PS551 Syllabus
_Introduction to Statistical Inference and Political Research_
Fall 2013

Tuesdays and Thursdays
2:30–3:45 pm
Engineering Hall 3345

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1 Course Overview

This course should help you to think critically about data in social science. We will cover the following topics:

- Data collection and measurement
- Data description and visualization
- Measures of association
- Probability
- Inference
- Causality

The course revolves around a series of group and individual projects that you and your classmates will participate in throughout the semester (see Section 3.1 below for details about the projects). In my view, the best way to learn statistics is by actually doing statistics, and rather than having you waste your time with contrived examples (coin flips and draws from an urn), we will get our hands dirty with some actual social science.

2 Required Texts

The readings for this course will mainly be drawn from a free online text, *OpenIntro Statistics*, Second Edition (available at: http://www.openintro.org/stat/textbook.php). In addition to the free text book, we will read a selection of journal articles and selections from other books. These readings will all be available online through Learn@UW.

*Don’t confuse the cost of the reading materials for their value in helping you learn the material.* I understand what it is like to be a student, and textbooks (especially statistics texts) can be pricey. Just because you aren’t shelling out $150 or more for a textbook, you should still be consulting it regularly. If you would like, you can purchase a hardcopy of the text (for about $10 with shipping) by searching for it on Amazon.
3 Assessment

A traditional statistics course (like the one that I took when I was an undergrad not too long ago) has a weekly homework assignment and a series of quizzes and midterm examinations. This usually involves a lot of memorizing formulae and seemingly arbitrary rules and then regurgitating that material onto an examination form. We are going to do things a little differently.

Your learning will be assessed in three ways:

- (35%) Participation in the Group Project
  - (10%) A detailed division of labor for the project (see Appendix A for an example)
    ∗ This document needs to be agreed upon by all members of the group
    ∗ It will determine "your part" of the project below
  - (10%) Attendance in the group meetings with the TA during section time.
  - (40%) Your part of the project
  - (40%) The overall quality of the group’s project

- (25%) Short take-home quizzes after each of the 5 sections of the course

- (40%) Individual projects
  - (10%) Proposal
  - (10%) Meeting with TA
  - (20%) Mid-semester progress report
  - (60%) Content of the final project

3.1 Projects

You will be involved with two major projects that will determine the largest part of your grade for this course. The first project is a group project, the second project is an individual project.
3.1.1 Group Projects

The group projects are designed to help reinforce the subject material. At the beginning of the semester you will be assigned into one of 4 groups corresponding with the different sections of the course. At the end of each section of the course (see Section 6 for the topics), one of the groups will present their project. As a group, your project will incorporate the following elements (see Appendices B and C for a few more specifics):

- A high-quality written report of the project to include:
  - An executive summary of what you did
  - A detailed introduction section that motivates the problem
  - A clear statement of your research question
  - A detailed report of your methodology and the reasoning for it
  - A conclusion with a discussion of possible next steps

- A one-page handout to accompany your oral presentation

- Appropriate visual aids that will help the audience understand your oral presentation

- A set of five questions to be included on the take-home quiz for the section (at least three of which must be directly related to the content of your project).

In addition to these things, at least one member of your group will present a summary of your project to the class. The presentation should take at least 15 but no more than 20 minutes. Following the presentation, the group will field questions from the class. The presentation will:

- Briefly review the concepts from the course that are foundational to your presentation

- Clearly cover:
  - The research question
  - Your methodology
  - Your results
The report and quiz questions will be due the lecture prior to your presentation. Each group will work closely with the TA in the development of the project to ensure that their presentations are on track.

3.1.2 Individual Projects

The individual projects are an opportunity for you to formulate a research question, collect some data, and analyze it. There are a few milestones during the course of the semester that will help to ensure that you have an acceptable project.

Early in the semester, you will turn in a proposal outlining a potential research question and meet with either the TA to get your project approved. This will help to ensure that your project is feasible and that you will have the resources necessary to provide an answer to the question by the end of the course. In this meeting, you will lay out a general time line (working backwards from the presentation date) to make sure that you stay on track with the project.

About midway through the semester, you will turn in a progress report detailing the work you have done on your project to that point and any revisions you have made to the time line. The individual project is not something that you can put off until the end of the semester and cram into the week or two before it is due. It will require sustained effort and coordination on your part to complete it well.

