

SYLLABUS

Multilevel Analysis of Survey Data
 Survey Research Techniques Summer Program 2010

University of Michigan: Education 890 or Psychology/Sociology 988.202
 University of Maryland: SURV699K

Note: This video course taught simultaneously at the University of Michigan and the University of Maryland. Although the syllabus is the same for each location, registration, on-site faculty, staff, and facilities are different. Check the syllabus and the individual institutions for details.

Logistical Information

Where and When

Class Time: June 7 – July 2, 2010, 10:30-12:30 p.m. (includes lectures and labs). Orientation at the University of Michigan takes place on Monday, June 7, starting at 9:00 a.m., in the meeting rooms on the 6th floor of the Institute for Social Research (ISR) building. This is primarily for students who are not already part of the University of Michigan community. Orientation at the University of Maryland takes place on Monday, June 7, 10:30 -12:30 a.m., Room 2208 Lefrak Hall. The first class will be held on Tuesday, June 8, at the regular time.

Location: The location for lectures at the University of Michigan is rm. 300, in the Perry Building, whereas the location for the lectures at the University of Maryland is rm. 1208 in Lefrak Hall. These are video conference rooms that we will use for all lectures. The labs at the Michigan site will be held in room 4212 in the School of Education Building (SEB); labs in Maryland depend on the day. On Friday, June 11th, and Tuesday, June 15th, the labs will be held in rm. 2208 Lefrak Hall; all other labs will be held in rm. 0229 in Lefrak Hall.

<i>Staff</i>	<i>University of Michigan</i>	<i>University of Maryland</i>
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Staff (continued)

	<i>University of Michigan</i>	<i>University of Maryland</i>
Teaching Assistants:	Julie Posselt jposselt@umich.edu Lindsay Bell lhbell@umich.edu	Cara Jackson cjacks12@umd.edu
Office Hours:	Wed 2-4 pm and Thurs 2-4 pm, always in SOE room 2211	Wed 1-3 pm, Benjamin 2110b

Registration

The course is offered through the University of Michigan's Survey Research Techniques Summer Institute at the Institute for Social Research and the Joint Program in Survey Methodology at the University of Maryland. (Please note that the course is not part of ICPSR, the other series of summer research methods courses at ISR.) Dr. Steven Heeringa directs the Summer Institute at the University of Michigan; Jill Esau is education programs administrator (jesau@isr.umich.edu). The Institute's office is in rm. 4050 in the ISR building at the University of Michigan (734-647-4620). Roger Tourangeau directs JPSM; Rupa Jethwa Eapen is the assistant to the director (rjeapen@survey.umd.edu). The JPSM office is in rm.1218 Lefrak (301-314-7911)

The course enrolls both degree and non-degree students. Degree students may take the course either for credit or as an audit; non-degree students are all auditors ("summer scholars" at UM). Although tuition is required of students in any of these categories, course-credit tuition is higher at the University of Michigan and the University of Maryland. Michigan students may register (and pay tuition) in one of two categories: Summer Institute or School of Education. Summer Institute students, either degree or non-degree students, register in the usual way and pay fees through the Institute. Students who qualify for School of Education course credit also register with the Summer Institute, but they will need register for ED-890 in the Fall 2010 term, with tuition paid for a 3-credit course in that semester. Students planning to take advantage of the School of Education option must take the course for credit. Maryland students register for the course as part of the University's summer schedule. For Maryland students who have tuition reimbursement in the fall but not the summer, it may be possible to defer tuition payment until the beginning of the next academic year. These arrangements must be made with the instructor and JPSM prior to the first day of the course. At both universities, it is very difficult to change status after the course is over, so be sure you're registered in the right category.

