

Course Syllabus
Psy 526/626: Multilevel Regression
Spring 2019

Instructor

Jason T. Newsom, Ph.D., Professor, Department of Psychology. Office: 317F Cramer Hall Center (3rd floor),
Email: newsomj@pdx.edu. Office hours: Tu noon–1:00 PM, Wed 1:00–2:00 PM, and by appointment.

Meeting Times and Location

Class: Tu, Th 10:00–11:50 AM, 307 Cramer Hall (CH). Lab sessions: Douglas Fir 6 (SW 11th and Market), Th 11:00–11:50 AM (as needed).

Text

Snijders, T.A.B., & Bosker, R.J. (2012). *Multilevel analysis: An introduction to basic and advanced multilevel modeling (2nd Edition)*. London: Sage. ISBN: 184920201X

Recommended Text

Raudenbush, S.W., & Bryk, A.S., (2002) *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: Sage. ISBN: 076191904X

Optional (not at the PSU bookstore)

Heck, R.H., Thomas, S.L., & Tabata, L.N. (2014). *Multilevel and longitudinal modeling with IBM SPSS, second edition*. New York: Routledge. ISBN: 0415817110 (electronic copy available through PSU Library).

Finch, W. H., Bolin, J. E., & Kelley, K. (2014). *Multilevel Modeling Using R*. Boca Raton, FL: CRC Press. ISBN: 1466515856 (electronic copy available through PSU Library).

Overview

This course is intended to introduce students to multilevel regression techniques (also known as hierarchical linear models, random coefficient models, or mixed models) and will cover the fundamental concepts and application of the techniques. By the end of the course, students should be able to apply, write about, critique applications of, and read methodological articles about multilevel regression analysis.

Prerequisites

This course assumes that students have taken a graduate statistics course that covers simple and multiple regression.

Readings and Commentaries (5%)

There will be several readings assigned each week taken from the text and supplemental sources. The readings will usually include an example article that applies MLR. Please read the material prior to class and be prepared for discussion. Students will be required to turn in a **one-page commentary** on the readings for that week on each Tuesday by 9 AM via email. The commentaries should be an informal set of questions, comments, or summary information (summarize only if you cannot think of anything else to say) about the articles. The purpose of the commentaries is to make sure the class is prepared for discussion and to help the instructor identify discussion topics and sources of confusion in the readings. I will assign 2 (complete and well-considered), 1 (did not read some/lacking effort), or 0 (did not read most/minimal effort/late/nothing) points to each, with one freebie.

Homeworks

There will be three homework assignments consisting of data analysis and reporting of multilevel regression problems using R, SPSS or the student version of the multilevel package, HLM 7 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011; Scientific Software International). The student version of HLM can be downloaded from the following internet site: <http://www.ssicentral.com/index.php/products/hml/free-downloads-hlm>. It is unlikely that you will need to refer to the manual, but much of the information is available under the help function of the package.

Homework due dates are: Late assignments are not accepted without penalty (10% per day late) except for cases of illness or family emergencies. **See reading schedule below for due dates.** Please contact me ahead of time if you are going to miss the deadline for any reason.

Grades

Grades are based on an average of the three homework assignments with total percentages assigned the following grades: $\geq 90 = A$, $85-89.9 = B+$, $80-84.9 = B$, $75-79.9 = C+$, $70-74.9 = C$.

Other Resources

There are several useful electronic links on the class website. Of particular note is a website devoted to multilevel analysis with links to software and other useful information is at <http://www.cmm.bristol.ac.uk/links/index.shtml>. I also suggest that you subscribe to the multilevel listserv at: <http://www.bristol.ac.uk/cmm/learning/support/jisc.html> (a digest format is available). A great deal can be learned from seeing questions and answers from other researchers wrestling with multilevel analysis issues.

Sexual Harrassment, Sexual Violence, and Discrimination

As an instructor, one of my responsibilities is to help create a safe learning environment for my students and for the campus as a whole. Please be aware that as a faculty member, I have the responsibility to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination. If you would rather share information about sexual harassment, sexual violence or discrimination to a confidential employee who does not have this reporting responsibility, you can find a list of those individuals or contact a confidential advocate at 503-725-5672. For more information about Title IX please complete the required student module Creating a Safe Campus in your D2L.

Disabilities

I am happy to make any necessary arrangements with students who have a disability and are in need of academic accommodations. If you have not done so already, please contact the Disability Resource Center, 116 Smith Memorial Student Union, <http://www.pdx.edu/drc/>, Email: drc@pdx.edu, for assistance and any testing arrangements. I would appreciate it if you would check with me as soon as possible to discuss any needed accommodations and to make sure that I have received a faculty notification letter. If any aspects of instruction or course design result in barriers to your inclusion or learning, please let me know.

Course Readings Psy 526/626 Multilevel Regression, Spring 2019

All supplemental readings available online at the class website: <http://web.pdx.edu/~newsomj/mlrclass> (password protected zip file—check with me for the password)

Commentaries are due at 9 AM on Tuesday of each week (second date listed in each topic section below)

Book Sources: **S & B** = Snijders & Bosker text. **Singer & Willett**, (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press. **Kreft, I., & de Leeuw, J.** (1998). *Introducing multilevel modeling*. London: Sage. **Hox, J.** (2010). *Multilevel analysis: Techniques and applications, second edition*. New York: Routledge.

4/4,4/9 Regression Review & Overview of Multilevel Regression

- S & B, Chapter 1 & Chapter 2.

