

University of Southern California

School of Social Work

SOWK 599

Longitudinal Data Analyses: Theory and Application

SPRING 2008

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Location: SWC 110 and WPH B36

Day/Time: Thursday 1-5pm

I. COURSE DESCRIPTION

The purpose of this course is to introduce some common methods and issues in longitudinal data analyses and to help learn advanced statistical techniques which will be used when analyzing longitudinal data, responding to the current demand of longitudinal data analysis. As longitudinal data analyses are frequently used as scientific tools to conduct academic research in social work and other related disciplines, graduate students are encouraged to understand basic concepts and theories in longitudinal data analyses. The class is intended for doctoral students who have completed some statistical courses covering topics including linear regression, One-way ANOVA and logistic regression.

This 4-unit class will be split between lectures with students' discussions (70%) and lab sessions (30%), with a focus on applying longitudinal data analysis methods to real world problems. The course will introduce various statistical techniques including repeated measurement ANOVA, general linear model analyzing response profiles, linear mixed effect models, generalized estimating equations, generalized linear mixed effect model, concept of latent variable, exploratory and confirmatory factor analyses, structural equation model, latent growth curve models, and latent growth mixture models. Mplus and SAS program will be taught in lab sessions, but various computer programs (e.g., SPSS, Amos, HLM) will be introduced in lectures.

Students are encouraged to bring in their own data sets and apply longitudinal analysis approach to develop a final term paper. A data set will be available for those who don't have their own data set. There will also be computer assignments homework assignments, and a final project.

II. COURSE OBJECTIVES

The course objective of this class is to get graduate students familiar with several advanced statistical techniques to handle longitudinal data. Upon completion of this course, students should be able to:

1. understand inter-individual and intra-individual differences in change over time;
2. design longitudinal research in the their study field;
3. apply advanced statistical techniques in order to solve unanswered research questions due to limitation of cross-sectional data analysis technique;
4. critically review research articles in which longitudinal data analysis techniques are used.

III. COURSE FORMAT

The course will combine lectures and discussion in class as well as computer lab instructions. Three instructors will work together as a team. Students will be encouraged to conduct their own research projects, and will present final projects in class.

IV. COURSE EVALUATION AND GRADING

All students are expected to regularly attend class and be on time. A student with more than two unexcused absences during the course of this class may receive a no credit. A student who is tardy three or more times to class may receive a grade of no credit. If a student receives a no credit grade in this class, they will be required to repeat this class.

Class grades will be based on the following:

93 – 100	A
90 – 92	A-
87 – 89	B+
83 – 86	B
80 – 82	B-
77 – 79	C+
73 – 76	C
70 – 72	C-

Grade will be determined by the class attendance (10%), five assignments (25%), a presentation (15%) and a final paper (50%).

V. ATTENDANCE POLICY

Students are expected to attend all classes. **Students with more than two unexcused absences (or 6 hours absence from alternative class schedule) may risk failure.** This policy exists because the social work program is one of professional preparation. In addition to acquiring theoretical knowledge, students are expected to acquire professional values, to integrate knowledge from a range of courses, to develop professional skills and be socialized into the profession. Members of the faculty of the School of Social Work are convinced that this cannot be accomplished through independent study alone. Thus, attendance at classes is required unless legitimate and special reasons exist for absences or tardiness. Any such absences or tardiness should be discussed directly with the course instructor.

University of Southern California policy permits students to be excused from class, without penalty, for the observance of religious holy days. This policy also covers scheduled final examinations which conflict with students' observance of a holy day. Students must make arrangements *in advance* to complete class work which will be missed, or to reschedule an examination, due to holy days observance.

VI. COURSE EXPECTATIONS AND GUIDELINES

The instructors will prepare and distribute course material; they will meet students during office hours, after class, and by appointment for consultation; and provide timely and clearly explained feedback on student performance.

Students will be expected to complete the reading assignments, two assignments, one presentation, and final written term paper during the semester.

Assignments: Five brief written reports about students' projects will be assigned; detail instructions and guidelines for these assignments will be provided. Assignments turned in late will result in an automatic deduction of one point for every day, including weekends.

Presentation: Each student will present their term paper projects in the class and all students will share their feedback on the presentations

Final term paper: Students will submit 15-20 page, double spaced, final paper.