Course Overview

Purpose and Aims

A problem. Although the hierarchical linear modeling technique is applicable to many disciplines in social science and the professions, our course provides examples of its utility in a particular discipline: education. A major phenomenon of interest in educational research is the learning of individual students. Two educational realities -- (1) that learning implies change in individuals

over time but (2) learning occurs in organizational settings (classrooms, schools) -- cause persistent and troublesome methodological problems in quantitative research. One problem is how to measure change. Another involves how to accommodate the grouped nature of the phenomenon (often referred to as "the unit of analysis problem"), as education almost always occurs in groups (classrooms, schools) but its effects are expected to accrue to individuals. These methodological problems have distinct, long-standing, and non-overlapping literatures. In a sense, the problems share a common cause: traditional statistical techniques are not adequate to model the hierarchical nature of either phenomenon.

Applicability. Education illustrates a clear dilemma in this regard, and much educational research is flawed because of it. However, the problem is not limited to that field. Both measuring change and estimating effects on individuals when the "treatment" takes place in groups are common phenomena in social science evaluation research. Therefore, although the instructors in this course all specialize in the field of education, and the data we use in the course for illustrative purposes are educational, the usefulness of the techniques learned in the course have broad applications. In past years, students have come from many social science and professional fields.

Focus. The course is meant to introduce students to the multilevel methodology and to help them become skilled in its use. We begin by discussing the need for multilevel methods in survey research, as well as the circumstances under which these methods are appropriate and necessary. We ask students to read articles in which the method is employed, both to become familiar with the standard terminology and notation, and to review the substance of a variety of work where these methods are applicable. When the course ends, we hope that students will have both a good understanding and considerable skill in using HLM in survey research with nested data.

Target audience and prerequisites. Although the course focus is on quantitative methodology, our orientation is more toward applications than statistical derivations. We expect that students have a working knowledge of general linear models and are familiar with non-experimental multivariate methods, preparation in mathematical statistics is not required. We do expect, however, that students have considerable experience with statistical computing in a social science setting. Generally, this means that students have completed at least two semesters of graduate training in quantitative research methods and statistics and are capable of formulating, conducting, and interpreting results for and analysis of variance (ANOVA) and OLS regression with several variables. We also expect that students are reasonably skilled in and comfortable with using common statistical software (e.g., SPSS, SAS, STATA) for data manipulation.

Although the database offered for class use comes from the field of education, we expect that class members come from a variety of social science disciplines. At any point in the course, students with access to other data with a multi-level structure, adequate within-and between-group sample sizes, and appropriate variables are encouraged to make use of them. However, because the course moves at a fast pace (a semester's work in four weeks with weekly written assignments and HLM analyses), it is unwise to use new data if preparing them would occupy a substantial amount of students' time and effort. In previous years, the intensity of the class has meant that most students have worked with the class data files. However, some students have used their own data for the final project.

Objectives. Hopefully, students in this class will learn:

1. To formulate multilevel research problems in terms of a hierarchical linear model (HLM).

2. To pose and test hypotheses about various parameters of multilevel models and to write clearly about both the statistical and substantive meaning of these results.
3. To examine critically the application of HLM to particular problems in light of its statistical assumptions.
4. To conduct a meaningful two-level hierarchical linear model analysis, write up the results, and draw substantive conclusions from the analysis.
5. To gain a reading knowledge of applications of hierarchical linear models beyond the standard two-level organizational model.

Organization

Format. We have offered this course as part of the ISR Summer Institute since 1994. The course has been offered jointly at the University of Maryland, through the Joint Program in Survey Methodology, using video conferencing technology since 1997.

We teach the course in a workshop format, which alternates between lectures and labs. Both lectures and labs are required, as this is a "hands-on" course. Lectures and labs are informal, meant to provide opportunities for questions and discussions. A culminating activity in the course is the final project (both a paper and an oral presentation). The purpose of presenting students' "work in progress" is to provoke discussion around the HLM methodology employed in a variety of contexts (data, research questions), rather than as a "test" of the quality of work. The scope of final project presentations depends on class sizes at both locations. In past years, several final projects have been developed into conference presentations and gateway research activities.

