Introduction to Statistics and Data Analysis II
ICPSR Summer Program, 2012
July 16th – August 9th, 3–5pm

Course Instructors:

<table>
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<tr>
<th>Home Institution</th>
<th>Lok-Sze Wong</th>
<th>Priyamvada Trivedi</th>
<th>R. Joseph Waddington</th>
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<tr>
<td></td>
<td>Instructor</td>
<td>Teaching Assistant</td>
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<tr>
<td>Office Hours</td>
<td>9am – 10am  Monday-Friday</td>
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Email
We will frequently use email to communicate with you; we encourage you to do the same with us and with others in our class. Please check your email regularly for announcements, information, and updates. We expect you to be up-to-date on all course communications when you come to class.

Course Focus and Goals
This course is an introduction to ordinary least squares (OLS) bivariate and multiple regression. It assumes familiarity with introductory statistics, probability, and data analysis. The primary goal is to develop applied and intuitive (versus theoretical or mathematical) understandings of OLS regression as a research methodology. While the content is focused on quantitative methods, you will find the knowledge and skills you gain during these four weeks also prepares you for and overlaps with research design and qualitative methodologies.

Course Work
Daily Reading: The content covered by your readings will not always be covered in class due to the amount of material we must cover in a short amount of time. However, you are still responsible for knowing the content because it is fundamental to your ability to use regression analysis well. Be sure to complete readings prior to class and clarify with us any questions you have immediately.

Daily Meetings: Lectures and class work will complement readings, including covering material not in your readings. In addition, a large portion of time will be spent analyzing
real social science data. Be ready to participate and wrestle with a great deal of new information.

*Weekly Lab Sessions:* Labs will provide you the opportunity to further master course content and receive guidance on homework. They are also opportunities to become familiar with using statistical software to analyze your data.

*Homework:* We will assign daily a set of practice problems to assist you with mastering regression analysis. These can serve as material for discussion the following day.

In addition, you have four more substantial assignments, which are graded. Expect these to extend the work we’ve completed to that point, and expect them to build on each other.

Some homework requires use of statistical software. Make sure you schedule the time you need to access the software (ICPSR has two computer labs for your use; UM students/staff/faculty have access to virtualsites.umich.edu) and to complete assignments.

**Homework requirements:**
- Typed, organized, and stapled
- Present exercises in numerical order
- Show all of your work so we can provide partial credit for your work
- Clearly label answers
- Embed visuals and SPSS output within the exercises, not as attachments
- Answer the entire prompt. For example, when we ask you to “interpret” your answer or “explain” some condition of the exercise, please do so.

**Required Books**

The books will be available at Ulrich’s Bookstore:
549 E. University Ave
[www.ulrichs.com](http://www.ulrichs.com)
(734) 662-3201
They are also available for purchase online (amazon.com, etc.).

**Grading**
Your grade for this course is based on four weekly assignments. They will become progressively more difficult. Thus, the weighted value will increase with each assignment:
- 1st Assignment = 15%
- 2nd Assignment = 20%
- 3rd Assignment = 30%
- 4th Assignment = 35%
### Schedule (to be adapted as needed)

