A. Overview of Course

This seminar is a hands-on introduction to multilevel modeling (MLM) (also known as hierarchical linear (HLM) modeling, random effects models, growth curve modeling, mixed models, etc.). The statistical approaches addressed in this class deal with data collected from “nested” units, or data in which some set of clustering agents have been used. Data that have this nested or clustered format require different statistical methods than those taught in other courses because they violate the independence of observations assumptions of OLS and other regression models. Nested data can include multiple people within the same family, multiple students within the same classroom or school, multiple residents within the same neighborhood, multiple respondents within the same interviewer, multiple people within the same country, or multiple observations over time within the same person. There is no “one size fits all” multilevel model; theory, research questions, and data structure will guide the selection of a multilevel model (as it does in non-nested data). Although you may use any software you wish to complete this course, I will provide code and examples using SAS and Stata. As such, familiarity with conducting statistical analyses in a syntax-based statistical software program (e.g., SAS, Stata) is highly recommended before taking this course.

B. Goals of the Course

1. Identify common types of data and research questions that require a multilevel analysis.
2. Read and evaluate studies that use multilevel models
3. Construct research questions that are appropriately addressed with multilevel models
4. Complete a research product that uses multilevel models
5. Make statistical writings using multilevel models more accessible and understandable.
6. Communicate findings from analyses of multilevel data in written and verbal presentation.

C. Format of the Course

The course will be comprised of readings, lectures and discussion. Students are expected to come to class with questions on assigned readings.

It is understood by the instructor that students in this course will vary in their statistics background, exposure to mathematical statistics, and other courses in statistical analysis. As such, the assigned readings are technical, but selected to be readable with the tools from this course.
D. Homework Assignments

This class will consist of participation, weekly discussion board postings, homework assignments and a final project with assignments throughout the semester.

Homework assignments and paper assignments will be given on alternating weeks, starting with the second week of class. Each assignment will be due the following Friday by the beginning of class. Late assignments will be deducted by one letter grade for each day that they are late. Because there will be homework or a paper assignment each week, no extensions will be given on homework assignments except for excused absences. Late assignments will be deducted by 10 points for each day that they are late. Assignments handed in on Friday after class will be considered one day late, on Saturday will be considered two days late, and so on. All assignments that are not received within five business days (by the end of the day on Friday) will receive a grade of zero. Details on each assignment will be given during class and/or posted on Canvas.

The homework assignments will focus on application of the methods discussed in class to actual data sets. They are designed to acquaint you with the methods and software for each topic of the course.

Homework assignments must be typed. Students are required to use equation editors for accurate notation. All work and final answers must be neat and clearly labeled. All answers in which more than one answer is provided or the final answer is ambiguous will be marked as incorrect. All assignments must be handed in via Canvas to the instructor at the beginning of class, unless otherwise noted. Homework assignments will be graded on a three-point scale, ✓+, ✓, and ✓-, corresponding to 100, 90 and 80 points, respectively. Although study groups are permitted to facilitate understanding the material, all students are required to turn in their own homework assignments. Copying another student’s homework or handing in another student’s homework as your own (including with minor changes) is considered cheating, per the UNL Student Code of Conduct (http://stuafs.unl.edu/dos/code#rules).

This class requires students to write statistical findings for a scientific audience. Students who need writing assistance are encouraged to visit the UNL writing center: http://www.unl.edu/writing/.

E. Paper Assignments and Final Project

The final project will be a piece of empirical research conducted using a data set of your choice, applying the methods discussed here. The data must have a multilevel data structure; what kind of multilevel data structure is selected will vary across projects. The final paper may be substantive or methodological in nature. Students may work in pairs to complete this course paper; students will be asked to grade their teammate at the end of the semester. Students are strongly encouraged to meet with Dr. Olson to discuss their topics and datasets.