Hopefully, the class structure and format accommodate some variety in the backgrounds and expectations students bring to the class. Lectures provide the theory and purpose of HLM, discussion of analyses using it, as well as a vehicle for understanding what is being done, why it might be done, what conclusions may be drawn, and examples of studies using HLM. The labs offer "how-to" experiences, where students receive instruction from the Teaching Assistants in how to use the statistical software, HLM (Hierarchical Linear Models). Although out-of-class work involves both readings and weekly write-ups of computing projects, the majority of out-of-class time is spent at a computer, learning to work with HLM and to prepare data and variables to use in HLM analyses. There is no exam. All students, whether they are taking the course for credit or not, receive a letter grade. Assignments of class members not receiving course credit will be evaluated on the same scale.

Requirements. Minimum requirements include attending all lectures and labs, completing assigned readings, writing up three short and one longer data analysis, and making an oral presentation. As the course is designed around learning to **use** HLM, all students (including auditors) are expected to complete the assignments, in order to learn the methodology, how to apply it to data, and to receive feedback on their work. The assignments are meant to be progressive. Thus, it is impossible to do the later assignments without mastering the skills involved in the early ones. If for some reason students need to miss a class, they are still expected to complete the assignments. Missing classes is strongly discouraged.

The course finale is the presentation of final projects, each focusing on a topic of personal and substantive interest. This will include both a written paper of 10-20 pages and a short presentation to the class (10-15 minutes). Students may work individually or in pairs on all assignments.

Data. Many of the examples discussed in class, and the course-supplied data file, come from a multilevel longitudinal educational dataset. We make use of the first two waves of the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K). As stated, class members from other fields are welcome to use their own data (if the data have an appropriate multilevel structure) for assignments beyond the introductory ones. If you plan to do this, you should discuss it early with Professors Lee or Croninger to make sure your data are appropriate and that you have sufficient time to create an appropriate systems file which can interface with HLM software.

The ECLS-K data are available from the National Center for Education Statistics (NCES) in the U.S. Department of Education. Many NCES datasets exist in two forms: public-use and restricted. ECLS-K is available in both forms, but we will make use of the public-use version. You should feel free to obtain a copy of these data from NCES on your own. However, for the class, we will supply students with SPSS systems files (children and schools) made from ECLS-K, where we have sampled down the numbers of children, schools, and variables. The dataset contains the first two waves of ECLS-K data, the Fall 1998 wave and Spring 1999 wave when children were kindergarteners. Because the sampling frame for ECLS-K involved a two-stage process (first schools were sampled, then a random sample of kindergarten children in those schools was drawn), the data structure is quite appropriate for school-effects studies using multilevel statistical methods.

Computer usage. Although comparable HLM software is available in both mainframe and PC versions, class instruction uses HLM for Windows. We will be working with HLM 7Beta. Students will have access to the software at on-site labs and through temporary copies of the program that can be downloaded onto their personal computers. (This version has been provided to us for instructional purposes and will “expire” on approximately August 1st.) Statistical software (e.g., SPSS and SAS) is available at many University of Michigan and University of Maryland computing sites. We use SPSS for labs and class handouts, as the HLM program can read data from SPSS systems files. .

If you wish to purchase your own copy of the HLM 6 software, the cost is about \$425, with modest additional charges for upgrades. It is also possible to do a “trial-run” and rent HLM for various specific periods of time. The HLM software is sold by Scientific Software Incorporated (SSI), 7383 N. Lincoln Avenue, Suite 100, Chicago, IL 60646. Telephone: (847) 657-2140. Fax: (847) 675-0720. Website: www.ssicentral.com. Of course, it is strictly illegal to copy the software.

Materials

A. Books:

Raudenbush, S. W., & Bryk, A. S. (2002). Hierarchical Linear Models: Applications and Data Analysis Methods, 2nd Edition. Newbury Park, CA: Sage Publications. [Note: Most of the issues that we will cover are included in the first edition. While we recommend that you purchase the 2nd edition, you will probably be able to follow along if you already own the 1st edition.]

Raudenbush, S.W., Bryk, A., Cheong, Y.F., and Congdon, R.T. (2004). HLM 6: Hierarchical Linear and Nonlinear Modeling. Chicago, IL: SSI (Scientific Software International). [This is the handbook or users guide for the software we will use in class.

