Robert M. La Follette
School of Public Affairs
UNIVERSITY OF WISCONSIN–MADISON

Public Affairs 818: Introduction to Statistical Methods for Public Policy Analysis
Spring 2024

CLASS MEETINGS
Mondays and Wednesdays, 11:00AM-12:15PM
Ingraham 214

DISCUSSION SECTIONS

301: Fridays 9:55 AM - 10:45 AM
302: Fridays 11:00 AM - 11:50 AM
303: Fridays 12:05 PM - 12:55 PM
Van Hise 487

INSTRUCTOR
Ross Milton, Assistant Professor of Public Affairs
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Drop-in office hours: Wednesdays 9:00-10:00am
and by appointment.
Location: Observatory Hill Office Building (LFS House) Rm 305

TEACHING ASSISTANT
Nguyen Vuong
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Drop-in office hours: Thursdays 1:00-3:00pm
Location: TBA

Course Information

An introduction to the statistical methods used in public policy. Covers the basics of probability, statistics, and quantitative methods in public policy analysis. Stresses interpretation and presentation of data as well as theory.

This is a course about learning from and describing data. We will learn how to visualize data in ways that are easily understood and what considerations must be made to do so, how to compare groups, and how to investigate the relationships between characteristics. To do so we will learn the basics of regression, probability, and statistical inference. These are the necessary statistical tools to effectively organize and interpret data and present those findings to the world.

By the end of the course, you should be comfortable applying these techniques in policy analysis. In addition, you should have sufficient experience with the statistical software Stata to use it in future courses and independently.

The goal of the course is to teach practical statistical methods and intuition, not to test your mathematical abilities. Basic arithmetic and algebra skills are sufficient to excel in the course when combined with consistent diligence throughout the semester.

REQUIRED TEXTS

- De Veaux, Velleman, and Bock (2020) Stats: Data and Models, 5th edition. ISBN: 9780135163825
- Bueno de Mesquita, E., Fowler, A. (2021). Thinking Clearly with Data: A Guide to Quantitative Reasoning and Analysis. United Kingdom: Princeton University Press.
- Other readings will be distributed via the Canvas course page.

REQUIRED SOFTWARE

We will learn statistics and also learn how to use computer software to implement the statistics we learn. We will be using Stata, a popular statistical software package used by many social scientists, policy analysts, and other La Follette courses. So, we need:

- Access to Spreadsheet software (Excel or Google Sheets)
- Access to Stata. Three methods are freely available through UW.
    1. Access through the Social Science Computing Cooperative's (SSCC) Winstat servers. If you do not already have a SSCC account, you can request one here (https://www.ssc.wisc.edu/sscc_jsp/account/lab/). This allows you to access a full windows desktop with space to save your files from any computer. More information about connecting to Winstat is here (https://www.ssc.wisc.edu/sscc/pubs/winstat.htm).
    2. Download Stata free of charge via the campus software library.
    3. Stata is available in the La Follette computer lab and other labs on campus.

LEARNING OUTCOMES

Course Learning Outcomes

Students will be able to…

- Use basic numeric and visualization tools to describe data.
- Use statistical inference to answer policy relevant research questions.
- Analyze and interpret the relationship between two or more variables.
- Use statistical computing software to conduct statistical analysis of data.
- Evaluate the methodology and conclusions of statistical policy analyses.

HOMEWORK ASSIGNMENTS

Students are responsible for the completion of near-weekly problem sets. The problem sets vary in their content depending on the section of the course we are in. Some require you to analyze data to answer a policy-related question and present your results. Some require you to think about policy related measurement issues. Others are more traditional 'problem sets'.

Students are encouraged to work in groups on problem sets, but each student must turn their own work. Under no circumstance will late homework be accepted. The problem sets are intended to provide intensive practice in applying the tools developed in lecture. You should look at homework as an opportunity to make some mistakes and learn from them. *My expectation is that you put time and effort into completing assignments, but I do not expect that completed assignments will be perfect and error free. Your lowest homework grade will not be counted.*

Detailed solutions to technical homework assignments will be posted. Students should review the solutions closely and compare them to their own work.

WRITING ASSIGNMENTS

Two short writing assignments are required. These assignments are an opportunity to demonstrate student's understanding of statistical issues by communicating them in non-technical language to a non-statistical audience. The memos should follow professional writing best practices that enable the reader to quickly find the information they need by using a 'skimmable' writing style and the "BLUF," "bottom line up front", communication principle.

