prerequisites should contact the instructor to determine their eligibility to take this course.
STATISTICAL SOFTWARE PACKAGES

Students may choose to use Stata, SAS, or SPSS as the primary statistical software package for the course, though the classroom lectures and materials will be based on Stata. Specialized software package HLM will also be demonstrated.

TEXTBOOKS


RECOMMENDED TEXTBOOKS


ASSIGNMENTS

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<th>Assignment</th>
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<td>Assignment 1</td>
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<td>Assignment 5</td>
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<td>Midterm Exam (take home)</td>
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<td>Final Exam (take home)</td>
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GRADING SYSTEM

The standard School of Social Work interpretation of grades and numerical scores will be used.

H = 94-100
P = 80-93
L = 70-79
F = 69 and below
**Policy on Class Attendance**

Class attendance is an important element of class evaluation, and you are expected to attend all scheduled sessions. Each class session will cover a great deal of materials, and you will fall behind the course when you miss even one class session. It’s student’s responsibility to inform the instructor via email in advance for missing a class session. You are expected not to miss more than two sessions for the whole semester. Starting from the second missing, your course grade will be reduced by 10% for each session missed.

**Policy on Incomplete and Late Assignments**

Assignments are to be turned in to the professor by 5pm of the due date noted in the course outline. Extensions may be granted by the professor given advance notice of at least 24 hours. Late assignments (not turned in by 5pm on the due date) will be reduced 10 percent for each day late (including weekend days). A grade of incomplete will only be given under extenuating circumstances and in accordance with University policy.

**Policy on Academic Dishonesty**

Students are expected to follow the UNC Honor Code. Please include the honor code statement along with your signature on all assignments:

“I have neither given nor received unauthorized aid on this assignment.”

Please refer to the APA Style Guide, the SSW Manual, and the SSW Writing Guide for information on attribution of quotes, plagiarism and appropriate use of assistance in preparing assignments.

If reason exists to believe that academic dishonesty has occurred, a referral will be made to the Office of the Student Attorney General for investigation and further action as required.

**Policy on Accommodations for Students with Disabilities**

Students with disabilities which affect their participation in the course may notify the instructor if they wish to have special accommodations in instructional format, examination format, etc., considered.

**Course Outline (Topics, Readings, and Assignments)**

8/24/11 1. Introduction and course overview

Review of longitudinal design: multi-wave panel, cohort, staggered multiple cohorts, cohort-sequential, experimental, survey, and designs using administrative data.

Review of conventional approaches to longitudinal analysis: transition probability of Markov chain model, paired t test, within-subject ANOVA, repeated measure MANOVA.

Review of statistical concepts: statistical assumptions embedded in OLS, problems of autocorrelation, and maximum likelihood estimator.

Readings:
Singer & Willett, Chapter 1.

8/31/11  2. Life table and Kaplan-Meier methods
Overview of event history analysis
Censoring
Cohort life tables
Kaplan-Meier’s estimate of survivor functions

Readings:
Guo, Chapters 1 & 2.
Singer & Willett, Chapter 9.

(Hand out Assignment 1)
Assignment 1 (Due: 9/14/11): (1) hand calculation of a life table; (2) use provided data set to construct life tables by stratum, perform a Kaplan-Meier test on group differences, and interpret findings; and (3) describe a longitudinal study that requires event history analysis.

9/7/11  3. Discrete time models
Review of binary and multinomial logistic regression
The logit model for discrete time
Time-varying covariates

Readings:
Guo, Chapter 3.
Singer & Willett, Chapters 10-11.

9/14/11  4. Parametric models
The exponential model
The Weibull model
Overview of other parametric models

Readings:
Guo, Chapter 5.
Singer & Willett, Chapters 12-13.

(Hand out Assignment 2)
Assignment 2 (Due: 9/28/11): (1) solve problems on discrete-time and parametric models; and (2) use provided data to estimate a discrete-time model, and interpret findings.

