

# Public Policy 529.001: Statistics - Standard Sequence Fall 2019 Syllabus

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The objective of this course is to provide a foundation in statistics and their application to questions in public policy and social science research. Key topics include research design, data collection and management, descriptive statistics, probability theory, and basic statistical inference for different types of data.

By nature of the material, this course is difficult. There will be times when you feel that you are just not getting it, and this is normal. Know this ahead of time, and keep working hard. There are no short cuts. Know also that I am on your side. My only goal is to help you learn, and I will push you because that is what I need to do in order for you to learn. The rewards will come if you persist!

## Class Meeting Schedule

Unless otherwise noted, lectures are Mondays and Wednesdays, 1:00 - 2:30 pm in 1120 Weill Hall. Weekly section meetings are held on Fridays, 2:30 - 4:00 pm in 1120 Weill Hall.

## Textbooks

Statistics textbooks have different strengths and weaknesses, and no single book will work well for everyone. It is useful, however, to have one text be a focal point for presentation of the material. The following book, which is available for purchase, will serve in that role for this course:

- Alan Agresti, *Statistical Methods for the Social Sciences*, 5th edition, (Pearson: 2018).

Unfortunately, this is a new edition, so cheaper used copies are not widely available. Rentals may be considerably cheaper than purchasing the text. Also, using the 4th edition (co-authored with Barbara Finlay) is fine, but please be aware some of the data and computer output images are a bit outdated.

Although I strongly recommend you purchase or rent the Agresti text, alternatives issued under Creative Commons licenses have become increasingly viable in recent years, and I encourage you to utilize these resources as well. Two such books follow:

- David M. Diez, Christopher D. Barr, and Mine Çetinkaya-Rundel, *OpenIntro Statistics*, 3rd edition, 2015. Available for download at <https://www.openintro.org/stat/textbook.php>.
- Barbara Illowsky and Susan Dean, *Collaborative Statistics*, 2012. Available for download at <http://tinyurl.com/nmvpevf>.

I expect that the *OpenIntro Statistics* book will be the more helpful of the two for this course, but both have good features. The relevant sections from these texts are listed on the syllabus along with those of the Agresti text so that you can refer to these books whenever you find it helpful.

Other reading selections will be made available on the Canvas site for the course. You can log into Canvas at <http://canvas.umich.edu>.

There are several resources for learning Stata available on Canvas, including a handbook that Professor Jon Hanson compiled for Public Policy 567. If you wish to purchase a book, consider one of the following:

- Alan C. Acock, *A Gentle Introduction to Stata*, 5th edition, (Stata Press: 2016).
- Kyle C. Longest, *Using Stata for Quantitative Analysis*, 2nd edition, (SAGE Publications: 2014).

Of these two books, the Longest is a bit more basic and spends more time introducing Stata.

## Clickers

We will use i>clickers during class to provide feedback about your understanding of the material. You can purchase one from the UofM Computer Showcase in Shapiro Library or Pierpont Commons for \$29 (used) or \$39 (new). Please let me know if this cost poses a problem for you.

## Assignments and Grading

Your grade for this course will be determined by the following:

Participation	5%
Problem sets	25%
Quizzes	20%
Midterm exam	25%
Final exam	25%

Participation will be measured via i>clicker. You will receive two points for every correct answer and one point for every incorrect answer. Reading the textbook before lecture will help you do well on these questions. I will drop your two lowest i>clicker scores from your grade.

By nature, this material is cumulative and you will become stronger with practice. Problem sets will thus be assigned on a regular basis. You are encouraged to collaborate with other students to figure out how to answer questions on the problem sets. It is essential, however, that you write up all of your answers independently and in your own words. The ability to produce the answer yourself is a marker for your learning. Credit will not be given if it is determined that answers were not written independently.

Problem sets are due at the start of lecture or section. Late problem sets will receive no credit. The lowest problem set score will be dropped. Requests for re-grades will be honored, but the entire problem set will be re-graded by the instructor. Consequently, the re-graded score may be lower than, equal to, or higher than the original score.

Quizzes will be given on September 30 and November 20. The midterm exam will be given on Monday, October 28, and the final exam will take place on Tuesday, December 17.

The final course letter grade reflects the Ford School's guidelines. An A is awarded for work that is Excellent, an A- for work that is Very Good, a B+ for work that is Good, a B for work that is Acceptable, and a B- for work that is below expectations for graduate work. You should know I do not have a predetermined formula to convert numeric point totals into these categories. It would be a mistake, for instance, to assume that a grade of 75% on an exam translates into a C, since exams vary in their difficulty.

## **Software**

Students will use the Stata statistical package for many homework assignments. This application is available on computers in the Ford School computer lab and many of the larger computer labs on campus. Additionally, students can remotely log in to the university's Virtual Sites (see information at <https://its.umich.edu/computing/computers-software/campus-computing-sites/software>) to access Stata when not on campus. Discussion section will include help with the statistical computing skills required to complete these assignments. Students who want additional training in using software for statistical work are encouraged to take *PubPol 647-648: Data Analysis with Excel* or *PubPol 567: Stata Practicum* in future semesters.

## **Academic Integrity**

It is expected that students are familiar with the Ford School's expectations for academic integrity as described at <http://fordschool.umich.edu/academics/expectations>, which adhere to the [academic integrity policies for Rackham Graduate School](#). Violations of these policies will be taken seriously.

## **Students with Special Needs**

If you believe you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Office of Services for Students with Disabilities to help us determine appropriate accommodations. I will treat any information you provide as private and confidential.