If you decide to purchase a personal copy of HLM for Windows you can ask SSI to deduct the price of the manual.]

Luke, Douglas A. (2004). Multilevel Modeling. Quantitative Applications in the Social Sciences. Newbury Park, CA: Sage Publications. (A good, inexpensive introduction to multilevel modeling, though we do not always agree with what the book says about specific topics, e.g., centering.

(Optional) O'Connell, A.A. and McCoach, D.B. (Eds.) (2008). Multilevel Modeling of Educational Data. Charlotte, N.C.: Information Age Publishing. (We will include two chapters from this book in the coursepack, but many may appreciate the readability of this edited volume).

B. Course pack:

The course pack is in two sections. Course pack A (required) includes all readings assigned in the course, whereas Course pack B (optional) includes additional readings on HLM that you may wish to refer to on your own during or after the course. The readings in Course pack A are available on C-Tools for Michigan and Maryland students. They may be downloaded for free for use in the class. Students in Michigan may also purchase Course packs A and B from the Copy Center in the basement of ISR if downloading and printing present difficulties. A copy of both course packs is also on reserve at the Helen Newberry House at Michigan. University of Maryland students interested in purchasing either Course pack A or B should contact the instructor.

Policy on Readings. All required readings listed for the course are either in the books, Course Pack A, or on the C-Tools site at UM. Reading assignments in the HLM 6 manual are not listed in this syllabus. Students should become familiar with the manual very early in the course, to have read the relevant sections before each lab, and to bring along the manual for all lab sessions.

The class dataset is in two SPSS systems files (for children and schools). Students who wish to use SAS or STATA will need to convert these files. Depending on the statistical software students choose to use, we expect that they have access to the appropriate User's Guide or manual. Our labs include very little direct instruction in SPSS (and none in SAS or STATA). We assume that students gained good skills in statistical computing and general linear model techniques in previous courses and/or project work.

C. Websites

There are quite a few websites in Europe and the United States with lectures and training materials on multilevel models. We do not specifically recommend any of these sites, but you may want to explore some of them to see what is useful and available to you. We list a few: one site at the University of Bristol (UK) and another at the University of California Los Angeles. You may also find the HLM web pages at Scientific Software International in Chicago useful www.ssicentral.com.

<http://www.cmm.bristol.ac.uk/learning-training/> [Some video lectures and examples, mostly associated with MLwiN.]

<http://www.cmm.bristol.ac.uk/learning-training/multilevel-m-support/books.shtml#rs> [Nice list of texts and textbooks, some specifically associated with different software programs.]

<http://www.ats.ucla.edu/stat/> [No videos about HLM but examples and datasets from some of the major textbooks. Some good videos of lectures about other techniques and SPSS, too.]

Schedule

The pace of the course is fast. Each week includes an assignment that involves posing a multilevel research question, data manipulation, computing, interpreting, and writing. We expect all students (credit or no-credit) to complete three assignments and a final project, due at the end of each of the four weeks. The assignments build on one another, becoming progressively more complex. Because of the fast pace, we discourage requests for extensions on assignments. It is important that students practice the skills covered in lab and master them promptly, as knowledge is cumulative. The major time spent on the course is at the computer, particularly in the first two weeks. The usual schedule has lectures on Monday, Wednesday, and Thursday, labs on Tuesday and Friday, 10:30 – 12:30. Because the first full class falls on Tuesday (June 8, 2010), the first week's labs are on Wednesday and Friday, with the first assignment due on Friday.

The topics and reading assignments listed for each class are approximate, based on the pace we think we will follow and reflecting the order of topics covered class by class. Although the progression will be the same as listed in the syllabus, the days on which each topic is covered depends, to some extent, on how the course progresses. Assignment deadlines will not change, however.

The final project, and its presentation, represents the culminating experience of the course. Format for the project should resemble articles from scholarly journals in the course pack -- discussion of the problem and some theory, discussion of method, presentation of results, and discussion of the substantive meaning of the findings. You should not conduct a literature review on your chosen topic; but if you have knowledge of relevant literature, feel free to cite it.