9/21/11 5. Cox proportional hazards model (I)
Overview
Partial likelihood estimator
Cox regression with time-varying covariates

Readings:
Guo, Chapter 4.
Singer & Willett, Chapter 14.

9/28/11 6. Cox proportional hazards model (II)
Competing risks
Accelerated failure time models
Model-predicted survivor curves
Power analysis for survival models

Readings:
Singer & Willett, Chapter 15.

10/5/11 7. Cox proportional hazards model (III)
Introduction to multilevel event time data (multivariate failure time data)
Marginal approaches to multilevel event times
Unobserved heterogeneity

Readings:
Guo, Chapter 6.

(Hand out Midterm)
Midterm Exam (Due: 10/26/11): Use data sets provided by the course or data set you choose to run a Cox regression model. Write a paper (no more than 14 pages, double spaced) to present findings. The paper should include: (1) data and specification of Cox regression; (2) testing interaction terms; (3) present predicted survivor curves based on estimated model; and (4) interpret findings.

10/12/11  8. Overview of HLM and contextual analysis
Multi-level hypotheses in social sciences
Intra-class correlation
Random effects
Two-level model

Readings:
Singer & Willett, Chapter 2.

10/19/11  Happy Fall Break! No class.

10/26/11  9. Contextual analysis
Three-level model
Goodness-of-fit indices
Application to contextual and multilevel analysis

Readings:
Singer & Willett, Chapters 3-4

(Hand out Assignment 3)
Assignment 3 (Due: 11/9/11): (1) describe a multilevel or longitudinal study that requires hierarchical linear modeling, (2) solve problems on HLM; (3) use provided data to estimate intra-class correlation, and (4) run a two-level HLM, interpret findings.

11/2/11  10. Principles of estimation, hypothesis testing, and GEE method
Hypothesis testing
Multiparameter testing
HLM assumptions about data
Overview of estimation via ML and empirical Bayesian
Generalized-estimating-equation (GEE) method

Readings:
Singer & Willett, Chapters 5-6

11/9/11  11. Computer Lab:
Using HLM software

Readings:
Singer & Willett, Chapter 7

(Hand out Assignment 4)
Assignment 4 (Due: 11/30/11): Read the Sampson, Raudenbush, & Earls’ (1997) article. Group discussion and classroom presentation. This Science-published study has made significant contributions to the field, both conceptually and methodologically. On the due date, students will present findings from their group discussions on the paper. Students will be divided into smaller groups in advance.


11/16/11 12. Growth curve analysis and testing mediating effects
Graphic presentation of individual trajectories
Three-level models in growth curve analysis
Predicted values of outcome variable using SAS Proc Mixed
Testing mediating effects in HLM

Readings:
Singer & Willett, Chapter 8

11/23/11 Thanksgiving holiday! No class.

11/30/11 13. Classroom discussion & other topics in HLM
Part A (9:00-10:00):
Student presentation and classroom discussion on Sampson, Raudenbush, & Earls (1997).

Part B (10:00-11:50):
Other applications of HLM: power analysis for HLM, HLM and SEM, multiple outcome variables, structured covariance matrix within subjects.

Readings:


(Hand out Assignment 5)

**Assignment 5 (Due: 12/7/11):** Choose one article from two that are provided by the course to perform a critical review. The provided articles employed (or potentially should have employed but did not) either a survival model or an HLM. This review (no more than two pages, single-spaced) should focus on: (1) strengths and limitations (very briefly), (2) major statistical problems, and (3) recommendations for revisions.

(Hand out Final)

**Final Exam (Due: 12/12/11):** Use data sets provided by the course or data set you choose to run an HLM. Write a paper (no more than 14 pages, double spaced) to present findings. The paper should include: (1) research objectives and questions; (2) methods and model specifications; (3) findings; and (4) conclusions and implications.

**12/7/11**


Overview of generalized linear model (GLM)
- Multilevel logistic regression
- Multilevel ordered logistic regression
- Multilevel Poisson regression

**Readings:**

**Course summary**
Topics for future study

**12/12/11**

**Final Exam Due**