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<th><strong>WEEK ONE</strong></th>
<th><strong>TOPICS</strong></th>
<th><strong>WORK DUE</strong></th>
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| **Day 1: Monday, July 16th** | o Introductions  
 o Overview/Review of Bivariate Regression | ✓ Read the Syllabus and Ask any questions you have  
 ✓ Read Agresti & Franklin - Chapter 3, Sections 2 & 3 |
| **Day 2: Tuesday, July 17th** | o The Building Blocks of Bivariate Regression | ✓ Read Agresti & Franklin - Chapter 3, Section 4 and Chapter 12, Section 1  
 ✓ Read Lewis-Beck – pg. 9-20 |
| **Day 3: Wednesday, July 18th** | o Describing the Strength of an Association: $r$ and $r^2$ | ✓ Read Agresti & Franklin - Chapter 12, Section 2  
 ✓ Read Lewis-Beck – pg. 20-25  
 ✓ Assignment #1 distributed |
| **Day 4: Thursday, July 19th** | o Applying What We’ve Learned So Far | ✓ Review all of your notes  
 ✓ Reread anything that still doesn’t make sense  
 ✓ Assignment #1 distributed |
| **Day 5: Friday, July 20th** | o Making Inferences about an Association: Confidence Intervals and Significance/Hypothesis Tests | ✓ Read Agresti & Franklin - Chapter 12, Section 3  
 ✓ Read Lewis-Beck – pg. 26-37 |
| **WEEK TWO** | **TOPICS** | **WORK DUE** |
| **Day 6: Monday, July 23rd** | o Residuals, Residuals, Residuals | ✓ Read Agresti & Franklin - Chapter 12, Section 4  
 ✓ Read Lewis-Beck – pg. 37-43  
 ✓ Assignment #1 due at the beginning of class |
| **Day 7: Tuesday, July 24th** | o Applying What We’ve Learned So Far | ✓ Review all of your notes  
 ✓ Reread anything that still doesn’t make sense  
 ✓ Assignment #2 distributed |
| **Day 8: Wednesday, July 25th** | o What if the Relationship Isn’t Linear?: Transformations | ✓ Read Lewis-Beck – pg. 43-47  
 ✓ Read Agresti & Franklin - Chapter 12, Section 5 |
| **Day 9: Thursday, July 26th** | o Applying and Extending What We’ve Learned So Far | ✓ Review all of your notes  
 ✓ Reread anything that still doesn’t make sense |
| **Day 10: Friday, July 27th** | o Multiple Regression! (a.k.a. The Model You Will Use in Real Life) | ✓ Read Agresti & Franklin - Chapter 13, Sections 1 & 2  
 ✓ Read Lewis-Beck – pg. 47-51 and 52-53 |
| Day 11: Monday, July 30<sup>th</sup> | Using Multiple Regression to Make Inferences | ✓ Read Agresti & Franklin - Chapter 13, Section 3  
✓ Read Lewis-Beck – pg. 51-54  
✓ Assignment #2 due at the beginning of class  
✓ Assignment #3 distributed |
| Day 12: Tuesday, July 31<sup>st</sup> | Applying and Extending What We’ve Learned So Far | ✓ Review all of your notes  
✓ Reread anything that still doesn’t make sense |
| Day 13: Wednesday, August 1<sup>st</sup> | Using Residuals to Check Ourselves  
How to Build Models | ✓ Read Agresti & Franklin - Chapter 13, Section 4  
✓ Reread Agresti & Franklin – pg. 650  
✓ Read Lewis-Beck – pg. 56-58 |
| Day 14: Thursday, August 2<sup>nd</sup> | Multicollinearity  
Evaluating the Relative Effects of Independent Variables | ✓ Read Lewis-Beck – pg. 58-66 |
| Day 15: Friday, August 3<sup>rd</sup> | Categorical Independent Variables | ✓ Read Agresti & Franklin - Chapter 13, pg. 658-660  
✓ Read Lewis-Beck – pg. 66-73  
✓ Assignment #3 due at the beginning of class  
✓ Assignment #4 distributed |
| Day 16: Monday, August 6<sup>th</sup> | Interactions Amongst Variables | ✓ Read Agresti & Franklin - Chapter 13, pg. 660-663  
✓ Read Lewis-Beck – pg. 54-56 |
| Day 17: Tuesday, August 7<sup>th</sup> | Applying and Extending What We’ve Learned So Far  
How Do We Model a Categorical Dependent Variable? | ✓ Read Agresti & Franklin - Chapter 13, Section 6 |
| Day 18: Wednesday, August 8<sup>th</sup> | How You Might Handle Missing Data  
Other Advanced Topics | ✓ TBA |
| Day 19: Thursday, August 9<sup>th</sup> | Other Advanced Topics | ✓ TBA  
✓ Assignment #4 due at the beginning of class |