- Kreft & de Leeuw, pp. 1-8

Optional: • Chapter 2, "Simple linear regression and correlation," Pedhazur, E.J. (1997). *Multiple regression in behavioral research: Explanation and prediction (3rd Edition)*. Fort Worth, TX: Harcourt Brace.

Optional: Chapter 5, "Elements of multiple regression analysis: Two independent variables" in Pedhazur, E.J. (1997). *Multiple regression in behavioral research: Explanation and prediction (3rd Edition)*. Fort Worth, TX: Harcourt Brace.

4/11,4/16 Random vs. Fixed Coefficients, Random Intercept Models, Intraclass Correlation Coefficient

- Kreft & de Leeuw, pp. 10-12.

- S & B, Chapter 4, Sections 4.1 - 4.5 and Section 4.9 only. (*Optional: Chapter 3*).

- From Hays, W.L. (1973). *Statistics for the social sciences*. New York: Holt, Rinehart, & Winston. (pp.535-536). (ICC)

- From Steele, R.G.D., Torrie, J.H., & Dickey, D.A. (1997). *Principles and procedures of statistics: A biometric approach (3rd Ed.)*. Boston, MA: McGraw-Hill. (pp. 297-299). (ICC)

- *Example Article:* Beauchamp, M. R., Bray, S. R., Fielding, A., & Eys, M. A. (2005). A multilevel investigation of the relationship between role ambiguity and role efficacy in sport. *Psychology of Sport and Exercise*, 6, 289-302.

4/18,4/23 Full Multilevel Regression Models, Part I: Varying Slopes, Hypothesis Tests, Explained Variance, Model Building

- S & B, Chapter 5, except Sections 5.2 and 5.3.1, Chapter 6.

- Roberts, K.J., Monaco, J.P., Stovall, H., & Foster, V. (2011). Explained variance in multilevel models (pp.219-230). In J.J. Hox & J.K. Roberts (Eds.), *Handbook of Advanced Multilevel Analysis*. New York: Routledge.

4/25,4/30 Full Multilevel Regression Models, Part II: Cross-level Interactions & Centering

- S & B, Chapter 5, Section 5.2 only (cross-level interactions)

- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics*, 31, 437-448. (*Optional section: Interactions in LCA*)

- S & B, Chapter 4, Section 4.6 only, Chapter 5, Section 5.3.1 only (centering)

- Enders, C.K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods*, 12, 121-138.

- *Example Article:* Morrison, E. W., Wheeler-Smith, S. L., & Kamdar, D. (2011). Speaking up in groups: a cross-level study of group voice climate and voice. *Journal of Applied Psychology*, 96, 183.

5/2 Homework 1 Due

5/2,5/7 Estimation Methods, Assumptions & Diagnostics

- S & B, Chapter 4, Sections 4.7 – 4.8 only (estimation).

- S & B, Chapter 10 (assumptions & diagnostics).

- Raudenbush & Bryk, pp. 266-280 (assumptions, diagnostics, remedies)

- S & B, Chapter 12, Sections 12.1 – 12.2 only (remedies).
- Bauer, D.J., & Cai, L. (2009). Consequences of unmodeled nonlinear effects in multilevel models. *Journal of Educational and Behavioral Statistics*, 34, 97–114.

5/9,5/14 Growth Curve Models, Part I: Linear Growth

- Singer & Willett, Chapter 2 & 3.
- Hox, Chapter 5, pp. 79-99
- *Example Article:* Stoddard, S.A., Zimmerman, M.A., Bauermeister, J.A. (2011). Thinking About the Future as a Way to Succeed in the Present: A Longitudinal Study of Future Orientation and Violent Behaviors Among African American Youth. *American Journal of Community Psychology*, 48, 238–246.

5/16,5/21 Growth Curve Models, Part II: Extensions of Growth Curve Models

- S&B Chapter 15
- Singer & Willett, Chapter 6.
- *Example Article:* Hindman, A.H., Cromley, J.G., Skibbe, L.E., and Miller, A.L (2011). Conventional and Piecewise Growth Modeling Techniques: Applications and Implications for Investigating Head Start Children's Early Literacy Learning. *Evaluation Review*, 35, 204 - 239.

5/23 Homework 2 Due

5/23,5/28 Binary and Noncontinuous Outcomes

- S&B Chapter 17
- Hox, Chapters 6 & 7.
- Example: Bradshaw, C. P., Mitchell, M. M., O'brennan, L. M., & Leaf, P. J. (2010). Multilevel exploration of factors contributing to the overrepresentation of black students in office disciplinary referrals. *Journal of Educational Psychology*, 102, 508.
- *Optional:* Hedeker, D. (2005). Generalized linear mixed models. In B. Everitt & D. Howell (Eds.), *Encyclopedia of Statistics in Behavioral Science*, New York: Wiley.

5/30,6/4 Missing Data, Sample Size Issues & Power

- S&B, Chapter 9 (missing data)
- Hox, Chapter 12 (sample size & power)
- S&B Chapter 11 (sample size & power)
- *Optional:* Scherbaum, C.A. & Ferreter, J.M. (2009). Estimating statistical power and required sample sizes for organizational research using multilevel modeling. *Organizational Research Methods*, 12, 347-367.

6/11 Homework 2 Due

6/6, 6/11* (No class—finals week) Homework 3 Due 4 PM

*Tuesday, finals week