Similar to the group projects, the individual projects will include:

- A high-quality written report of the project to include:
  - An executive summary of what you did
  - A detailed introduction section that motivates the problem
  - A clear statement of your research question
  - A detailed report of your methodology and the reasoning for it
  - A conclusion with a discussion of possible next steps

- Appropriate visual aids that will help the audience understand your oral presentation

In addition to these things, you will present a summary of your project to the class. The presentation should be 5-7 minutes. The presentation will:
• Clearly cover:
  – The research question
  – Your methodology
  – Your results

For both the group projects and the individual projects, I am primarily concerned with your methodology. A well thought out project that returns uninteresting results will receive as high a grade as a similarly well thought out project that has some interesting findings.

3.2 Take-home Quizzes

At the end of each section of the course (see Section 6 for dates), I will distribute a quiz that you will take home and complete. These quizzes are designed to assess your conceptual understanding of the material presented in each section. You may use your notes, the course text and readings, and the written reports from the group projects to complete the quiz. You may not consult with other students or online resources.

Quizzes will be distributed after each presentation and will be due back the next lecture.

4 Discussion Sections

The TA will use the scheduled times for the discussion sections as time to meet with the group that is assigned to present at the end of that segment of the course. She will also be available during office hours to meet with you about your individual projects or any questions that you have about the course material.

Time that would have been spent in discussion sections should be used for working on your individual and group projects.
5 Other policies

Academic Integrity
I take plagiarism very seriously. DON’T DO IT. It is easier to spot than you might think, and it makes me really mad. If you have questions about what constitutes plagiarism, talk to the TA or myself or read the University’s policy: http://students.wisc.edu/doso/acadintegrity.html

Attendance
It should go without saying, but I expect you to attend class and participate in the discussion. This is doubly true for the group presentations. If I notice a pattern of shirking when it comes to attendance or participation, I reserve the right to penalize your final grade accordingly.

Communication
I hope you will feel like you can come to me with questions or concerns about the course. Although office hours are the best way to get in touch with me, I will make every effort to accommodate you if you need to make a different appointment.

In addition to you being able to talk to me, I will need from time to time to get in touch with you. I will do this through the email address that is in the system. You are responsible for checking your email regularly.

Deadlines
All deadlines are final and, barring some emergency or life-threatening illness, no extensions will be made.

Special Needs and Accomodations
If you require some special accomodations or you think there is something that I should know about your situation that is relevant to your ability to participate in the course and complete the required assignments, please speak to me sooner rather than later. I am eager to make this course work
for everyone, but in order to do so, I need to hear from you early in the semester.

6 (Tentative) Schedule

I will make every effort to stay on schedule, but even “the best laid plans of mice and men...”

6.1 Data Collection and Measurement

In this section, we will discuss the idea of “data” in the social sciences. How do we measure social phenomena? How should we think about the resulting data? The first group will devise a plan to collect some data, collect the data, present their findings, and discuss their methodology. Group 1 will come up with some interesting things to measure and go out and collect some data.

- (Th) Sep 5: Measurement and types of data
  - Readings OpenIntro Ch. 1
- (T) Sep 10: Summaries of data
  - Readings Collaborative Statistics Ch. 2
- (Th) Sep 12: Sampling
  - Readings Collaborative Statistics Ch. 1
- (T) Sep 19: Visualizing data
- (Th) Sep 21: Group 1 Presentation
  - Assignment due Individual presentation proposal
6.2 Measures of Association

In this section, we will discuss the ways in which variables associated with one another. We begin with relatively simple measures of association for discrete and continuous data. We will also introduce the concept of regression and ordinary least squares. The second group will come up with a research question, find and discuss the appropriate data to explore bivariate relationships, and discuss their methodology.

- (T) Sep 24: Tabulation and Chi-squared
  - *Assignment due Quiz 1*
- (Th) Sep 26: Covariation and Correlation
  - *Readings* OpenIntro 7.1
- (T) Oct 1: Linear Regression
  - *Readings* OpenIntro 7.2–7.3; Collaborative Statistics Ch. 12
- (Th) Oct 3: Linear Regression (continued)
- (T) Oct 8: Non-linear association
- (Th) Oct 10: Group 2 Presentation

6.3 Probability

In this section, we will introduce the concepts that provide the foundations for inference. So far in the course, we have dealt only with observed data. In this section, we introduce the idea of an unobserved distribution that generates the data we observe.

