MULTILEVEL MODELING IN PSYCHOLOGY
PSY 710 B, SPRING 2007
12:25 – 3:10pm Monday Poe 417

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COURSE DESCRIPTION: This course provides an introduction to the logic and application of multilevel models. Multilevel models are used (or at least they should be!) when individuals are nested within communities and/or when individuals are measured repeatedly over time. This course will emphasize application of the method and will introduce computer programming using SAS.

STUDENT LEARNING OBJECTIVES:

1) Evaluate when and why it is useful to conduct multilevel models in psychological research.
2) Apply the logic of a multilevel/hierarchical model.
3) Develop practical skills by analyzing data, interpreting results, and preparing summary tables and text.
4) Communicate and explain the results of multilevel modeling analyses.

REQUIRED TEXTBOOK:

Raudenbush, S.W., & Bryk, A.S. (2002). *Hierarichcal Linear Models: Applications and Data Analysis Methods* (2nd ed.). Thousand Oaks, CA: Sage.

There will also be supplemental readings which will be available via the course website (http://vista.ncsu.edu).

REQUIRED SOFTWARE:

This class will primarily use SAS, which is available to all NCSU students and personnel through an online form:
http://www.cgibin.ncsu.edu/cc-bin/consult/sasform.pl

EVALUATION:

Lab/homework assignments	Throughout semester	40%
Exam	March 27	25%
Research presentation	April 16, 23	20%
Participation	Throughout semester	15%

Overall course grades will conform to the following as designated by the university: A+ (97-100%), A (93-96%), A- (90-92%), B+ (87-89%), B (83-86%), B- (80-82%), C+ (77-79%), C (73-76%), C- (70-72%), D+ (67-69%), D (63-66%), D- (60-62%), F (anything below 60%).

Lab assignments will involve configuring data in SPSS, performing statistical analyses using SAS, interpreting output, and writing results sections using tables and/or figures. The commands that will be necessary to complete the assignments will be covered during relevant class meetings. Homework assignments will involve interpretations of tables from an article as well as a critique of an article that you will choose from your own research area. All lab/homework assignments will be due at the **beginning** of the class on the due date. Late assignments will be accepted with a 10% per day deduction in points.

Exam: The exam will consist of mostly short-answer questions, and will focus on the application of the material (e.g., interpreting output).

The *research presentation* will be a 10-15 minute in-class presentation which should have short introduction, method, and discussion sections and a full-length results section including tables and figures. Using one of the datasets from the course or one of your own (discuss by the beginning of February), you will generate research questions and/or hypotheses, perform appropriate analyses, and present and interpret the results. Your dataset needs to be clean and ready to use by February 5th (cases selected, variables computed, etc.). A more detailed description of the requirements will be distributed later.

Class participation includes (a) being in class every week, (b) being well-prepared by having carefully read all the assigned readings, (c) contributing actively to critical discussions in class about the readings, and (d) participating actively in the lab sessions.

FOR EXTRA HELP:

I will make every effort to support students in understanding course content and reading materials. I can meet with students during office hours and as needed by appointment. Students are also welcome to e-mail questions at any time. Students are **strongly encouraged** to read the required readings **before** class, and to try to work out problems themselves first, to fully capitalize on the benefits of self-discovery.

INCOMPLETE GRADES:

An incomplete grade may be assigned at the discretion of the instructor as an interim grade for a course in which the student has: (1) completed a major portion of the course with a passing grade, (2) been unable to complete course requirements prior to the end of the term because of extenuating circumstances, and (3) obtained agreement from the instructor and arranged for resolution of the incomplete grade.

ACCOMODATIONS:

Reasonable accommodations will be made for students with verifiable disabilities. Please register with Disability Services for Students at 1900 Student Health Center, 515-7653. See http://www.ncsu.edu/provost/offices/affirm_action/dss for more information.

ACADEMIC INTEGRITY:

Students will adhere to the University's Code of Student Conduct (http://www2.ncsu.edu/prr/student_services/student_conduct/POL445.00.1.htm). Consistent with the provisions of this Code, academic dishonesty is defined as cheating, plagiarism, and aiding and abetting others to cheat or plagiarize. Students who are accused of violations of the Code will be referred to the Coordinator, Office of Student Conduct.

Overview of Topics

Note: Schedule subject to change/update

		Readings
January 22	Introduction; review of regression; why MLM is important	R & B pp. xix-xxii
January 29	Intra-class correlation; within/between group relations	R & B Ch. 1 R & B pp. 23-24
February 5	Traditional and contemporary concepts of change; Preparing datasets	BRN Chs. 9-10
February 12	Intro to MLM: Research questions, basic equations	R & B Chs. 2 & 3
February 19	Examples of Level 1 and Level 2 variables, using SAS, centering	Singer Kreft et al. R & B pp. 31-35
February 26	Level 1 effects: Model 1 (fully unconditional model) Model 2 (One-way ANCOVA with random effects) Model 3 (Random coefficients model)	re-read R & B: pp. 16-26, 31-37, 68-75
March 5	NO CLASS: SPRING BREAK	
March 12	Level 2 effects: Model 4 (Means as outcomes regression) Model 5 (Intercepts and slopes as outcomes) Model 6 (Model with non-randomly varying slopes) Generalizations of the models	review R & B: Chs. 2 & 4 Hawkins et al.
March 19	Running and interpreting models with Level 1 and 2 effects "Issues" in explained variance	Snijders & Bosker chapter
March 26	EXAM	
April 2	Daily diary designs, time varying covariates	R & B pp. 179-181 Nezlek Neupert et al.
April 9	Lower level mediation, dyads	Kenny et al. Maguire
April 16	PRESENTATIONS	
April 23	PRESENTATIONS	

References

Baltes, P.B., Reese, H.W., & Nesselroade, J.R. (1988). *Introduction to Research Methods: Lifespan Developmental Psychology*. Hillsdale, NJ: Lawrence Erlbaum.

