THE UNIVERSITY OF TENNESSEE
COLLEGE OF SOCIAL WORK

Applied Quantitative Research Methods: Applied Multilevel Modeling
Instructors: John G. Orme, Ph.D.
SW 665 (3 credit hours) Office: 219 Henson Hall
Fall, 2014 Phone: 974-7503
Thursday: 1:25 – 4:25 Office Hours: Thursday, 12:30-1:30
Room: Bailey, TBA e-mail: jorme@utk.edu
Instructor’s Web Page: http://www.csw.utk.edu/faculty/orme/
Teaching Assistant: Matthew J. Cuellar, MSW, Ph.D. Student/Graduate Teaching Assistant
mcuellar@utk.edu
http://www.csw.utk.edu/phd/students/cuellar.htm
John Bailey, Principal Secretary - Knoxville Campus. jbaile14@utk.edu (865) 974-6481

Prerequisites
Ability to formulate, estimate, and interpret traditional (single-level/fixed effects) linear multiple regression models with continuous dependent variables. Several courses on campus provide adequate preparation including: SW 606, SOCI 631, and STAT 538 among others.

Ph.D. Program Mission
The purpose of social work education at the doctoral level is to develop an understanding and appreciation of the scientific method so that graduates can improve and extend the knowledge base of social work practice, and inform social policy, through empirical research. Graduates of doctoral programs assume leadership roles in social work education, research, and practice.

The Ph.D. program in social work provides training in social and behavioral science research methods and the opportunity for students to apply these methods to social problems and social work practice areas. Doctoral research is directed toward developing knowledge that can be used by social work educators, practitioners, administrators, and policy makers. Graduates of the Ph.D. program are prepared to contribute to the improvement of the design and implementation of social services and to develop and disseminate social work knowledge through research and teaching.

Ph.D. Program Competencies
1. Upon completion of the UT CSW Ph.D. program, students will be able to:
2. Demonstrate expert knowledge in a focused substantive area relevant to social work.
3. Conduct independent and original scientific research that advances knowledge in a substantive area.
4. Communicate scientific findings in an effective way to a range of audiences (from lay persons to other scientists).
5. Secure funding for a substantive research agenda.
6. Teach students the knowledge, skills, and values they need to be proficient social workers in a substantive area.
Code of Conduct
It is the student’s responsibility to have read the College of Social Work Ethical Academic and Professional Conduct Code that is in the College of Social Work Ph.D. Student Handbook (www.csw.utk.edu).

The Honor Statement
An essential feature of the University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.

Ethical Guidelines
*The American Statistical Association's Ethical Guidelines* for Statistical Practice are intended to help statistics practitioners make and communicate ethical decisions. Clients, employers, researchers, policymakers, journalists, and the public should be urged to expect statistical practice to be conducted in accordance with these guidelines and to object when it is not. While learning how to apply statistical theory to problems, students should be encouraged to use these guidelines, regardless of whether their target professional specialty will be "statistician."

Employers, attorneys, and other clients of statistics practitioners have a responsibility to provide a moral environment that fosters the use of these ethical guidelines (American Statistical Association: [http://www.amstat.org/about/ethicalguidelines.cfm](http://www.amstat.org/about/ethicalguidelines.cfm)).

University Civility Statement
Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, graciousness, cordiality, affability, amiability and courteousness. Civility enhances academic freedom and integrity, and is a prerequisite to the free exchange of ideas and knowledge in the learning community. Our community consists of students, faculty, staff, alumni, and campus visitors. Community members affect each other’s well-being and have a shared interest in creating and sustaining an environment where all community members and their points of view are valued and respected. Affirming the value of each member of the university community, the campus asks that all its members adhere to the principles of civility and community adopted by the campus ([http://civility.utk.edu/](http://civility.utk.edu/))

Disability Services
If you need course adaptation or accommodations because of a documented disability or if you have emergency information to share, please contact the Office of Disability Services at 2227 Dunford Hall at 974-6087. This will ensure that you are properly registered for services.

