Psychology 878: Hierarchical Linear Modeling

Spring 2019
TR 3:30-4:45pm
CBBI Conference Room

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Office Hrs: Thursdays 1:30-3:30pm
Location: 212 Wolf Hall

Website: http://www1.udel.edu/canvas/

Textbook: Bickel, R. (2007). *Multilevel analysis for applied research: It's just regression!* Guilford Press.

Optional: Heck, R.H., Thomas, S.L., & Tabata, L.N. (2013). *Multilevel and Longitudinal Modeling with IBM SPSS*, 2nd edition. Routledge Publishing.

Prerequisites:

Students should have taken courses on ANOVA and linear regression, and have a solid understanding of these topics. Students must also have a basic understanding of IBM SPSS, including syntax commands, as this will be the primary program used throughout the course. If you are unsure if this course is right for you, please see me as soon as possible and we can figure it out together.

Goals of the Course:

The goal of this course is to provide a detailed introduction to the basic concepts in hierarchical linear modeling (HLM; also called multilevel modeling and linear mixed modeling). The basics of HLM are manageable and can be understood by most regular statistics users. However, HLM can become complicated fairly quickly once you get into advanced topics. Accordingly, we will focus on mastering the basics in this course, and leave the advanced topics for your future learning endeavors. Some examples of advanced topics that will not be covered in this class are: categorical outcomes, multivariate outcomes, multilevel survival analyses, and power analyses. Mastering the basics is essential for understanding this type of analysis, and so having a solid foundation will allow you to learn more advanced topics throughout your career.

Note that this is a very applied statistics course that focuses on how to use HLM to analyze your data and how to interpret the output. In addition, we will exclusively use SPSS, and thus a lot of the applied learning will be specific to SPSS (although SPSS commands often easily translate into other programs like SAS).

HLM is a data analytic technique that is used when there is some form of dependency in the data – that is, when people or observations are more similar to each other than they would be to other people or observations. This dependency occurs in many different contexts. For example, repeated assessments of the same person, students who are grouped within classrooms, or people who are grouped within families. HLM provides a way to account for the dependency that is inherent in these types of data, while also allowing us to answer many interesting questions!

All assignments and in-class exercises are designed to maximize your achievement of the following learning goals. By engaging fully in these activities, by the end of the semester you will be able to:

- Understand when you would use HLM and why
- Understand how to construct a multilevel model, choose random and/or repeated effects, and specify covariance structures
- Understand IBM SPSS syntax for the mixed command and how to interpret the output
- Understand how to problem solve and check your own work
- Identify and implement the steps for model building (either bottom-up or top-down)
- Apply the concepts learned in class to a research question you generated

Readings

I encourage you to do all of the assigned readings. However, if you are pressed for time, the *most important readings* are from the reading supplement. I created the supplement specifically for this class, using material from a statistics website that conveys complex information in an easy-to-understand manner. You will learn a lot from the reading supplement (trust me!). The book is also very user friendly and is much more digestible than a normal statistics book. You should read the book if you feel like you need information above and beyond what we discussed in class, or if you need additional clarification on any topic.

Elements of Your Grade:

Final grades are non-negotiable – grade changes will be made only to correct clerical errors. Your *total points* will be based on the following components:

Exams	50%
Final Project	20%
Meeting about Final Project	10%
Participation	10%
HW Assignments	10%

Exams:

There are two open-notebook take home exams in this course. All of the work that you turn in should be yours and yours alone. Do not copy your answers from another student or from my class materials! Since these will be take home exams and you will have a week to complete each, I will not allow make-up exams (except in the case of a documented emergency that spans the entire time of the exam period). Late exams will receive a 5% grade reduction for every day late.

Final Project

You will complete a final project that involves generating a multilevel research question, building a model, analyzing the data, and writing up the results. This project will be worth 20% of your final grade. Around ½ through the semester, you will also meet with me to discuss ideas for your final project. This meeting will be worth 10% of your final grade. Details about the final project and the meeting will be discussed in class and posted on Sakai.

Participation Points

Your participation grade will stem from completing the in-class activities. We typically complete an activity in each class. You will get a participation point if you were there during class and worked on the activity. I will send around a sign-in sheet during the in-class activity portion of each class – just add your name to the list to get participation points for that day. It is your responsibility to attend class, or make alternative arrangements with me ahead of time if you need to miss a specific class.