Hawkins, J.D., Guo, J., Hill, K.G., Battin-Pearson, S., & Abbott, R.D. (2001). Long-term effects of the Seattle social development intervention on school bonding trajectories. *Applied Developmental Science, 5*, 225-236.

Kenny, D.A., Korchmaros, J.D., & Bolger, N. (2003).Lower level mediation in multilevel models. *Psychological Methods, 8*, 115-128.

Kreft, I. G. G., de Leeuw, J., & Aiken, L. S. (1995). The effect of different forms of centering in hierarchical linear models. *Multivariate Behavioral Research, 30*, 1-21.

Maguire, M.C. (1999). Treating the dyad as the unit of analysis: A primer on three analytic approaches. *Journal of Marriage and the Family, 61*, 213-223.

Neupert, S.D., Almeida, D.M., Mroczek, D.K., & Spiro, A. III. (2006). Daily stressors and memory failures in a naturalistic setting: Findings from the Normative Aging Study. *Psychology and Aging, 21*, 424-429.

Nezlek, J.B. (2001). Multilevel random coefficient analyses of event- and interval-contingent data in social and personality psychology research. *Personality and Social Psychology Bulletin, 27*, 771-785.

Raudenbush, S.W., & Bryk, A.S. (2002). *Hierarichcal Linear Models: Applications and Data Analysis Methods* (2nd ed.). Thousand Oaks, CA: Sage.

Singer, J.D. (1998). Using SAS Proc Mixed to fit multilevel models, hierarchical models, and individual growth models. *Journal of Educational and Behavioral Statistics, 24*, 323-355.

Snijders, T.A.B., & Bokser, R.J. (2003). *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. Thousand Oaks, CA: Sage.

Other recommended readings

Chou, C.P., Bentler, P.M., & Pentz, M.A. (1998). Comparisons of two statistical approaches to study growth curves: The multilevel model and the latent curve analysis. *Structural Equation Modeling, 5*, 247-266.

Collins, L.M. (1996). Measurement of change in research on aging: Old and new issues from an individual growth perspective. In J.E. Birren & K.W. Schaie (Eds.), *Handbook of the psychology of aging* (pp. 38-56). San Diego: CA, Academic Press.

Collins, L.M., & Sayer, A.G. (2000). Modeling growth and change processes: Design, measurement, and analysis for research in social psychology. In H. Reis & C. Judd (Eds.), *Handbook of research methods in social psychology* (pp. 478-495). Cambridge: Cambridge University Press.

Cumsille, P., Sayer, A.G., & Graham, J.W. (2000). Perceived exposure to peer and adult drinking as predictors of growth in positive alcohol expectancies during adolescence. *Journal of Clinical and Consulting Psychology, 68*, 531-536.

Curran, P.J. (2000). A latent curve framework for the study of developmental trajectories in adolescent substance use. In J.S. Rose, L.Chassin, C.C. Presson, & S.J. Sherman (Eds.), *Multivariate applications in substance use research: New methods for new questions* (pp. 1-42). Mahwah, NJ: Erlbaum.

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*, 567-595.

Curran, P.J., Muthen, B.O., & Harford, T.C. (1998). The influence of changes in marital status on developmental trajectories of alcohol use in young adults. *Journal of Studies on Alcohol, 59*, 647-658.

Curran, P.J., Stice, E., & Chassin, L. (1997). The relation between adolescent and peer alcohol use: A longitudinal random coefficients model. *Journal of Consulting and Clinical Psychology, 65*, 130-140.

Davila, J., & Bradbury, T. N. (2001). Attachment insecurity and the distinction between unhappy spouses who do and do not divorce. *Journal of Family Psychology Special Issue, 15*, 371-393.

Hox, J.J. (2000). Multilevel analyses of grouped and longitudinal data. In T.D. Little, K.U. Schnable, & J. Baumert (Eds.), *Modeling longitudinal and multilevel data: Practical issues, applied approaches, and specific examples* (pp. 2-32). Mahwah, NJ: Erlbaum.

MacCallum, R.C., Kim, C., Malarkey, W.B., & Kiecolt-Glaser, J.K. (1997). Studying multivariate change using multilevel models and latent curve models. *Multivariate Behavioral Research, 32*, 215-253.

Nessleroade, J.R. (1991). Interindividual differences in intraindividual change. In L.M. Collins & J.L. Horn (Eds.), *Best methods for the analysis of change: Recent advances, in unanswered questions, future directions* (pp. 62-105). Washington, DC: American Psychological Association.

Nessleroade, J.R., & Ghisletta, P. (2000). Beyond static concepts in modeling behavior. In L.R. Bergman, R.B. Cairns, L.G. Nilsson, & L. Nystedt (Eds.), *Developmental science and the holistic approach* (pp. 121-135). Mahwah, NJ: Erlbaum.

Osgood, D.W. (2001). Advances in the application of multilevel models to the analysis of change. In L.M. Collins & A.G. Sayer (Eds.), *New Methods for the Analysis of Change* (pp. 97-104). Washington, DC: American Psychological Association.

Raudenbush, S.W. (2001). Toward a coherent framework for comparing trajectories of change. In L.M. Collins & A.G. Sayer (Eds.), *New methods for the analysis of change* (pp. 33-63). Washington, DC: APA.

Schwartz, J.E., & Stone, A.A. (1998). Strategies for analyzing ecological momentary assessment data. *Health Psychology, 17*, 6-16.