To assist in writing the paper, there are intermediate deadlines throughout the term for portions of the paper. Paper assignments will be graded using letter grades (e.g., A+, A, A-). The following scores will be assigned to each letter grade:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Numeric Score</th>
<th>Letter Grade</th>
<th>Numeric Score</th>
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<tbody>
<tr>
<td>A+</td>
<td>100</td>
<td>C</td>
<td>71</td>
</tr>
<tr>
<td>A</td>
<td>95</td>
<td>C-</td>
<td>68</td>
</tr>
<tr>
<td>A-</td>
<td>91</td>
<td>D+</td>
<td>65</td>
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<tr>
<td>B+</td>
<td>88</td>
<td>D</td>
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<td>B</td>
<td>85</td>
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<tr>
<td>B-</td>
<td>78</td>
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<td>0</td>
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<tr>
<td>C+</td>
<td>75</td>
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The final paper will be between 15 and 20 pages in length (excluding references), double spaced, Times New Roman 12 pt. font with 1 inch margins. All students or student teams will conduct a brief oral presentation of their papers in class. Your final presentation grade will be determined by evaluations from Dr. Olson and your classmates. More information on the paper assignments and the presentations will be distributed throughout the semester.
F. Discussion Board Postings: What’s Useful or Interesting or Confusing This Week?

Because readings for statistics courses tend to be technical, I am keeping the number of readings somewhat lighter than in other 900-level courses to allow each of you a chance to engage with the material. Before each class, please post on the discussion board the answer to two questions. Please provide the reference and page number, especially where topics are confusing. Please post by 9:00 AM on Friday mornings. Postings made on time (9:00 AM Fridays) that address the two questions below will receive 2 points. Questions that fail to answer one of the questions or are late (after 9:00 AM Fridays and before 1:00 pm on Friday) will receive 1 point. Failing to post by the 1:00 pm on Friday will receive 0 points.

1. What in the readings seems particularly useful or interesting this week?
2. What in the readings was confusing or hard to understand this week?

G. Participation

Participation in class will make the course a better experience for everyone. Given the ongoing COVID-19 pandemic, please do not come to class if you are sick, exposed to COVID-19, or otherwise not feeling well. We will be flexible and have alternative methods of participation for students who cannot attend class in person.

In the case of inclement weather, we will hold class at the scheduled time unless the University is closed. We may meet over Zoom as needed. Students are required to have completed the readings before the class meeting time. Attendance alone is not sufficient to earn a full participation grade.

H. Grading

Grades will be constituted as follows:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Homework assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Paper assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Useful/confusing postings</td>
<td>10%</td>
</tr>
<tr>
<td>Final presentation</td>
<td>20%</td>
</tr>
<tr>
<td>Final paper</td>
<td>20%</td>
</tr>
<tr>
<td>Participation</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Final grades will be assigned as follows:

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<thead>
<tr>
<th>Grade</th>
<th>Weighted Percentage</th>
<th>Grade</th>
<th>Weighted Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>100-97</td>
<td>C</td>
<td>72.9-70</td>
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<tr>
<td>A</td>
<td>96.9-93</td>
<td>C-</td>
<td>69.9-67</td>
</tr>
<tr>
<td>A-</td>
<td>92.9-90</td>
<td>D+</td>
<td>66.9-63</td>
</tr>
<tr>
<td>B+</td>
<td>89.9-87</td>
<td>D</td>
<td>62.9-60</td>
</tr>
<tr>
<td>B</td>
<td>86.9-80</td>
<td>D-</td>
<td>59.9-55</td>
</tr>
<tr>
<td>B-</td>
<td>79.9-77</td>
<td>F</td>
<td>0.0-54.9</td>
</tr>
<tr>
<td>C+</td>
<td>76.9-73</td>
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<td></td>
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</table>

I will not give extra credit and will not change grade distributions to ‘curve’ the class. Students may take the course pass/no pass. If taking the class pass/no pass, students must earn a B or better grade to earn a “pass.”

I have a 24/7 grade policy – please wait 24 hours after receiving a grade to talk to me about any concerns that you may have, and do so within 7 days of receiving the grade.

