Hierarchical Linear Models II: Special Topics
ICPSR 2011

Instructors

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Course Description

This is a second course in hierarchical linear models. Individuals who enroll should have taken the ICPSR course *Hierarchical Linear Models I: Introduction* or its equivalent, and have experience using HLM research techniques. This course will consider causal inference for multilevel and longitudinal analysis; estimating HLM from incomplete data; models for spatially dependent neighborhood effects; generalized hierarchical linear models, including models for binary, count, ordinal, and multinomial outcomes; embedding measurement models in HLM; multivariate models for growth; and models for dyads, with consideration of cross-sectional models for matched pairs and longitudinal models for dyads changing over time.

Required Reading


Sequence of Topics

Tuesday July 5

I. Multivariate linear models for change as hierarchical models

- Disaggregating within-person and between-person effects using a time-varying covariate: Compositional effects model (National Youth Survey data; Transition to Parenthood, KPS, 2008)
- The multivariate approach to modeling longitudinal data: The unrestricted model
- Comparison of models for level-1 residual variance: homogenous, heterogeneous, and a log-linear function of time.
- Compound symmetry and models for autoregressive (AR1) residual variance

  Reading:  HLM (2nd edition): Chapter 6
II. Item response models at Level-1: Embedding measurement models in HLM (example from Arnett data; Balaban data)

Reading: HLM (2nd edition): Chapter 11

Doorenbos, Verbitsky, Given & Given (2005)
Raudenbush, Johnson, & Sampson (2003)

III. Extending the multivariate outcomes model to distinguishable dyads

- Cross-sectional models for matched pairs
  - Parallel scales approach (Barnett marital distress data)
  - Known measurement error variance approach (Sanderson relationship data)

- Longitudinal models for dyads changing over time (Powers cortisol data)

Reading: Lyons & Sayer (2005)
Raudenbush, Brennan, & Barnett (1995)
Sayer & Klute (2005)

Wednesday July 6

I. Hierarchical generalized linear models

- Binary outcomes (example from Thailand survey data)
  - A Bernoulli Model
  - A Binomial Model
- Counts (Neighborhood predictors of homicide in Chicago: SRE, 1997)
- Models for ordinal data (Teacher Commitment data; HLM, Chap. 10)
- Models for multinominal data (NELS post-secondary education destinations; HLM, Chap. 10)

Reading: HLM (2nd edition) Chapter 10

Rumberger (1995)
Raudenbush & Sampson (1999a)
Raudenbush, Johnson & Sampson (2003)
II. Models for spatially dependent neighborhood effects

- The spatial distribution of neighborhood collective efficacy
- Association between collective efficacy and homicide rates

Reading: Verbitsky-Savitz & Raudenbush (2009)
Sampson, Raudenbush & Earls (1997)

Thursday July 7

I. Estimating HLM from incomplete data

Reading: Shin and Raudenbush (2007; 2010; 2011)

- a Standard Two-Level HLM
- Contextual Effects Model
- New Directions

II. Three and Four-level Models with nested and cross-classified random effects

- Three-level models (effects of grade retention on child growth, HY, 2007)
- Three-level cross-classified models (neighborhood and school effects on children’s educational attainment; teacher contributions to child growth, HLM, Chapter 12)
- A four-level nested model
- Four-level models with crossing and nesting (Instructional effects on child growth, HR, 2008; neighborhood and school effects on child growth)

Reading: HLM (2nd edition) Chapter 12

Suggested: Hong & Yu (2007)
Hong & Raudenbush (2008)

Friday July 8
Causal Inference for Multilevel Data

I. Multilevel Propensity Score Adjustment

- Introduction and brief overview
- Rubin’s causal model
- Causal effects of educational interventions: An application using grade retention
- Multi-level randomized experiments: Naïve analysis of ECLS-K data
- Selection bias and the propensity score
Logistic regression and hierarchical logistic regression
Propensity score estimation
Propensity stratification, causal analysis with propensity adjustment
Sensitivity analysis
Final remarks

III. Concurrent Treatments: Marginal Mean Weighting with Stratification (MMW-S)
Hong (2010; 2011)

IV. Time-varying treatments
- Inverse probability of treatment weighting (HR, 2008)
- Adaptive centering with random effects (R, 2009)

Reading: Hong & Raudenbush (2005; 2006; 2008)
Raudenbush (2009)

Selected References Organized by Topic

Multivariate Models for Dyads


Models for Causal Inference for Multilevel Data


**Models for Incomplete Multilevel Data**


**Generalized Linear Models with Random Effects**


**Multivariate Hierarchical Growth Models**


**Measurement Models**


**Cross-classified Models**


Raudenbush, S.W. (1993). A crossed random effects model for unbalanced data with

**Models for Spatially Dependent Neighborhood Effects**