- (T) Oct 15: Rules of probability
  - *Readings* OpenIntro Ch. 2
  - *Assignment due Quiz 2*
- (Th) Oct 17: Bernoulli and Binomial Distributions
  - *Readings* Collaborative Statistics Ch. 4
• (T) Oct 22: Normal Distribution
  – *Readings* OpenIntro Ch. 3

• (Th) Oct 24: Sampling Distribution and the Central Limit Theorem
  – *Assignment due* Individual presentation progress report

### 6.4 Inference

In this section, we will begin to tie together the principles we learned from the previous section on probability with the things we learned about data from the first two sections. Inference is all about dealing with the uncertainties associated with sampling in a principled way. It allows us to make claims about a population even when we have only observed a small sample of that larger population. Group 3 will use data from a sample to make inferences about a population.

• (T) Oct 29: Confidence intervals
  – *Readings* OpenIntro Ch. 4
  – *Assignment due* Quiz 3

• (Th) Oct 31: Hypothesis testing
  – *Readings* OpenIntro Ch. 5, Collaborative Statistics Ch. 9

• (T) Nov 5: Statistical significance and Linear Regression

• (Th) Nov 7: Statistical significance (continued)

• (T) Nov 12: Group 3 Presentation

### 6.5 Causation

In this final section of the course, we will talk about causation. What does it mean to say that a change in $x$ *causes* a change in $y$? Why are experiments so powerful? What can we do when (as is often the case in social settings) we cannot conduct an experiment? Group 4 will design an experiment that could provide evidence bearing on an interesting question. They will present their results and discuss their methodology.
• (Th) Nov 14: Potential outcomes model
  – Readings Rubin 1974

• (T) Nov 19: Multiple regression and Ceteris Paribus
  – Readings OpenIntro 8.1–8.3

• (Th) Nov 21: Experimental Gold Standard

• (T) Nov 26: Quasi- and Natural Experiments
  – Readings Mostly harmless reading

• (Th) Nov 26: Thanksgiving Break

• (T) Dec 3: Group 4 Presentation

6.6 Individual project presentations
A Division of Labor

[Note: this is a general guideline, your group may work out something
different with the TA for the needs of your particular project]

Group Member(s) assigned responsibility for the written report:

_________________________________
_________________________________

Group Member(s) assigned responsibility for the handouts and visual aids:

_________________________________
_________________________________

Group Member(s) assigned responsibility for the oral presentation:

_________________________________
_________________________________


B  Written Report Rubric

Note: Each project is unique and the rubric provided below is intended as a general guideline. We’ve discussed the sticky problem of measurement in this course, and grading is just another example of the difficult task of taking some multidimensional feature of the real world (in this case, your group’s performance across a wide range of tasks) and projecting it into a new, one-dimensional space. The TA and I will work with you to come up with a rubric that fits the needs of your specific projects.

• Is the report well-organized and professional?
  – Spelling and grammar
  – Readability
  – Overall style

• Does the report contain all of the required information?
  – One-page executive summary
  – Introduction that clearly motivates the problem and states the question (1-2 pages)
  – Conceptual Review section that briefly reviews the concepts drawn on in a different way than was presented in the readings and lectures (e.g. using different examples) (2-3 pages)
  – Methodology section that clearly explains and provides justification for your project (3-4 pages)
  – Results section that succinctly presents your findings and any analysis (2-3 pages)
  – Conclusion that summarizes what you have done and discusses possible future directions to take the project (1-2 pages)

• Were the methods used appropriate to the problem?
  – Does the overall content of the report demonstrate an understanding of the subject matter?
  – Were there significant methodological flaws in the ways in which the project was carried out?
C  Handouts and visual aids Rubric

• Are the handouts and visual aids professionally done and well-organized?
  – Spelling and grammar
  – Readability
  – Overall style

• Do the handouts and visual aids help to communicate the information contained in the oral presentation?
  – Appropriate visualizations of the data/analysis
D  Oral Presentation Rubric

- Is the presentation well-organized?
  - Flow of the presentation makes sense
  - Adequate time is given to the different sections

- Style
  - Was the presentation well-rehearsed?
  - Was it given in a professional way?

- Substance
  - Did the presenter seem to have a good understanding of the subject material?
  - Was the information presented accurate?
E  Group Contact Info

Use the space below to record the names and contact information for the other members in your group.

Name:  
Contact:  

Name:  
Contact:  

Name:  
Contact:  

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Contact:  

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