Grade appeals must be made in writing. The procedure for grade appeals is the following: (1) Provide the instructor with your grade appeal in writing, including documentation to support the claim, within two weeks of the grade being given. (2) The instructor will regrade your assignment. Grades may go up or down on regrading. (3) If you still would like to pursue a grade appeal after the regrading, provide written documentation to the Graduate Chair of the Sociology
Department. More information about grade appeals can be found here: http://cas.unl.edu/grading-appeals and http://www.unl.edu/gradstudies/bulletin/graduate-grade-appeals

I. Technology and other distractions policy

The use of cell phones is not allowed in class. Laptops or tablets for class purposes are permitted, but not for use of non-class related websites (this includes checking email or working on other courses during class). Turn off all cell phones before class starts. One accidental ring of a cell phone will be permitted per semester; after this, the student’s participation grade will have 3 points deducted for each ring, text, or other use of the phone or electronic device in class. All newspapers, magazines, or any other material other than that necessary for this class also must be put away when entering the classroom. Any student who is seen reading a newspaper, magazine, or anything not related to this class will receive an automatic 3 point deduction from his/her participation grade for each use of this material.

All students will be expected to use statistical analysis software appropriate for multilevel models. You may use any software package you choose, but our class examples will use the multilevel models procedures in SAS or Stata. We will either meet in a computer laboratory so that all students can use this type of software or in the classroom with students bringing laptops. If students have laptop computers, then students may bring these computers during hands-on ‘lab’ time. More information on this laboratory time will be distributed throughout the semester.

J. Office hours and e-mail

Office hours will be held Monday 11:00 AM-12:00 PM and Wednesday 9:00-10:00 AM at Dr. Olson’s office, 703 Oldfather Hall or via Zoom. Appointments for meetings with Dr. Olson either in person or via Zoom can be scheduled by contacting her via e-mail (kolson5@unl.edu; preferred) or before class. Please wear a face covering to in person office hours.

All e-mails from Dr. Olson to the class will be conducted through Canvas. It is your responsibility to ensure that the e-mail address in Canvas is up-to-date. It is also your responsibility to ensure that other class members who need your e-mail address have your preferred e-mail address.

K. Academic Honesty

Academic honesty is essential to the existence and integrity of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. The University's Student Code of Conduct addresses academic dishonesty. Students who commit acts of academic dishonesty are subject to disciplinary action and are granted due process and the right to appeal any decision.

Cheating and plagiarism will not be tolerated. Both cheating and plagiarism are violations of UNL’s Student Code of Conduct. Any assignment, exam, or project in which cheating or plagiarism or any other form of academic misconduct is identified will result in immediate failure of the assignment and, depending on the scope of the assignment, may result in immediate failure of the class. These acts of cheating, plagiarism, or any other violations of academic integrity will be reported to the Sociology graduate chair, Sociology department chair, and to the Office of the Dean of Students, as detailed in the UNL Sociology Graduate Handbook. The instructor reserves the right to use Turnitin or other plagiarism detection tools to help in assessing the risk of plagiarism. For information on plagiarism and what constitutes acceptable and unacceptable citations, please see the Graduate Studies website at http://www.unl.edu/gradstudies/current, https://www.unl.edu/gradstudies/current/integrity and http://www.unl.edu/gradstudies/current/integrity#plagiarism

Class notes will be placed on Canvas before each class period. Students are responsible for bringing an electronic or printed copy of the class notes to each class. The instructor will not make copies of the notes.

L. Accommodations for Students with Disabilities

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can discuss options privately. To establish reasonable accommodations, I may request that you
register with Services for Students with Disabilities (SSD). If you are eligible for services and register with their office, make arrangements with me as soon as possible to discuss your accommodations so they can be implemented in a timely manner. SSD contact information: 117 Louise Pound Hall; 402-472-3787.

M. Counseling and Psychological Services

UNL offers a variety of options to students to aid them in dealing with stress and adversity. Counseling and Psychological & Services (CAPS); is a multidisciplinary team of psychologists and counselors that works collaboratively with Nebraska students to help them explore their feelings and thoughts and learn helpful ways to improve their mental, psychological and emotional well-being when issues arise. CAPS can be reached by calling 402-472-7450. Big Red Resilience & Well-Being (BRRWB) provides one-on-one well-being coaching to any student who wants to enhance their well-being. Trained well-being coaches help students create and be grateful for positive experiences, practice resilience and self-compassion, and find support as they need it. BRRWB can be reached by calling 402-472-8770.
**Required Readings and Due Dates.** The class schedule, assignments, and readings below is subject to change. Changes will be announced in class and/or on the class web page. Not knowing about syllabus changes, including changes in assignments, because of class absence or for not checking the class Canvas website are not legitimate excuses for failure to complete the course requirements.