## **Inclusivity**

Members of the Ford School community represent a rich variety of backgrounds and perspectives. We are committed to providing an atmosphere for learning that respects diversity. While working together to build this community we ask all members to:

- share their unique experiences, values and beliefs
- be open to the views of others
- honor the uniqueness of their colleagues
- appreciate the opportunity that we have to learn from each other in this community
- value one another's opinions and communicate in a respectful manner
- keep confidential discussions that the community has of a personal (or professional) nature
- use this opportunity together to discuss ways in which we can create an inclusive environment in Ford classes and across the UM community

## **Student Mental Health and Wellbeing**

The University of Michigan is committed to advancing the mental health and wellbeing of its students. We acknowledge that a variety of issues, such as strained relationships, increased anxiety, alcohol/drug problems, and depression, directly impacts students academic performance.

If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) at 734-764-8312 and <https://caps.umich.edu/> and/or University Health Service (UHS). For a listing of other mental health resources available on and off campus, visit: <http://umich.edu/~mhealth/>.

## **Use of Technology in the Classroom**

There is very good [evidence](#) that laptops and tablets make it harder to learn. As a result, I do not allow laptops or other screens in the classroom. I do not allow audio or video recording in the classroom.

Notes from the course (both the ones that I provide and the ones that you take) may not be posted on a web site, made available for file sharing, or distributed in any medium (print or electronic). The only exception is to provide a copy to a student in the class who has been absent from class.

Please refer to <http://fordschool.umich.edu/academics/expectations> for a full statement on the Ford School's academic expectations.

## September 4: Introduction

- Agresti, chapter 1.

## September 9: Sampling and Measurement

- Agresti, chapter 2.
- Additional resources: *OpenIntro Statistics*, sections 1.1–1.4; *Collaborative Statistics*, chapter 1.

## September 11 & 16: Descriptive Statistics

- Agresti, chapter 3.
- Additional resources: *OpenIntro Statistics*, sections 1.6–1.8; *Collaborative Statistics*, chapter 2.

## September 18 & 23: Probability

- ▷ Problem Set 1 due Monday, September 23.
- Agresti, section 4.1. Reading from the additional resources is strongly recommended for the lectures on probability.
- Additional resources: *OpenIntro Statistics*, sections 2.1–2.4; *Collaborative Statistics*, chapter 3.

## September 25: Probability Distributions

- Agresti, sections 4.2–4.3.
- Additional resources: *OpenIntro Statistics*, sections 2.5 and 3.1–3.3; *Collaborative Statistics*, chapters 4–6.

## September 30 & October 2: Probability Distributions cont.

- ▷ Problem Set 2 due Monday, September 30.
- ⇒ In-class quiz on Monday, September 30. ⇐
- For more on the binomial distribution, see <https://tinyurl.com/ydalpxke>.

## October 7: Sampling Distributions

- ▷ Problem Set 3 due Monday, October 7.
- Agresti, sections 4.4–4.7 and pp. 118–123.
- Additional resources: *OpenIntro Statistics*, sections 3.4 and 5.1; *Collaborative Statistics*, chapter 7.

## **October 9: Statistical Inference (Estimation)**

- Agresti, chapter 5.
- Additional resources: *OpenIntro Statistics*, sections 4.1–4.2, 5.1; *Collaborative Statistics*, chapter 8.

## **October 14: Fall Study Break**

## **October 16: Significance Tests**

- ▷ Problem Set 4 due Wednesday, October 16.
- Agresti, sections 6.1–6.5.
- Additional resources: *OpenIntro Statistics*, sections 4.3, 6.1–6.2; *Collaborative Statistics*, chapter 9.

## **October 21 & 23: Significance Tests continued**

- Agresti, sections 6.6–6.8.

## **October 28: Midterm Exam**

## **October 30: Experimental Design and Causality**

- ▷ Problem Set 5 due Wednesday, October 30.
- “Research Design,” in Kellstedt and Whitten, *The Fundamentals of Political Science Research*, 2009, chapter 4. See Canvas.
- Additional resources: *OpenIntro Statistics*, section 1.5.

## **November 4 & 6: Statistical Inference (Comparison of Two Groups)**

- Agresti, section 7.1–7.8.
- Additional resources: *OpenIntro Statistics*, sections 5.2–5.4, or *Collaborative Statistics*, chapter 10.

## **November 11 & 13: Association Between Categorical Variables**

- ▷ Problem Set 6 due Monday, November 11.
- Agresti, Chapter 8.
- Additional resources: *OpenIntro Statistics*, sections 6.3–6.6, or *Collaborative Statistics*, chapter 11.

### **November 18: ANOVA**

- ▷ Problem Set 7 due Monday, November 18.
- Agresti, sections TBD.
- Additional resources: *OpenIntro Statistics*, section 5.5, or *Collaborative Statistics*, chapter 13.

### **November 20: Catch-up**

⇒ In-class quiz on Wednesday, November 20. ⇐

### **November 25: Correlation Analysis**

- Agresti, sections 9.1–9.2 and 9.4
- Additional resources: *OpenIntro Statistics*, sections 7.1–7.3, or *Collaborative Statistics*, sections 12.1–12.5.

### **November 27: Practice Problems**

### **December 2 & 4: Linear Regression**

- ▷ Problem Set 8 due Wednesday, December 4.
- Agresti, sections 9.3 and 9.5–9.7.
- Additional resources: *OpenIntro Statistics*, sections 7.4–7.5, or *Collaborative Statistics*, sections 12.6–12.11.

### **December 9: Introduction to Multivariate Relationships**

- Agresti, chapter 10, sections 11.1–11.6.
- *OpenIntro Statistics*, sections 8.1–8.3.

### **December 11: Review**

- ▷ Problem Set 9 due Wednesday, December 11.

### **Tuesday, December 17, 1:30–3:30 pm: Final Exam**