Multilevel Modeling with HLM and SPSS
ICPSR Summer Program in Quantitative Methods of Social Research
University of Massachusetts Amherst
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COURSE DESCRIPTION

Multilevel models (MLM), also known as hierarchical linear models (HLM) and mixed effects models are widely used across a range of disciplines, including sociology, psychology, political, education, and public health. They provide a conceptual framework and a flexible set of analytic tools to study a variety of social, political, and developmental processes. In this workshop, we will teach in parallel the use of both the HLM7 and SPSS software packages to fit two- and three-level multilevel models, primarily focusing on linear outcomes.

In MLM, one set of applications focuses on data in which persons are clustered within social contexts, such as couples, families, schools, neighborhoods, or organizations. A second set of applications concerns individual growth or change over time, where time series or longitudinal data are clustered within persons. A third set of applications involves a combination of the two: persons changing over time who are also nested within organizational contexts. Participants will be exposed to a wide variety of hands-on examples, with emphasis on computing practice and interpretation and reporting of results. Topics include an introduction to the basic two-level model for continuous outcomes, assessment of fit, checking model assumptions, single and multiparameter hypothesis testing, the extension to three-level models, and nonlinear models for binary and count outcomes. Although the workshop will focus on practice with SPSS and HLM, syntax for other statistical software packages (Mplus, R, Stata, and SAS) will be provided to participants as needed.

Course Website: https://tinyurl.com/ICPSRMLM2019

Suggested Textbook:

SEQUENCE OF TOPICS

Monday

• An introduction and brief history
  
  * Methodological criticism of past treatment of hierarchical data
  * Problems in the measurement of organizational effects
  * Problems in the measurement of change

• The logic of the 2-level multilevel model illustrated by an application to the study of individual change over time: National Youth Survey data (NYS1)
  
  * Modeling change over time for one individual: The Level 1 model
  * Modeling change over time for J individuals: The Level 2 model
  * Polynomial models
  * Studying correlates of growth
  * Model comparison tests

• In-class computing: An Introduction to the HLM 7 Computer Program and SPSS MIXED syntax
  
  * Data input and creating the MDM file; NYS data
  * Graphing raw data
  * Practice with growth curve models
  * Equation graphing: model graphs, level-1 graphing
  * Introduce SPSS Mixed syntax

Reading: Raudenbush & Bryk: Chapters 1, 2, 6

Tuesday

• Time-varying covariates and group-mean centering (NYS data)

• Assessing model fit
  
  * Proportional reduction of variance (PRV)
  * Multiparameter hypothesis testing (contrasts for simple slopes)
• In-class computing: Adding time-varying predictors, calculating PRV, & testing contrasts: NYS data
  *Provide SPSS syntax for these models

• Working with Empirical Bayes coefficients (posterior predictions)

• Introduction to organizational effects
  *An application of the 2-level model to organizational research: High School and Beyond (HSB)
  *Introducing the scorecard for model comparisons

Reading: Raudenbush & Bryk: Chapter 9

**Wednesday**

• Random intercept models
  * Intercept-only model
  * Intraclass Correlation

• Random slopes models
  *Unconditional random slopes
  * Cross-level interactions

• In-class computer lab: Intercept and slope models with HSB data
  *Provide SPSS syntax for these models

• Centering
  *The contextual effects model using HSB
  * The state-trait model using NYS

Reading: Raudenbush & Bryk, Chapters 4, 5

**Thursday**

• Dyadic models
  * Introduction to 2-person models (Work-Family Transitions Data (WFTP))
  * Cross-sectional dyad models
    - Intraclass correlation
- Individual versus combined emphasis
- Actor-Partner Interdependence Model
* Longitudinal dyad models

- **In-class computing: Dyadic models**
  *Provide SPSS syntax*

- **Introduction to the 3-level model: Chicago Schools Data**
  * The level-1 model
  * The level-2 model
  * The level-3 model

- **In-class computer lab: 3-level models**
  *Provide SPSS syntax for these models*

Reading: Raudenbush & Bryk, Chapter 8

**Friday**

- **Introduction to non-linear models for binary and count data**
  * Binary outcomes: Thailand example
  * Count outcomes: Ansell drinks example

- **In-class computer lab: Practice with Thai or Ansell data**
  *Provide SPSS syntax*

Reading: Raudenbush & Bryk, Chapter 8

The formal part of the course will end at around 1 PM. The instructors will be available in the afternoon for individual consulting on the participant’s own data.
Selected References Organized by Topic

School Effectiveness Applications


Neighborhood Effects Applications


Individual Growth Modeling Applications


Hierarchical Models for Dyads


**Binary & Count Outcomes**


**Multiple Informant/Multiple Outcomes Applications**


**Three Level Models**