VII. REQUIRED TEXTBOOKS

1. Bollen, K. A. & Curran, P. J. (2006). Latent curve models: A structural equation perspective. Hoboken, NJ: John Wiley & Sons, Inc.(required)
2. Fitzmaurice G.M., Laird N.M., Ware J.H. (2004). Applied Longitudinal Analysis. Hoboken, NJ: John Wiley & Sons, Inc.
3. Rex B. Kline (2005) Principles and Practice of Structural Equation Modeling, Second Edition (Methodology in the Social Sciences). The Guilford Press.

VIII. ACADEMIC ACCOMMODATIONS

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. *Please be sure the letter is delivered to the instructor as early in the semester as possible.* DSP is located in STU 301 and is open from 8:30 a.m. to 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

IX. COURSE OUTLINE AND ASSIGNMENTS

Week 1 (January 14) – Week 3 (January 28): Course Overview & Repeated Measurement ANOVA

Topics:

- Course goals and objectives
- Introduction of Longitudinal research designs/Data structures, assumptions, & notations
- Overview of Repeated Measurement ANOVA

*** No Class on Week 2 (January 21, Martin Luther King Holiday)**

REQUIRED READINGS:

Hedeker D., Gibbons R.D. (2006). Longitudinal Data Analysis. Hoboken, NJ: John Wiley & Sons, Inc. Chapter 1, 2.

Munro B.H. (1997). Statistical Methods for Health Care Research. 3rd Edition. Philadelphia, PA: Lippincott-Raven Publishers. Chapter 10 (optional)

**** Homework Assignment #1**

Week 4 (February 4) – Week 5 (February 11): General Linear Model Analyzing Response Profiles

Topics

- Overview of general linear model analyzing response profiles, parametric curves and modeling the covariance

REQUIRED READINGS:

Fitzmaurice G.M., Laird N.M., Ware J.H. (2004). Applied Longitudinal Analysis. Hoboken, NJ: John Wiley & Sons, Inc. Chapter 5-7.

Singer J. (1998). Using SAS Proc Mixed to Fit Multilevel Models, Hierarchical Models, Individual Growth Models. *Journal of Educational and Behavioral Statistics*, 24(4):323-355 (optional).

Bryk, A. S., & Raudenbush, S. W. (1987). Application of hierarchical linear models to assessing change. *Psychological Bulletin*, 101(1), 147-158. (optional)

No Class on Week 6 (February 18, President Day)

Week 7 (February 25): Linear Mixed Effects Models

Topics

- Introduction of linear mixed effects models

REQUIRED READINGS:

Fitzmaurice G.M., Laird N.M., Ware J.H. (2004). *Applied Longitudinal Analysis*. Hoboken, NJ: John Wiley & Sons, Inc. Chapter 8.

Hedeker D., Gibbons R.D. (2006). *Longitudinal Data Analysis*. Hoboken, NJ: John Wiley & Sons, Inc. Chapter 4, 6.

**** Homework Assignment #2**

Week 8 (March 3): Latent Variables and Exploratory Factor Analysis

Topics:

- Go over matrix terminology
- Introduction of latent variable concept
- Exploratory factor analysis

REQUIRED READINGS:

Hatcher L (1994). *A Step-by Step Approach to Using SAS for Factor Analysis and Structural Equation Modeling*. Cary, NC: SAS Institute Inc. Chapter 2.

Loehlin JC (2004). *Latent Variable Models: An Introduction to Factor, Path, and Structural Equation Analysis*. Lawrence Erlbaum Assoc Inc. Chapter 5 (optional).

Hatcher L (1994). *A Step-by Step Approach to Using SAS for Factor Analysis and Structural Equation Modeling*. Cary, NC: SAS Institute Inc. Chapter 1 (optional).

Week 9 (March 10): Confirmatory Factor Analysis (CFA)

Topics:

- Introduction of confirmatory factor analysis
- Issues of model identities and model fitting

REQUIRED READINGS:

Loehlin JC (2004). Latent Variable Models: An Introduction to Factor, Path, and Structural Equation Analysis. Lawrence Erlbaum Assoc Inc. **Chapter 1, Chapter 3 (p 92-95)**

**** Homework Assignment #3**

*** Spring Break on Week 10 (March 17)**

Week 11 (Mar 24): Structural Equation Modeling (SEM)

Topics:

- Model building strategies
- Introduction of structural equation modeling

REQUIRED READINGS:

Rex B. Kline (2005) Principles and Practice of Structural Equation Modeling, Second Edition (Methodology In The Social Sciences). The Guilford Press. **Chapter 5 & 6.**

Musil, C. M., Jones, S. L., & Warner, C. D. (1998). Structural equation modeling and its relationship to multiple regression and factor analysis (Vol. 21, pp. 271-281).