Dimensions of Diversity
The College of Social Work and the University of Tennessee welcome and honor all people. In accordance with the U.S. Council on Social Work Education and the U.S. National Association of Social Workers, the College of Social Work defines “the dimensions of diversity as the intersectionality of multiple factors, including” age, class, color, culture, mental or physical disability, ethnicity, gender, gender expression, gender identity, immigration status, marital status, national origin, political ideology, race, religion, sex, and sexual orientation. The College values intellectual curiosity, pursuit of knowledge, and academic freedom and integrity. A person’s diverse life experiences may include oppression, poverty, marginalization, and alienation as well as privilege, power, and acclaim. The College of Social Work promotes social
justice and social change, and strives to end discrimination, oppression, poverty, and other forms of social injustice.

**Office of Information Technology (OIT)  [http://oit.utk.edu](http://oit.utk.edu)**

Phone: (865) 974-9900  
Online: help.utk.edu  
Walk-in: The Commons at Hodges Library  
Contact OIT for help with:
- Your NetID/Password  
- Your UT email account  
- Connecting to the campus network  
- Student computer support  
- Technology consults  
- Workshops  
- Computer labs  
- MyUTK  
- Online@ut (Blackboard Learn)

**Course Description**

Many research designs have nested samples. For example, pupils are nested within schools, children are nested within families, and employees are nested within agencies. In addition, in longitudinal/repeated measures designs observations over time are nested within individuals. In each of these examples, sub-units are grouped within larger units in a multilevel hierarchical structure (e.g., employees nested within agencies, or observations over time nested within individuals). Statistical models developed to analyze multilevel data are known as multilevel linear and non-linear models, hierarchical linear and non-linear models, random-effects models, random-coefficient models, and mixed effects models.

Multilevel regression models are an extension of multiple regression to multilevel data, so much of what you know about multiple regression is applicable to multilevel regression models. This course will give you a thorough conceptual understanding of linear multilevel regression models and their assumptions, and the ability to specify, test, interpret, and present the results of multilevel models. More specifically, you will learn how to use linear multilevel regression to analyze data in which individuals are nested within social contexts (e.g., employees nested within agencies). In this application individual outcomes (e.g., employee stress) are examined as a function of the social context (e.g., number of employees in each agency), individual characteristics (e.g., employee education), or the interaction between the social context and individual characteristics (e.g., interaction between agency size and employee education). In addition, you will learn how to use linear multilevel regression to examine changes in individuals over time. In this application the focus is on the pattern of change over time (e.g., increasing or decreasing employee stress), differences among individuals in the pattern of change over time (e.g., increasing stress over time for some, decreasing stress for others), or the effect of individual characteristics (e.g., education) on patterns of change over time (e.g., different patterns of change in stress over time for employees with different educational levels).

**Course Competencies**

By the completion of this course, students are expected to be able to demonstrate (through course activities, and/or assignments) how to:
1. Formulate meaningful multilevel research questions and hypotheses based on theory and previous research;
2. Specify, test, and interpret two-level multilevel regression models with continuous dependent variables;
3. Use the most recent version of the HLM (Hierarchical Linear and Nonlinear Modeling) software to estimate two-level multilevel regression models with continuous dependent variables;
4. Articulate statistical assumptions underlying multilevel models and evaluate the tenability of those assumptions for specified models using HLM and a general statistical package (e.g., SPSS).
5. Present the results of two-level multilevel regression models in a form suitable for presentation at conferences and publication in peer-reviewed journals;
6. Critically examine and interpret two-level multilevel models reported in peer-reviewed journals.

**Computer Programs**
We will use the most recent version of HLM for multilevel analyses. Note that HLM only runs on the Windows operating system. If you use a Mac computer note that virtual Windows such as VMWare on a Mac computer are not supported. On a Mac computer, the Windows operating system needs to be installed on a partition of the hard drive of the computer using Boot Camp. Or, you can use Parallels Desktop for Mac.

We will use the most recent version of SPSS for basic data management (see Field, 2013, Chapter 3 for a good overview). However, you may use other software for this purpose, if you like, but we may not be able to help you with it if problems arise. The following web site provides a wealth of information about SPSS:

[http://www.spssstools.net/](http://www.spssstools.net/). Also, following is an especially good book detailing how to use SPSS for a wide range of statistical analyses, including a chapter on multilevel linear models:


You can download a free student version of HLM and a PDF copy of the manual from [http://www.ssicentral.com/hlm/student.html](http://www.ssicentral.com/hlm/student.html). You can purchase SPSS from the computer bookstore in the University Center for a nominal fee, or you can download it free from: [https://web.dii.utk.edu/softwaredistribution/](https://web.dii.utk.edu/softwaredistribution/). You also can use HLM and SPSS directly through the following website: [https://apps.utk.edu/vpn/index.html](https://apps.utk.edu/vpn/index.html).