We expect that students read the assigned readings for each class before the class meets. Some of the readings for the course are quite technical, and you may find them difficult to fully understand. Some students have found it useful to revisit the more complex readings after the lecture, concentrating on the particular issues covered in the class.

We encourage students to work in pairs, although it is possible to work alone. In past years, many students have told us that the collegiality of working with a partner greatly enhanced their experience in this class. Because research out of class settings is almost always collegial, we have found that two minds focused on something new often produce more than the sum of the parts.

PART I: WHY DO WE NEED MULTILEVEL MODELS?

Monday, June 7: **Summer Program Orientation** at the University of Michigan starts at 9:00 am. Non-UM students should go to meeting rooms on the 6th floor of ISR. University of Maryland students should go to rm. 1208 in Lefrak Hall at the normal meeting time (10:30 am).

Tuesday, June 8: **Introduction to the multilevel approach.**

Burstein, L. and Miller, M.D. (1981). Regression-based analyses of multilevel educational data. In Borusch, R.F., Wortman, P.M., Corday, D.S. and Associates. Reanalyzing Program Evaluations. San Francisco: Jossey-Bass (Course pack A).

Haney, W. (1980). Units and levels of analysis in large-scale evaluation. In New Directions for Methodology of Social and Behavioral Science, 6, 1-15 (Course pack A).

Read pages in Course pack A that describe the Early Childhood Longitudinal Study -- Kindergarten Cohort. These are from the Electronic Codebook on the ECLS-K CD.

You may also find it useful to go to the NCES website (www.nces.ed.gov), click on "Reports," and ask for NCES 2000-070. This is a report entitled, "America's Kindergarteners," and it provides considerable information about the full sample from the ECLS-K. This may be downloaded free from the Internet.

Wednesday, June 9: **Lab**

Introduction to computing facilities at each location and distribution of class data files and HLM for Windows software. Accessing raw and systems data with HLM. Missing data. Investigating a two-level data structure for a dependent variable. Specifying the fully unconditional model and calculating the intraclass correlation. *[Please review the assignment for Friday, June 11th, so that you can be working toward its completion.]*

Thursday, June 10: **School effects, units of analysis, and an overview of Hierarchical Linear Models.**

Bidwell, C.E. and Kasarda, J.D. (1980). Conceptualizing and measuring the effects of school and schooling. American Journal of Education, 88, 401-430 (in Course pack A).

Read Chapters 1 & 2 Raudenbush and Bryk (2002). Hierarchical Linear Models: Applications and Data Analysis Methods, 2nd Edition. This book will hereafter be referred as R & B.

Friday June 11: **Lab.**

Continuation of Wednesday's lab.

Assignment #1 due (20% of grade): Select a simple multilevel research question that can be addressed with the ECLS-K data. Select a single dependent variable, a few child-level and a few school-level variables that will be helpful in exploring this question. Construct a multivariate data matrix (MDM) that uses these variables, making sure that you specify an appropriate weight. Compute the intraclass correlation (ICC) for your outcome. In a brief write-up, specify an appropriate research question, a description of variables, and a rationale for your choices. State and interpret the meaning of the ICC. Include a cover page that has a substantive title, your name, course, and date. Attach a copy of the statistics file for the MDM and the output for the fully unspecified model. Hand the assignment in at the end of lab

Student hoping to use their own data for this class will be required to complete Assignment 1 with both the class ECLS-K data and their own data (i.e., two Assignment 1's). We suggest that the ECLS-K assignment be completed first and turned in on Friday; personal data second (and turned in by Monday, June 14th)

PART II: THE WITHIN-GROUP HLM MODEL

Monday, June 14: **Logic of hierarchical linear models.**

Paterson, Lindsay. (1991). An introduction to multilevel modeling. In S. W. Raudenbush and J. D. Willms (Eds.), Schools, classrooms, and pupils. San Diego: Academic Press (in Course pack A).