Each assignment should not exceed 1000 words. Each assignment should provide a list of references in APA style that includes the article. Other sources may be useful in addressing the issue but are not necessarily required. Any sources used should be cited appropriately in the text using author-date parenthetical style for example (Smith, 1949).

Writing Assignment #1: Choosing statistics

You work in a policy job. The boss read an article on a newspaper/radio/tv/magazine/news website and has drawn some conclusions from it. Find a policy-relevant article that uses one or more *descriptive statistics* to lead the reader to some conclusions that you think may be unwarranted (or should be taken not to be the entire story) because *alternative statistics* (for example, a median instead of a mean) might give other answers so we would want to find them.

Write a professional memo for your boss and other personnel in your hypothetical organization. The memo should explain the subject matter of the article, and what the broad policy-relevant question that the article relates to is, describe the statistic(s) used in the article to address this question, and describe the conclusion that a reader might draw from the article. Then you should describe what other statistics could be used as alternatives to the one(s) used in the article and describe why you think its possible they would lead to alternative conclusions.

The memo should not presume that the audience has read the article.

Writing Assignment #2: Measurement and Samples

Identify a mass media piece that uses one or more statistics from a survey to answer a question, but that you believe could have led someone to a potentially incorrect conclusion because the sample from which the statistic is drawn is *not representative of the population of interest*.

Write a professional memo for your boss and other personnel in your hypothetical organization. The memo should explain the subject matter of the article, what the broad policy-relevant question that the article relates to is, and how the article answered the question. Explain the methodology of the survey to the extent that you can from the information available. Then explain the potential issue that makes the conclusion potentially misleading. Explain what the population of interest is and how that differs from the sample from which data are used. How could a better answer be achieved? Speculate regarding the direction of the bias caused by the unrepresentative sample (in other words, how would the answer differ with a representative sample).

The memo should not presume that the audience has read the article. If you are having trouble finding a suitable article, try a google news search for "survey". Sadly, it seems like a large fraction of the resulting articles would work well.

QUIZ AND EXAMS

There is a quiz, a midterm exam, and a final. The midterm and quiz are scheduled for during regular class time. The final is scheduled according to the university's final exam schedule. The midterm covers approximately the first half the course. The quiz covers probability and will take only part of the class time. The final is cumulative but emphasizes more recent material. For the quiz and exams students may use a one-sided 8.5"x11" page note sheet.

- Midterm Exam: Monday March 11
- Quiz: Monday April 8
- Final Exam: Tuesday May 7, 2:45-4:45, Location TBA.

WRAP-UP AND IN CLASS ASSIGNMENTS

There will be brief post-class assignments each week in which you report your comfort level with the material and answer other questions. These will be graded on a completion basis. In addition, there will be occasional in class assignments. *Your lowest grade on these assignments will not be counted.*

DISCUSSION AND PARTICIPATION

Active participation is key to learning both statistics and how to use statistical software. Students are expected to attend all lectures and discussions sections. You will have many questions. You can ask them in class, in office hours, or via email.

GRADING

Course grades are assigned based on:

- Homework assignments – 20%
- Writing assignments – 20%
- Quiz – 10%
- In class assignments and wrap-ups – 10%
- Exams – 40%

In order to reward exceptional performance and mitigate the effects of a bad day, the midterm and final will be weighted to benefit each student. The better of a student's two exams will make up 22.5% of their grade while the worse will make up 17.5%. The total weight of the two exams is 40% of the final grade.

If you have any questions or concerns about how your assignment or exams are graded, please send an email to the teaching assistant detailing your concerns.

Final course grades will be assigned according to this rubric:

- 90+ A
- 85-90 AB
- 80-85 B
- 75-80 BC
- <75 C

DISCUSSION SECTIONS

All students enrolled in this class should be assigned to a discussion section with a teaching assistant. These discussion sections will meet once a week throughout the course of the semester. In discussion sections, the problem sets from the previous week will be reviewed, old material may be rehashed, questions will be answered, and, on occasion, new material will be presented. To get the most out of the course, attendance and active participation in these discussion sections will be vital.

Course Policies

This 3 CR course has two 75 min lectures per week and one 50 min discussion section. Students are expected to work approximately 6 hours per week outside of class to complete assignments and learn the relevant material.