Week 12 (Mar 31): Multiple-group CFA and SEM

Topics:

- Continue on structural equation modeling
- Introduction of multiple-group approach structural equation modeling

REQUIRED READINGS:

Rex B. Kline (2005) Principles and Practice of Structural Equation Modeling, Second Edition (Methodology In The Social Sciences). The Guilford Press. **Chapter 7 & 8.**

Taris, T. W., & Semin, G. R. (1997). Gender as a Moderator of the Effects of the Love Motive and Relational Context on Sexual Experience. *Archives of Sexual Behavior*, 26(2), 159-180.

Vandenberg, R. J., & Lance, C. E. (2000). A Review and Synthesis of the Measurement Invariance Literature: Suggestions, Practices, and Recommendations for Organizational Research. *Organizational Research Methods*, 3(1), 4-70.

Week 13 (April 7) Latent Growth Curve Analyses I

Topics

- Analysis of individual change
- Overview of Latent Growth Curve analysis
- Unconditional model in latent growth curve analysis

REQUIRED READINGS:

Bollen, K. A. & Curran, P. J. (2006). *Latent curve models: A structural equation perspective*. Hoboken, NJ: John Wiley & Sons, Inc. Chapter 1 & 2.

Nesselroade J. R. (1991). Interindividual differences in intraindividual change. in *Best Methods for the Analysis of Change*, Collins & Horn eds., 1991, pp. 92–105.

Speer, D. C., & Greenbaum, P. E. (1995). Five methods for computing significant individual client change and improvement rates: Support for an individual growth curve approach. *Journal of Consulting and Clinical Psychology*, 63(6), 1044-1048.

Anstey, K. J., & Hofer, S. M. (2004). Longitudinal designs, methods and analysis in psychiatric research. *Australian and New Zealand Journal of Psychiatry*, 38(3), 93-104.

**** Homework Assignment #4: Outline of a term paper project**

Week 14 (April 14): Latent Growth Curve Analyses II

Topics

- Conditional model in latent growth curve analysis

REQUIRED READINGS:

Bollen, K. A. & Curran, P. J. (2006). *Latent curve models: A structural equation perspective*. Hoboken, NJ: John Wiley & Sons, Inc. Chapter 6.

Brekke, J. S., Hoe, M., Long, J., & Green, M. F. (2007). How neurocognition and social cognition influence functional change during community-based psychosocial rehabilitation for individuals with schizophrenia. *Schizophrenia Bulletin*, doi:10.1093.

Fraser, M. W. (2004). Intervention research in social work: Recent advances and continuing challenges. *Research on Social Work Practice*, 14(3), 210-222.

Curran, P. J., & Muthen, B. O. (1999). The application of latent curve analysis to testing developmental theories in intervention research. *American Journal of Community Psychology*, 27(4), 567-595.

**** Homework Assignment #5**

Week 15 (April 21): Latent Class Growth Curve Analysis & Latent Growth Mixture Models

Topics

- Analysis of groups in longitudinal research
- Latent class

REQUIRED READINGS:

Muthen, B., & Muthen, L. K. (2000). Integrating Person-Centered and Variable-Centered Analyses: Growth Mixture Modeling With Latent Trajectory Classes. *Alcoholism: Clinical & Experimental Research* June, 24(6), 882-891.

Muthén, B. (2004). Latent variable analysis: Growth mixture modeling and related techniques for longitudinal data. In D. Kaplan (ed.), *Handbook of quantitative methodology for the social sciences* (pp. 345-368). Newbury Park, CA: Sage Publications.

Nagin, D. S. (1999). Analyzing Developmental Trajectories: A Semiparametric, Group-Based Approach. *Psychological Methods* June, 4(2), 139-157 (optional).

Week 16 (Apr 28): Term paper presentation

** The final paper for the class is due Tuesday, May 6, 2008 at 5pm. A handout with detailed instructions for completing the assignment will be distributed in class.