**Class Format**
We will teach this course in a workshop format that alternates among lectures, discussion, question-and-answer sessions, and hands-on in-class data analysis that will provide you an opportunity to apply the material discussed in class. You will need to bring a laptop to each class session with the most recent versions of HLM and SPSS installed (or the software package of your choice). More specifically, each week will include the following:
1. Review of output from previous week
2. Lecture
3. In-class activities (turned in at the end of class via dropbox)

**Required Texts**
Hox, J. J. (2010). *Multilevel analysis: Techniques and applications* (2nd ed.). New York:
Required & Optional Readings


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1 The data set discussed in this article in the class dropbox folder.


Course Materials
All course materials (e.g., data sets, Power Point presentations, class exercises, articles in pdf format) will be stored on dropbox.com in a folder accessible by the entire class. You will receive an email link that will let you access these materials. Download all of these materials to your computer and use them from your computer, not from dropbox.

Class Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course overview; Review of linear multiple regression; Discussion of data sets for projects</td>
<td>Field (2013), Chapter 8</td>
</tr>
<tr>
<td>2</td>
<td>Introduction to and rationale for multilevel models; Preparing, structuring, and pre-screening data for two-level linear models with individuals nested within social contexts</td>
<td>Hox (2010), Chapter 1, Appendix A, B &amp; C; Rabe-Hesketh &amp; Skrondal (2012, pp. 1-8)</td>
</tr>
<tr>
<td>3</td>
<td>Two-level linear models with individuals nested within social contexts: Introduction to the HLM software and notation, and estimation and interpretation</td>
<td>Hox (2010), Appendix A, B &amp; C; Field (2013, pp. 814-849), Chapter 20; Snijders &amp; Bosker (2012), Chapter 2; Garner &amp; Raudenbush (1991); Diez Roux (2002) (Useful reference throughout the course)</td>
</tr>
</tbody>
</table>
of the “null” model and the unconditional intraclass correlation coefficient

Please Read: Hox (2010, pp. 11-23), Chapter 2; Garson (2013, pp. 55-67), Chapter 3


Week 4  Topic: Two-level linear models with individuals nested within social contexts:
9/10 Random intercepts and slopes without level-2 covariates (i.e., random coefficient regression models)
Please Read: Garson (2013, pp. 67-72), Chapter 3; Palardy (2013)
Optional Readings: Video showing how to analyze the “popularity” data used Hox, Chapter 2 (http://jeroenooms.github.com/multilevel/)

Week 5  Topic: Two-level linear models with individuals nested within social contexts:
9/17 Random intercepts and slopes with level-2 covariates (i.e., intercepts-and-slopes-as-outcomes models)
Please Read: Hox (2010), Chapters 2 (pp. 36-39) & 3; Garson (2013, pp. 72-81), Chapter 3;
Optional Readings: Baer et al. (2009); Aguinis et al. (2013)

Week 6  Topic: Two-level linear models with individuals nested within social contexts:
9/24 Estimation methods, assumptions, and diagnostics
Please Read: Hox (2010), Chapters 2 (pp. 23-32), 3 & 4; HLM7 Manual (2011), Chapter 2 (pp. 35-43)
Optional Readings: McCoach & Black (2008); Snijders & Bosker (2012), Chapter 2

Week 7  Topic: Presentations of two-level linear models with individuals nested within social contexts
10/1 Discipline specific cross sectional article due

Week 8  Topic: Two-level linear longitudinal models: Introduction & preparing, structuring, and pre-screening data for two-level longitudinal models
10/8 Paper due for two-level linear models with individuals nested within social contexts
Please Read: Singer & Willett (2003), Chapters 1 & 2
Optional Readings: Heck et al. (2014), Chapter 2; Bickman et al. (2002); Bolger, N., & Laurenceau (2013), Chapters 3 & 4; restructuring in SPSS (https://www.youtube.com/watch?v=-GNRFeHAVy0)

10/15 FALL BREAK

Week 9  Topic: Two-level linear longitudinal models: Random intercepts and slopes without level-2 covariates (i.e., random coefficient regression models)
10/22 Please Read: Hox (2010), Chapter 5; Singer & Willett (2003), Chapter 3
Optional Readings: Field (2013, pp. 849-866), Chapter 20; Singer & Willett video and accompanying handout (http://gseacademic.harvard.edu/lda/Video.htm); Hauser-Cram et al. (1999)