University of Wisconsin-Madison Policies

Institutional academic policies and statements are reviewed and updated annually, as needed. They currently include:

- Teaching and Learning Data Transparency Statement
- Campus Resources for Academic Success
- Course Evaluations and Digital Course Evaluations
- Students' Rules, Rights and Responsibilities
- Diversity and Inclusion Statement
- Academic Integrity Statement
- Accommodations for Students with Disabilities
- Academic Calendar and Religious Observances

Usage of Audio Recorded Lectures Statement
Lecture materials and recordings for PA818 are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

Class Schedule (subject to change)

- DVB refers to Stats: Data and Models (5th edition)
- BMF refers to Thinking Clearly with Data

Week	Class	Date	Topic and Readings
1	1	Wed Jan 24	Introduction, Syllabus, Data and Statistics, Stata basics Readings: 1. DVB, Ch. 1
2	2	Mon Jan 29	Categorical data, Quantitative data Readings: 1. DVB, Ch. 2.1-2.4 2. Fry, Hannah, (2021), "What Really Counts" 3. BMF, Ch. 1
	3	Wed Jan 31	Readings: 1. DVB, Ch. 2.5 2. Chapter 2, "Charting Inequality" in Cowell, F.A., 2011. *Measuring inequality*. Oxford University Press.
3	4	Mon Feb 5	Cross-tabulations Readings: DVB, Ch. 3
	5	Wed Feb 7	Distributions Reading: 1. DVB Ch 4 In class data exploration
4	6	Mon Feb 12	Z-scores & Comparing Distributions Readings: 1. DVB, Ch. 5 2. Reardon, S. F. (2011). The Widening Academic Achievement Gap between the Rich and the Poor: New Evidence and Possible Explanations. In G. J. Duncan, & R. J. Murnane (Eds.), *Wither Opportunity? Rising Inequality, Schools, and Children's Life Chances* (pp. 91-116). New York: Russell Sage Foundation. 3. Barshay, Jill (2019) Inside the Reardon-Hanushek clash over 50 years of achievement gaps, The Hechinger Report, May 27.
	7	Wed Feb 14	Associations & Correlations Readings: 1. DVB, Ch 6 2. BMF, Ch 4
5	8	Mon Feb 19	Causality & Experiments Readings: 1. BMF, Ch 5

	9	Wed Feb 21	Causality & Experiments Readings: 1. BMF, Ch 9 2. Gerring, John. 2012. "Mere Description." British Journal of Political Science 42: 721-46
6	10	Mon Feb 26	Linear Regression Readings: 1. DVB, Ch 7
	11	Wed Feb 28	Linear Regression Readings: 1. DVB, Chs. 8.1-8.3 & 8.6-8.7
7	12	Mon Mar 4	Multiple Regression Readings: 1. DVB, Ch 9
	13	Wed Mar 6	Multiple Regression Readings: 1. BMF, Ch 10
8	14	Mon Mar 11	Midterm Exam
	15	Wed Mar 13	Introduction to Probability Readings: 1. DVB, Ch 12
9	16	Mon Mar 18	Conditional probability/Bayes rule Readings: 1. DVB, Ch 13 2. BMF, Ch 15
	17	Wed Mar 20	Random variables Reading: 1. DVB Ch. 14
March 25 & 27 – Spring Break			
10	18	Mon Apr 1	Surveys and Sampling Readings: 1. DVB, Ch 10
	19	Wed Apr 3	Surveys and Sampling Readings: 1. BMF, Ch 6 2. "When You Hear the Margin of Error Is Plus or Minus 3 Percent, Think 7 Instead," *The New York Times*, Oct 2016.
11	20	Mon Apr 8	1. Probability Quiz 2. Sampling error, confidence intervals for proportions Reading: 1. DVB, Ch 16
	21	Wed Apr 10	Sampling error: confidence intervals for means Readings: 1. DVB, Ch 17

12	22	Mon Apr 15	Hypothesis testing Readings 1. DVB, Ch. 18
13	23	Wed Apr 17	P-values Readings: 1. DVB, Ch. 19
	24	Mon Apr 22	Comparing groups Readings: 1. DVB, Ch. 20 2. BMF, Ch 7
14	25	Wed Apr 24	Regression inference Readings: 1. DVB, Ch. 23
	26	Mon Apr 29	Regression inference Readings: 1. DVB, Ch. 23
15	27	Wed May 1	Non-sampling error Readings: 1. BMF Ch 16 2. Manski, C.F., 2019. Communicating uncertainty in policy analysis. *Proceedings of the National Academy of Sciences* 3. Bradley, V.C., Kuriwaki, S., Isakov, M., Sejdinovic, D., Meng, X.L. and Flaxman, S., 2021. Unrepresentative big surveys significantly overestimated US vaccine uptake. *Nature* a. Coy, Peter (2021) "Are Vaccine Polls Flawed?" *The New York Times,* Dec 10.
		Tue, May 7	Final Exam

Schedule last updated: 1/24/2024