Arnold, C. (1992). An introduction to hierarchical linear models. Measurement and Evaluation in Counseling and Development, 25 (July), 58-90 (in Course pack A).

Review Chapter 2 of R & B.

Tuesday, June 15: **Lab.**

Creating within-group models in HLM. Random v. fixed effects. Centering options. Interpretation of HLM output.

Wednesday, June 16: **Overview of statistical estimation.**

Read Chapters 3 and 4 of R & B.

Cohen, P., Cohen, J., West, S. G., Aiken, L. S. (2002). Random coefficient regression and multilevel models. In Applied Multiple Regression/Correlational Analysis for the Behavioral Sciences (Chapter 14, pp. 536-567). Mahwah, NJ: Lawrence Erlbaum (in Course pack A).

Raudenbush, S. W. & Willms, J. D. (1995). The estimation of school effects. Journal of Educational and Behavioral Statistics, 20 (4), 307-337 (in Course pack A).

PART III: THE BETWEEN-GROUP HLM MODEL

Thursday, June 17: **Application of HLM to research on organizational effects.**

Read Chapter 5 of R & B.

Lee, V.E. and Bryk, A.S. (1989). A multilevel model of the social distribution of high school achievement. Sociology of Education, 62(2), 172-192 (in Course pack A).

Rowan, B., Raudenbush, S.W., and Kang, S.J. (1991). Organizational design in high schools: A multivariate analysis. American Journal of Education, 99(2), 238-266 (in Course pack A).

Friday, June 18: **Lab.**

Continuation of Tuesday's lab.

Assignment #2 due (20% of grade): Within-group HLM data analysis and write-up. Include at least 3 independent variables in the within-group model. Between-group model should be unconditional. You should write up what you have done, along with the substantive meaning and interpretation of results. Be sure to discuss possible second-stage outcomes (what does the output tell you about possible outcomes at level 2?). Again, please put a cover page on this assignment, with a title, your name, and the date. We prefer that you make and number tables (or read the HLM output into your text), and refer to tables or output in your write-up. If you choose to include HLM output instead of making tables, then you should edit it down to include only the meaningful output. Please turn in Assignment #2 to your TA in the Friday lab. *[You should be thinking about your final project and what data you will use. Please review the assignment and prospectus due at the end of next week.]*

Monday, June 21: **Example of HLM application using ECLS-K data.**

Lee, V. E., Burkam, Ready, D. D., Honigman, J.J., & Meisels, S. J. (2006). Full-day vs. half-day kindergarten: In which program do children learn more? American Journal of Education. 112(1), 163-208 (in Course pack A). A more extensive set of appendices & technical information is available on the journal's website.

Tuesday, June 22: **Lab.**

Constructing the two-level HLM model. Modeling intercepts and slopes. More on fixed and random effects. Interpretation of HLM output. Graphing HLM results.

Wednesday, June 23: **More applications of organizational effects models; Model specification: Centering; random and fixed effects.**

Review issues of centering, free, and fixed effects in R & B and the HLM manual.

Read Chapter 9 R & B.

Rice, J. K., Croninger, R. G., & Roellke, C. (2002) The effect of block scheduling high school mathematics courses on student achievement and teacher's use of time: Implications for educational productivity. Economics of Education Review, 21, 599-607 (in Course pack A).

McCoach, D.B. and Black, A.C. (2008). Evaluation of model fit and adequacy. In A.A. O'Connell and A.C. Black (Eds.) Multilevel Modeling of Educational Data (Chapter 7). Charlotte, NC: Information Age Press (in Course pack A).

PART IV: OTHER APPLICATIONS OF MULTILEVEL MODELS

Thursday, June 24: **Introduction to the study of change.**

Read Chapter 6 of R & B.

Willett, J.B. (1994). Measuring change more efficiently by modeling individual growth over time. In T. Husen & T.N. Postlethwaite (Eds.) The International Encyclopedia of Education, 2nd Edition. Oxford, UK: Pergamon Press (in Course pack A).