Week 10 Topic: Two-level linear longitudinal models: Random intercepts and slopes with level-2 covariates (i.e., intercepts-and-slopes-as-outcomes models)
10/29 Please Read: Singer & Willett (2003), Chapter 4
Optional Readings: Kutner et al. (2005): Singer & Willett video and accompanying handout (http://gseacademic.harvard.edu/alda/Videos.htm)

Week 11  Topic: Two-level linear longitudinal models: Estimation methods, assumptions, and diagnostics
Please Read: Kwok et al. (2008)
Optional Readings: Hox (2011); Heck et al. (2014), Chapter 5

11/12  NO CLASS

Week 12  Topic: Multilevel longitudinal analysis presentations
11/19  Discipline specific longitudinal article due
11/26  THANKSGIVING
12/3  Multilevel longitudinal analysis paper due

Course Requirements
There will be in-class assignments every week. These assignments are progressive. Thus, for the most part it is difficult to do the later assignments without mastering the skills involved in the early ones. If for some reason you need to miss a class, you still need to complete the in-class assignments. Please try your best to avoid missing class.

The instructor will create a dropbox folder for you and “invite” you to this folder. You should submit your assignments by saving them to this folder.

If you need extra time for an assignment due to a medical or personal emergency you should consult the instructor in advance, if at all possible. However, an extension is not automatic and there may be a grade penalty.

Journal Articles
Identify, read, and share with instructor one recent (no older than 10 years) article from your discipline in which multilevel modeling was used to analyze cross-sectional data and one article in which multilevel modeling was used to analyze longitudinal data. The instructor will create a dropbox folder for you and “invite” you to this folder. You should submit your articles by saving them to this folder.

Individuals within Contexts Paper
This assignment will let you use the skills you have learned throughout the first half of the class to analyze and write up results of a linear model for individuals within social contexts in the style of a journal article. You may work individually or with one other student on this paper. You will be assigned a number grade from 0 to 100 on this paper.

You should submit a brief proposal for this project by the second week of class. This proposal should specify your data set; level-1 covariates; level-2 covariates; outcome variable; sample size (at level-1 and level-2); and study design (e.g., survey, experimental).

You can use your own data set, you can locate and use a secondary data set, or you can select and use one of the data sets we will provide in the course materials. The data set should include at least (a) one quantitative level-1 dependent variable, (b) one level-1 independent variable, and (c) one level-2 independent variable. You should use this data set for your in-class assignments for the first half of the semester, and this will let you make gradual progress on this paper throughout the semester.
You should write this paper as if the introduction, literature review, and theory sections have already been written. Aside from these missing elements, though, you should structure your paper using the Journal Article Reporting Standards outlined in the sixth edition of the Publication Manual of the American Psychological Association (2010, pp. 247-248) and, more generally, you should use APA style (However, we recognize that you may not have all of the relevant information outlined in the Journal Article Reporting Standards, depending on your data set.). More specifically, follow the recommendations in Ferron et al. (2008) in terms of what to report and how to report information about multilevel models. In particular, include the following:

- Specify your research questions, and briefly discuss the rationale for using multilevel linear analysis
- Note the data set used and the source of the data set
- Describe essential characteristics of the research design (e.g., use of experimental manipulation of variables, use of longitudinal data collection) and sampling strategy (e.g., probability sampling, sampling weights) (You will know more about these for some data sets than for others.)
- Report sample size(s) at each level
- Report appropriate univariate descriptive information about the variables under investigation (e.g., means, standard deviations, skew, kurtosis)
- Describe patterns of missing data at each level, discuss the method used to handle missing data, and speculate about the degree to which missing data influenced the results
- Describe and define variables used in the analyses, including how categorical variables were coded (e.g., dummy coding, values assigned to categories); if and how quantitative explanatory variables were centered (e.g., grand- or group-mean centered) or otherwise scaled (e.g., converted to standard scores); procedures used to form aggregate level-two variables (e.g., averages computed within classes); and level(s) at which variables were measured in the multilevel models (e.g., level-1, level-2)
- Note the software used for the analyses, including the version used
- Specify the statistical model(s) tested in words and equations, including the fully unconditional model used to determine the ICC
- Explore and discuss the integrity of the model(s) tested (e.g., outliers, viability of distributional assumptions, multicollinearity, fit indices), and report information concerning problems with statistical assumptions that might influence the results
- Report the estimation method used (e.g., ML, REML), methods used to construct confidence intervals, and problems encountered in model estimation
- Report and interpret the intraclass correlation coefficient (ICC)
- Report and interpret all estimated parameters for each model reported, and make liberal use of tables and graphs to assist in interpretation of results (See Ferron et al. for more details about this)
- Report estimates of explained variance
- Include a conclusion summarizing your findings and linking them to your research questions