HW Assignments

Every HW assignment will be announced ahead of time and you will have multiple days to complete each assignment. Accordingly, you can plan in advance for any scheduling conflicts you might encounter. HW assignments will be self-graded; look for the self-grading policy on Canvass for details.

Academic Integrity:

Academic dishonesty is unacceptable under all circumstances. All exam work in this class is to be your own. All written work is to be your own. It is not acceptable to re-use the exact wording that I provide in my answer keys; you must use your own words. You are responsible for keeping drafts, references, and backup copies of all of your written assignments, to turn in upon my request until final grades are completed. If I discover that you have copied all or part of an exam or written assignment from another source (including another student, a web page, a textbook, my handouts, or other published source), you will be reported to the Office of Student Conduct for disciplinary action (I usually recommend an F grade in the course). To avoid plagiarizing, you must educate yourself about appropriate citation procedures and follow them carefully. When in doubt, ask. Please do not put your career at risk!

Students with Disabilities:

If you need special academic accommodations due to a documented physical or sensory disability, please contact the Office of Disability Support Services at www.udel.edu/DSS/ *during the first two weeks of class.* The office provides academic support services to eligible students with temporary and permanent disabilities.

General Note:

I support people of all nationalities, races, religions, ethnicities, abilities, sexual orientations, and gender identities. This means that everyone is welcome in this class. My goal is to foster an environment that embraces diversity of all kinds, so please let me know if there is anything I can do to improve the class along these lines.

Lecture Schedule and Reading Assignments

Week	Class	Day	Date	Topic	Readings and Assignments	HW Assignments
1	1	T	2/12	Overview and introductions	Reading supplement: Pages 2-3	
	2	R	2/14	GLM – Data Preparation	Reading supplement: Pages 4-6	
2	3	T	2/19	GLM – Main Effects and Interactions 1	Reading supplement: Pages 7-10	
	4	R	2/21	GLM – Main Effects and Interactions 2		HW 1 Assigned
3	5	T	2/26	What is HLM and Why Do We Use It?	Book: Chapter 1	HW 1a Due
	6	R	2/28	Some HLM basics	Book: Chapter 2	HW 1b Due
4	7	T	3/5	Handling dependency – R side modeling	Reading supplement: Pages 11-17	
	8	R	3/7	Handling dependency – R side modeling	Reading supplement: Pages 23-26	HW 2 Assigned
5	9	T	3/12	Handling dependency – G side modeling	Book: Chapter 3	HW 2a Due
	10	R	3/14	Handling dependency – G side modeling	Book: Chapter 4	HW 2b Due HW 3 Assigned
6	11	T	3/19	Handling dependency – G side modeling		HW 3a Due
	12	R	3/21	Misc Extra Topics	Reading supplement: Pages 27-32	HW 3b Due
7	13	T	3/26	Mixed versus other Analyses	Reading supplement: Page 18-22	
	14	R	3/28	Class Cancelled – Work on Exam #1	Exam #1 DUE (covers lecture 1-12)	

8	15	T	4/2	No Class – Spring Break		
	16	R	4/4	No Class – Spring Break		
9	17	T	4/9	Class canceled – medical procedure		
	18	R	4/11	Centering	Start meetings to discuss final project Book: Pages 134-143	
10	19	T	4/16	Model building – Bottom Up	Extra reading: Hox Chapter 4	
	20	R	4/18	Model building – Top Down		
11	21	T	4/23	HLM Equation 1	Book: Chapter 5	
	22	R	4/25	HLM Equation 2	Book: Chapter 5	HW 4 Assigned
12	23	T	4/30	Semi-Advanced #1 (changes over time)	Book: Chapter 11	HW 4a Due
	24	R	5/2	Semi-Advanced #2 (changes over time)		HW 4b Due HW 5 Assigned
13	25	T	5/7	Semi-Advanced #3 (mediation)		HW 5a Due
	26	R	5/9	Semi-Advanced #4 (3+ levels)	Book: Chapter 8	HW 5b Due
14	27	T	5/14	Writing up results	Two example write-ups on Canvas	
	28	R	5/16	Class Cancelled – Work on Exam #2	Exam #2 DUE (covers lecture 1-27)	
			TBA		Final Project DUE via Canvas	

*Schedule and readings subject to change