Friday, June 25: **Lab.**

Refining the 2-level HLM models. More on centering, level-1 and level-2 specification, and interpretation of HLM output.

Assignment #3 due (20% of grade): Prepare and write up an HLM which includes no more than 3 significant group-level predictors. You should model the intercept, and if possible (and you can find a slope that varies between schools) try modeling one slope as an outcome. Be sure you understand the meaning of the effects of group predictors on slopes, and describe this in your write-up. You may work individually or in pairs. It is a good idea to think of this assignment as a test run for your final project idea. Form of write-up should follow description for Assignment #2. Please turn both in to your TA in the Friday lab.

Also Due (not graded but required): One-page prospectus of plan for final project. Include research question, data, and some description of HLM usage. Projects may be done in pairs or individually. Try to discuss this idea with faculty or one of the TAs beforehand, to make sure idea is appropriate for HLM and feasible within the timeframe and your expertise. Using your own data is encouraged, if you have some and it is appropriate for HLM analysis. Please turn in the final project prospectus with Assignment #3.

Monday, June 28: **Application of HLM to studying change or growth.**

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

Huttenlocher et al. (1991). Early vocabulary growth: Relation to language input and gender. Developmental Psychology, 27(2), 236-248 (in Course pack A).

Tuesday, June 29: **Lab.**

Growth curve modeling with HLM. Organizing data for modeling growth in HLM. Linear and non-linear terms. Interpretation of HLM output.

Wednesday, June 30: **Advanced applications of multilevel models: Dichotomous outcomes.**

So far we've looked at only continuous, dependent variables using HLM. But what if you want to investigate a binary or dichotomous outcome? We will discuss some special circumstances associated with multilevel modeling of a binary outcome and hierarchical generalized linear models (HGLM) as a solution.

Read Chapter 8 of R & B.

Lee, V. E., & Burkam, D. T. (2003). Dropping out of high school: The role of school organization and structure. American Educational Research Journal, 40(2), 353-393, (In Course pack A).

Osgood, D.W., Wilson, J.K, O'Malley, P.M., Bachman, J.G., & Johnston, L.D. (1996). Routine activities and individual deviant behaviors. American Sociological Review, 61, 635-655. This article investigates several dichotomous outcomes, but also includes the study of change. (In Course pack A)

Rumberger, R.W. (1995). Dropping out of middle school: A multi-level analysis of students and schools. American Educational Research Journal, 32(2), 583-625. (In Course pack B)

Spybrook, J. (2008). Power, sample size, and design. In A.A. O'Connell and A.C. Black (Eds.) Multilevel Modeling of Educational Data (Chapter 8). Charlotte, NC: Information Age Press (in Course pack A).

PART V: STUDENT PRESENTATIONS

Note: The days required for presenting final projects depend on the course enrollment and how many students choose to work jointly. We have scheduled two days, based on previous years' enrollment. We expect that all students are present on both the day they present and the day they are in the audience. Presentations will occur at each location without the video link. Students should provide abstracts of their projects to the TAs 24 hours in advance to be made available at the other location.

Thursday, July 1: **Presentation of final projects for Group I.**

Assignment #4 due (40% of grade, 5% for presentation and 35% for paper): Final paper due for Group I. This is a final write-up of your work for the class, which may be an expansion of your work for Assignment 3. If you use citations to support the theory on which your work rests, please use APA or ASA format, and include all citations. Cite course readings as appropriate. Presentation and paper should include tables and graphs as appropriate.

Friday, July 2: **Presentation of final projects for Group II.**

Final paper due for Group II. See description above.

Optional reading (ask if you want a copy): Kreft, I.G.G., De Leeuw, J., and Kim, K-S. (1990). Comparing Four Different Statistical Packages for Hierarchical Linear Regression: GENMOD, HLM, ML2, and VARCL. Los Angeles: UCLA Center for Research on Evaluation, Standards and Student Testing. CSE Technical Report 311. Because this report is quite long, we have not included it in either Course pack A or B. We'll also provide you with information about websites and other resources upon request.

Revised June 8, 2010