Finally, submit key relevant computer output with your paper.

Note: If you would like to write a complete manuscript for submission to a journal we will be more than glad to work with you to develop your manuscript and give you feedback on it.
**Multilevel Individuals within Contexts Presentation**

This assignment will give you practice in presenting results of a multilevel linear model with individuals within social contexts in a conference format. For this assignment you should do a brief (15-20 minutes) Power Point presentation, with handouts as appropriate, based on your multilevel individuals within social contexts analysis paper. The style and tone of the presentation is a professional conference presentation at a major national conference. (We encourage students to consider submitting their projects—or some variant thereof—to professional conferences in their discipline whenever appropriate.) Consult the following web sites for information about what does and does not make a good presentation:


**Multilevel Longitudinal Analysis Paper**

This assignment will let you use the skills you have learned throughout the second half of the class to analyze and write up results of longitudinal multilevel linear model in the style of a journal article. You may work individually or with one other student on this paper. You will be assigned a number grade from 0 to 100 on this paper.

You should submit a brief proposal for this project no later than the seventh week of class. This proposal should specify your data set; number of study participants and number of observations over time; level-2 covariates; outcome variable; and study design (e.g., survey, experimental).

You can use your own data set, you can locate and use a secondary data set, or you can select and use one of the data sets we will provide in the course materials. The data set should include at least (a) one quantitative level-1 dependent variable measured on at least three occasions for the same group of people, (b) one level-2 independent variable, and (c) one level-2 independent variable. You should use this data set for your in-class assignments for the second half of the semester, and this will let you make gradual progress on this paper throughout the second half of the semester.

You should write this paper as if the introduction, literature review, and theory sections have already been written. Aside from these missing elements, though, you should structure your paper using the Journal Article Reporting Standards outlined in the sixth edition of the Publication Manual of the American Psychological Association (2010, pp. 247-248) and, more generally, you should use APA style (However, we recognize that you may not have all of the relevant information outlined in the Journal Article Reporting Standards, depending on your data set.). More specifically, follow the recommendations in Ferron et al. (2008) in terms of what to report and how to report information about multilevel models. In particular, include the following:

- Specify your research questions, and briefly discuss the rationale for using multilevel linear analysis
- Note the data set used and the source of the data set
- Describe essential characteristics of the research design (e.g., use of experimental manipulation of variables, use of longitudinal data collection) and sampling strategy (e.g., probability sampling, sampling weights) (You will know more about these for some data sets than for others.)
- Report sample size(s) at each level
Report appropriate univariate descriptive information about the variables under investigation (e.g., means, standard deviations, skew, kurtosis)

Describe patterns of missing data at each level, discuss the method used to handle missing data, and speculate about the degree to which missing data influenced the results

Describe and define variables used in the analyses, including how categorical variables were coded (e.g., dummy coding, values assigned to categories); if and how quantitative explanatory variables were centered (e.g., grand- or group-mean centered) or otherwise scaled (e.g., converted to standard scores); procedures used to form aggregate level-two variables (e.g., averages computed within classes); and level(s) at which variables were measured in the multilevel models (e.g., level-1, level-2)

Note the software used for the analyses, including the version used

Specify the statistical model(s) tested in words and equations, including the fully unconditional model used to determine the ICC

Consider whether change is linear or takes some non-linear form (e.g., quadratic)

Explore and discuss the integrity of the model(s) tested (e.g., outliers, viability of distributional assumptions, multicollinearity, fit indices), and report information concerning problems with statistical assumptions that might influence the results

Report the estimation method used (e.g., ML, REML), methods used to construct confidence intervals, and problems encountered in model estimation

Report and interpret the intraclass correlation coefficient (ICC)

Report and interpret all estimated parameters for each model reported, and make liberal use of tables and graphs to assist in interpretation of results (See Ferron et al. for more details about this)

Report estimates of explained variance

Include a conclusion summarizing your findings and linking them to your research questions

Finally, submit key relevant computer output with your paper.