**Required Texts**


- This book is available for free through UNL’s library: [https://unl.primo.exlibrisgroup.com/permalink/01UON_LINC/vl6msu/alma991029894454806387](https://unl.primo.exlibrisgroup.com/permalink/01UON_LINC/vl6msu/alma991029894454806387)
- It is lighter on the formulas and heavier on the applications than many other multilevel books.
- Book’s website: [https://multilevel-analysis.sites.uu.nl/](https://multilevel-analysis.sites.uu.nl/)
- Rens van de Schoot’s website (with R code): [https://www.rensvandeschoot.com/tutorials/](https://www.rensvandeschoot.com/tutorials/)


- Tom Snijder’s webpage: [https://www.stats.ox.ac.uk/~snijders/multilevel.htm](https://www.stats.ox.ac.uk/~snijders/multilevel.htm)
- Tom Snijder’s page for the book: [https://www.stats.ox.ac.uk/~snijders/mlbook.htm](https://www.stats.ox.ac.uk/~snijders/mlbook.htm)

**Strongly Recommended Texts**


- This book is a classic. It’s worth buying. If you are planning on doing a lot with multilevel models, you should own this book.
- We will read a few chapters from this book to supplement the Hox, et al. and Snijders & Bosker volumes.

**Recommended Texts**


- This book embeds R code along with a technical/Bayesian approach to understanding multilevel models. It’s easier to understand if you have had a probability theory and math stats course. It’s a go-to book for many statistically inclined quantitative social scientists.


- This two volume set is a bit out of date, but actually still amazing if you are a Stata user.


- This book has ALL the software code. As does Brady West’s website: [http://www-personal.umich.edu/~bwest/almmussp.html](http://www-personal.umich.edu/~bwest/almmussp.html)
- The examples are not always relevant to social science, but the models and code are some of the easiest to follow. Well worth putting on a holiday or birthday list.
August 27 – Introduction, Overview, and Fundamentals (Getting to know you questionnaire)

HMS, chapter 1.

S&B, Chapters 1&2.


September 3 – Thinking hierarchically – The basic two-level random intercept model (Homework assignment 1)

HMS, chapter 2.

S&B, chapters 3&4.


September 10 – Thinking hierarchically - Random slopes & Assumptions of the multilevel model (Paper assignment 1)

HMS, Chapter 13

S&B, Chapter 5, 10


September 17 – Estimation and hypothesis testing (Homework assignment 2)

HMS, chapter 3.

S&B, Chapter 6


September 24 – Using software for estimating multilevel models (Paper assignment 2)

West, Welch and Galecki, 2015, Chapter 3

S&B, Chapter 18

October 1 – Some methodological issues; Centering, missing data (Homework assignment 3)

HMS, Chapter 4
S&B, Chapters 7, 8 and 9


October 8 – Types of data: longitudinal data (Homework assignment 4)

HMS, Chapter 5
S&B, Chapter 15


October 15 – Types of data: categorical outcomes (Paper assignment 3)

HMS, Chapters 6 and 7
S&B, Chapter 17


October 22 – Types of data: cross-classified data (Paper assignment 4)

HMS, Chapter 9
S&B, Chapter 13

October 29 – Types of data: Survey data (weights & interviewers) (Homework assignment 5)

S&B, Chapter 14


November 5 – Types of data: Dyadic analyses (Paper assignment 5)


November 12 – Sample Sizes and Power Analyses (Homework assignment 6)

HMS, Chapter 12

S&B, Chapter 11

November 19 – Wrap up; Paper workshop (Paper assignment 6)

Details will be presented in class and on Canvas

November 26 – Thanksgiving break, no class

December 3 – Closing Thoughts; Paper workshop

Details will be presented in class and on Canvas

December 10 – Final Presentations

Details will be presented in class and on Canvas

Monday, December 13, 5:00 PM – Final Project Due