

SOCI 8200
Fall Semester 2006
Introduction to Hierarchical Linear and Non-Linear Modeling

Professor:	Dr. Tom McNulty	Office:	Baldwin 312
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Course Overview: This is a special topics seminar that focuses on applications of hierarchical linear and non-linear models (HLM). The class begins with a review of the logic, structure, and basic estimation principles of HLM. Applications of two-level linear models are illustrated, including estimating organizational effects on individuals and examining individual change overtime. We then consider generalizations to three-level models and to non-linear (HGLM) models for discrete outcomes (e.g., binary). Examples and assignments will reinforce the student's understanding of HLM and provide the practical skills to apply the techniques discussed in class. The course takes a hands-on approach with emphasis on the computer application, interpretation, and diagnosis of HLM.

Reading Materials: The following are available at the University Bookstore. Additional readings are listed below in the Course Outline and will be placed in the Baldwin Hall mailroom. I may add or substitute readings as the semester progresses.

Raudenbush & Bryk (2002). Hierarchical Linear Models (2nd ed.). Sage.

Raudenbush et al. (2004). HLM 6: Hierarchical Linear & Nonlinear Modeling. Scientific Software International, Inc.

Requirements & Expectations: The seminar assumes that students have a solid understanding of basic statistics and familiarity with regression analysis. Students are required to attend class regularly. Final course grades are based on a series of computer assignments that illustrate the logic and practical application of HLM.

COURSE OUTLINE

THE LOGIC OF HIERARCHICAL LINEAR MODELS

Raudenbush & Bryk, Ch. 1 & 2 (for more technical discussions, see chapters 3 & 14)
HLM6: Ch. 1

DATA CONSIDERATIONS & CREATING (MDM) FILES IN HLM6

HLM6: Ch. 2, pp. 14-36

Assignment 1: create HSB.MDM with HSB1.SAV & HSB2.SAV

ILLUSTRATION OF THE BASIC TWO-LEVEL MODEL

Raudenbush & Bryk, Ch. 4 (review Ch. 2, 23-29)
HLM6: Ch. 2, pp. 16-23, 26-36

Rowan, Raudenbush, & Kang (1991). "Organizational design in high schools: A multilevel analysis." *American Journal of Education* 99(2): 238-266.

Assignments 2-5: two-level analyses using HSB.MDM

- #2: One-Way ANOVA Model
- #3: Regression with Means-as-Outcomes
- #4: Random Coefficient Model
- #5: Intercepts- and Slopes-as-Outcomes Model

COURSE OUTLINE (cont.)

APPLICATIONS IN ORGANIZATIONAL RESEARCH

Raudenbush & Bryk, Ch. 5

Random Intercept Models (102-117)

Rowan, Raudenbush, & Cheong (1993). "Teaching as a non-routine task: Implications for the management of schools." *Educational Administration Quarterly* 29(4): 479-500.

Assignment 6: estimate a random intercept model – HSB.MDM

Intercepts- and Slopes-as-Outcomes Models (117-130)

Lee & Bryk (1989). "A multilevel model of the social distribution of high school achievement." *Sociology of Education* 62: 172-92.

Assignment 7: estimate an intercepts- and slopes-as-outcomes model – HSB.MDM

Special Topics (130-159)

Applications with Heterogeneous Level-1 Variance (130-34)
HLM6: Ch. 2, pp. 52-55

Assignment 8: analysis of heterogeneous level-1 variance – HSB.MDM

Centering Level-1 Predictors (134-49; see also Ch. 2, 31-35)

Use of Proportion Reduction in Variance Statistics (149-52; see also Ch. 4, 75-80)

Estimating the Effects of Individual Organizations (152-58; see also Ch. 4, 85-94)

Power Considerations (158-59)

Fixed, Random, or Nonrandom Varying Slopes (Ch. 2, 26-30; Ch. 4, 80-85)

COURSE OUTLINE (cont.)

APPLICATIONS IN THE ANALYSIS OF INDIVIDUAL CHANGE

Raudenbush & Bryk, Ch. 6

A Linear Growth Model (163-169)

Bryk & Raudenbush (1987). "Application of hierarchical linear models to assessing change." *Psychological Bulletin* 101(1): 147-158.

A Quadratic Growth Model (169-176)

Huttenlocher et al. (1991). "Early vocabulary growth: Relation to language input and gender." *Developmental Psychology* 27(2): 236-249.

Assignment 9: estimate a quadratic growth model – VOCAB.MDM

EXTENTION TO THREE-LEVEL MODELS

Raudenbush & Bryk, Ch. 8 (228-245)
HLM6, Ch. 3 & 4

The Basic Three-Level Model (228-237)

Assignment 10: estimate a basic three-level model – EG.MDM

Analysis of Individual Change within Organizations (237-245)

Marks, H.M. (2000). "Student engagement in instructional activity: Patterns in the elementary, middle, and high school years." *American Educational Research Journal* 37(1): 153-84

Assignment 11: model individual change within organizations – EG.MDM

COURSE OUTLINE (cont.)

HIERARCHICAL GENERALIZED LINEAR MODELS (HGLM)

Raudenbush & Bryk, Ch. 10
HLM6: Ch. 5 & 6

Binary Outcomes (291-309)

Bernoulli model (296-304; HLM6: Ch. 5, 96-98; Ch. 6, 115-122)

Blair-Loy & Wharton (2002). "Employees' use of work-family policies in the workplace social context." *Social Forces* 80(3): 813-845.

Assignment 12: estimate a Bernoulli model – NELS.MDM

Ordinal Outcomes: (317-325; HLM6: Ch. 5, 102-03; Ch. 6, 133-138)

Assignment 13: estimate an ordinal model – TCHR.MDM

Multinomial Outcomes: (325-333; HLM6: Ch. 5, 100-102; Ch. 6, 128-133)

Assignment 14: estimate a multinomial model – TCHR.MDM

ASSUMPTIONS & SPECIFICATION ISSUES IN HLM

Raudenbush & Bryk, Ch. 9

HLM6: Ch. 2, pp. 36-46 (analysis of residuals)