Note: If you would like to write a complete manuscript for submission to a journal we will be more than glad to work with you to develop your manuscript and give you feedback on it.

Multilevel Longitudinal Analysis Presentation
This assignment will give you practice in presenting results of a longitudinal multilevel linear model in a conference format. For this assignment you should do a brief (15-20 minutes) Power Point presentation, with handouts as appropriate, based on your longitudinal multilevel analysis paper. The style and tone of the presentation is a professional conference presentation at a major national conference. (We encourage students to consider submitting their projects—or some variant thereof—to professional conferences in their disciplines whenever appropriate.) Again, consult the following web sites for information about what does and does not make a good presentation, and take into consideration feedback on your first presentation:


In-Class Exercises
Each week you will be asked to do an in-class computer exercise which corresponds to the topic discussed in class that week. Everyone will use the same data set for these exercises. At the end of class each week you will be required to save your results to your personal dropbox folder. You
will be asked to re-do the assignment if it is not completed fully and correctly. Each assignment will be graded on a Pass/Fail (i.e., 100/0) basis.

Each week you will be asked to do an in-class computer exercise which corresponds to the topic discussed and the exercise completed in class that week. You should use the data set you selected for your paper for these exercises (i.e., in the first half of the semester the data set you selected for the multilevel individuals within social contexts paper, and in the second half the data set you selected for the multilevel longitudinal analysis paper). At the end of class each week you will be required to save your results to your personal dropbox folder. You will be asked to re-do the assignment if it is not completed fully and correctly. Each assignment will be graded on a Pass/Fail (i.e., 100/0) basis.

Class Participation
In addition to the assignments listed above, you are expected to read 100% of the assigned reading material and to come to each class prepared to discuss the readings and out-of-class exercises (e.g., ask and answer relevant questions). It is important that you do the assigned readings before class so you are prepared to discuss the readings in class.

The Course Grade will be Computed as Follows:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-class assignments</td>
<td>25%</td>
</tr>
<tr>
<td>Journal articles</td>
<td>5%</td>
</tr>
<tr>
<td>Individuals within contexts paper</td>
<td>20%</td>
</tr>
<tr>
<td>Individuals within contexts presentation</td>
<td>15%</td>
</tr>
<tr>
<td>Multilevel longitudinal analysis paper</td>
<td>20%</td>
</tr>
<tr>
<td>Multilevel longitudinal analysis presentation</td>
<td>15%</td>
</tr>
</tbody>
</table>

The Grading Scale is:
Final grades will be assigned as follows:
A    = 94 - 100
B+   = 89 - 93
B    = 84 - 88
C+   = 79 - 83
C    = 72 - 78
D    = 62 - 71

Multilevel Modeling Resources

Discussion Group
• [http://www.nursing.teaching.man.ac.uk/staff/mcampbell/multilevel.html](http://www.nursing.teaching.man.ac.uk/staff/mcampbell/multilevel.html)

Software Reviews
• [http://www.cmm.bristol.ac.uk/learning-training/multilevel-m-software/index.shtml](http://www.cmm.bristol.ac.uk/learning-training/multilevel-m-software/index.shtml)
  [http://www.stats.ox.ac.uk/~snijders/mlbook.htm](http://www.stats.ox.ac.uk/~snijders/mlbook.htm)


**Data Sets (Also, see websites for books listed below)**

• UCLA Academic Technology Services  
  [http://www.ats.ucla.edu/stat/hlm/examples/ald/default.htm](http://www.ats.ucla.edu/stat/hlm/examples/ald/default.htm)

• Niall Bolger & Jean-Phillippe Laurenceau  

• Natalia Sarkisian  
  [http://www.sarkisian.net/](http://www.sarkisian.net/)

• Jason Newsom  
  [http://www.upa.pdx.edu/IOA/newsom/](http://www.upa.pdx.edu/IOA/newsom/)

• John Painter  
  [http://www.unc.edu/~painter/](http://www.unc.edu/~painter/)

• Don Hedeker  
  [http://tigger.uic.edu/~hedeker/](http://tigger.uic.edu/~hedeker/)

**Websites**

• Mplus Homepage  

• University of Bristol, Centre for Multilevel Modelling  
  [http://www.bristol.ac.uk/cmm/](http://www.bristol.ac.uk/cmm/) &  
  [http://www.cmm.bristol.ac.uk/links/index.shtml](http://www.cmm.bristol.ac.uk/links/index.shtml)

• UCLA Academic Technology Services  
  [http://www.ats.ucla.edu/stat/hlm/examples/ald/default.htm](http://www.ats.ucla.edu/stat/hlm/examples/ald/default.htm)

• Lesa Hoffman  
  [http://www.lesahoffman.com/Courses.html](http://www.lesahoffman.com/Courses.html)

• Natalia Sarkisian  
  [http://www.sarkisian.net/](http://www.sarkisian.net/)

• Jason Newsom  
  [http://www.upa.pdx.edu/IOA/newsom/](http://www.upa.pdx.edu/IOA/newsom/)

• John Painter  
  [http://www.unc.edu/~painter/](http://www.unc.edu/~painter/)

• Kristopher J. Preacher  
  [http://www.quantpsy.org/interact/](http://www.quantpsy.org/interact/)

**Statistical Power Analysis Software**

  [http://sitemaker.umich.edu/group-based/optimal_design_software](http://sitemaker.umich.edu/group-based/optimal_design_software)  
  [http://www.healthstats.org/rmass/](http://www.healthstats.org/rmass/)  
  [http://crt-power.com/](http://crt-power.com/)

**Classes, Workshops, Video, Audio**

• Hox Book  

• University of Bristol, Centre for Multilevel Modelling  
  [http://www.bristol.ac.uk/cmm/learning/course-topics.html](http://www.bristol.ac.uk/cmm/learning/course-topics.html)

• Center for Rehabilitation Research using Large Datasets  
  [http://rehabsciences.utmb.edu/r24/module_nestedData.asp](http://rehabsciences.utmb.edu/r24/module_nestedData.asp)

• Lesa Hoffman  
  [http://www.lesahoffman.com/Courses.html](http://www.lesahoffman.com/Courses.html)
Selected Overview/Tutorial Articles/Chapters

Selected Articles with Cross-Sectional Applications

2 Data sets illustrated in Cohen et al. (2003), Kahn (2011), and Kahn and Schneider (2013) are in the class dropbox folder.


**Selected Articles with Longitudinal Applications**


**Selected Books/Associated Websites (many with data sets)**


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3 Data sets from the following are in the class dropbox folder: Bolger & Laurenceau; Cohen et al.; Heck et al.; Hox; Rabe-Hesketh & Skrondal; Raudenbush et al.; Snijders & Bosker; West et al.


Tables
The following web site and book provide valuable information about creating tables in APA style:


National Council on Family Relations: http://oregonstate.edu/~acock/tables/

Graphs and Other Figures
The following book provides valuable information about creating graphs and other types of figures in APA style:


Public Use Data Sets
The Inter-University Consortium for Political and Social Research (ICPSR) has a very rich array of data sets that you can use. The UT ICPSR website is:

http://www.lib.utk.edu/refs/data/icpsr.html

4 Here is a little hint about constructing tables. Centering columns on the decimal point is usually preferred. This can be done in Word using the decimal tab. Simply follow the following directions for each column (http://oregonstate.edu/~acock/tables/).

1. Show the ruler below the toolbars on the top of your screen in your Word document.
2. Identify the left tab symbol on the extreme left of the ruler. It looks like an L.
3. Click on this symbol three times. You will be scrolling through various tabs. The 3rd time, the decimal tab will be visible. It looks like an upside-down T with a dot on the right hand side.
4. Highlight the entire column of your table.
5. Click the location in the ruler that reflects where you want the decimal for that column to be.
6. That’s it. Unless you already have other tabs active in that column or have used the center text command, all numbers should be aligned at the decimal around that point.
Eleanor (“Ellie) Read, the UT Social Science Data Services Librarian, can help you access the ICPSR data sets and many more existing data sets that might be of interest. Ms. Read can be contacted at:

Phone: (865) 974-0011  
Fax: (865) 974-9242  
E-mail: eread@utk.edu

The following websites also have numerous public use data sets that you can use:

**World Health Organization**  
[http://www.who.int/research/en/](http://www.who.int/research/en/)

**CDC Wide-ranging OnLine Data for Epidemiological Research**  

**FedStats**  

**Centers for Disease Control and Prevention Public-Use Data Files**  
[http://www.cdc.gov/nchs/data_access/ftpdata.htm](http://www.cdc.gov/nchs/data_access/ftpdata.htm)

**United States Department of Health and Human Services**  

**Substance Abuse & Mental Health Data Archive**  
[http://www.icpsr.umich.edu/SAMHDA/](http://www.icpsr.umich.edu/SAMHDA/)

**Data.gov**  

**National Center for Education Statistics**  

**Roper Center for Public Opinion Research**  
[http://www.ropercenter.uconn.edu/data_access.html](http://www.ropercenter.uconn.edu/data_access.html)

**The Data and Story Library**  
[http://lib.stat.cmu.edu/DASL/DataArchive.html](http://lib.stat.cmu.edu/DASL/DataArchive.html)

**Carnegie Mellon University StatLib**  
[http://lib.stat.cmu.edu/datasets/](http://lib.stat.cmu.edu/datasets/)

**Henry A. Murray Research Archive**  
[http://www.murray.harvard.edu/frontpage](http://www.murray.harvard.edu/frontpage)

**Sociometrics Data Archives**  
[http://www.socio.com/dataarchives.htm](http://www.socio.com/dataarchives.htm)

**National Data Archive on Child Abuse and Neglect**  
[http://www.ndacan.cornell.edu/NDACAN/AboutNDACAN.html](http://www.ndacan.cornell.edu/NDACAN/AboutNDACAN.html)

**Center for AIDS Prevention Studies**  
[http://www.caps.ucsf.edu/tools/data/VCT/](http://www.caps.ucsf.edu/tools/data/VCT/)

**TheDataWeb**  
[http://www.thedataweb.org/datasets.html](http://www.thedataweb.org/datasets.html)
Rice Virtual Lab in Statistics  

Dr. Karl L. Wuensch’s SPSS-Data Page  
http://core.ecu.edu/psyc/wuenschk/SPSS/SPSS-Data.htm

Project on Human Development in Chicago Neighborhoods  
http://dvn.iq.harvard.edu/dvn/dv/mra/faces/study/StudyPage.xhtml?studyId=307&studyListingIndex=1_7f5088797bc253a292ee18fd7b70&rvn=2

Health Information and Trends Survey (HINTS): How Americans Find and Use Cancer Information  
http://hints.cancer.gov/dataset.jsp

National Survey of Children’s Health  
http://nschdata.org/Content/Default.aspx

National Survey of Children with Special Health Care Needs  
http://cshendata.org/Content/Default.aspx

The National Longitudinal Study of Adolescent Health (Add Health)  
http://www.cpc.unc.edu/projects/addhealth

National Ambulatory Medical Care Survey  
http://www.cdc.gov/nchs/ahcd.htm

National Hospital Discharge Survey  
http://www.cdc.gov/nchs/ahcd.htm

National Nursing Home Survey  
http://www.cdc.gov/nchs/nnhs.htm

National Immunization Survey  
http://www.cdc.gov/nis/datafiles.htm

Surveillance Epidemiology and End Results Program  
http://seer.cancer.gov/data/options.html

Behavioral Risk Factor Surveillance System  
http://www.cdc.gov/brfss/technical_infodata/surveydata.htm

Youth Risk Behavior Surveillance System  
http://www.cdc.gov/HealthyYouth/yrbs/data/index.htm

National Health and Nutrition Examination Survey  
http://www.cdc.gov/nchs/nhanes.htm

National Health Interview Survey  
http://www.cdc.gov/nchs/nhis.htm

Joint Canada/United States Survey of Health  
http://www.cdc.gov/nchs/nhis/jcush.htm

Longitudinal Studies of Aging  
http://www.cdc.gov/nchs/lsoa.htm

State and Local Area Integrated Telephone Survey
http://www.cdc.gov/nchs/slaits.htm

National Vital Statistics System
http://www.cdc.gov/nchs/nvss.htm

National Maternal and Infant Health Survey
http://www.cdc.gov/nchs/nvss/nmihs.htm

Panel Study of Family Dynamics
http://psidonline.isr.umich.edu/default.aspx
Multiple sub-studies/ data sets:
http://psidonline.isr.umich.edu/Studies.aspx

Secondary Data Analysis
The following books are good sources for the secondary data analysis:

