

Public Policy 529: Statistics Winter 2018 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 Tuesdays and Thursdays from 10:00–11:30 am in 1120 Weill Hall. Weekly section meetings are held on Fridays from 1:30–3:00 pm in 1110 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 and Barbara Finlay, *Statistical Methods for the Social Sciences*, 4th edition, (Pearson: 2008).

Since this book has been in print for a number of years, I recommend that you look around for various options to access the book. Rentals on barnesandnoble.com, for example, are considerably cheaper than purchasing the text.

Although I strongly recommend you purchase or rent the Agresti and Finlay 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 and Finlay 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 I 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.

Assignments and Grading

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

Problem sets	30%
Quizzes	20%
Midterm exam	25%
Final exam	25%

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.

The second portion of the course grade will come from two in-class quizzes worth 10% each. These quizzes, which will be given on February 1 and March 27, are designed to ensure that you are keeping up with the material between the two major exams for the course.

The midterm exam will be given on Thursday, February 22, and the final exam will take place on Monday, April 23. Each of these exams is worth 25%.

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 <http://www.itcs.umich.edu/sites/labs/virtual.php>) 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

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

January 4: Introduction

- Agresti and Finlay, chapter 1.

January 9: Sampling and Measurement

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

January 11 & 16: Descriptive Statistics

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

January 18 & 23: Probability

- Agresti and Finlay, 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.
- ▷ Problem Set 1 due Friday, January 19.

January 25: Probability Distributions

- Agresti and Finlay, sections 4.2–4.3.
 - Additional resources: *OpenIntro Statistics*, sections 2.5 and 3.1–3.3; *Collaborative Statistics*, chapters 4–6.
- ▷ Problem Set 2 due Friday, January 26.

January 30 & February 1: Probability Distributions cont.

- ⇒ In-class quiz on Thursday, February 1. ⇐
- For more on the binomial distribution, see <https://tinyurl.com/ydalpxke>.
- ▷ Problem Set 3 due Friday, February 2.

February 6: Sampling Distributions

- Agresti and Finlay, sections 4.4–4.7 and pp. 118–123.
- Additional resources: *OpenIntro Statistics*, sections 3.4 and 5.1; *Collaborative Statistics*, chapter 7.

February 8: Statistical Inference (Estimation)

- Agresti and Finlay, chapter 5.
 - Additional resources: *OpenIntro Statistics*, sections 4.1–4.2, 5.1; *Collaborative Statistics*, chapter 8.
- ▷ Problem Set 4 due Friday, February 9.

February 13 & 15: Significance Tests

- Agresti and Finlay, sections 6.1–6.5.
 - Additional resources: *OpenIntro Statistics*, sections 4.3, 6.1–6.2; *Collaborative Statistics*, chapter 9.
- ▷ Problem Set 5 due Monday, February 19.

February 20: Significance Tests continued

- Agresti and Finlay, sections 6.6–6.8.

February 22: Midterm Exam

February 27 & March 1: Winter Break

March 6: Experimental Design and Causality

- “Research Design,” in Kellstedt and Whitten, *The Fundamentals of Political Science Research*, 2009, chapter 4. See Canvas.
- Additional resources: *OpenIntro Statistics*, section 1.5.

March 8 & 13: Statistical Inference (Comparison of Two Groups)

- Agresti and Finlay, section 7.1–7.8.
 - Additional resources: *OpenIntro Statistics*, sections 5.2–5.4, or *Collaborative Statistics*, chapter 10.
- ▷ Problem Set 6 due Friday, March 9.

March 15 & 20: Association Between Categorical Variables

- Agresti and Finlay, sections 8.1–8.7.
 - Additional resources: *OpenIntro Statistics*, sections 6.3–6.6, or *Collaborative Statistics*, chapter 11.
- ▷ Problem Set 7 due Friday, March 16.

March 22: ANOVA

- Agresti and Finlay, sections 12.1–12.2 and 12.4.
- Additional resources: *OpenIntro Statistics*, section 5.5, or *Collaborative Statistics*, chapter 13.

March 27: Correlation Analysis

⇒ In-class quiz on Tuesday, March 27. ⇐

- Agresti and Finlay, 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.

March 29 & April 3: Linear Regression

- Agresti and Finlay, 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.
- ▷ Problem Set 8 due Friday, March 30.

April 5: Introduction to Multivariate Relationships

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

April 10 & 12: Introduction to Multivariate Relationships cont.

▷ Problem Set 9 due Tuesday, April 10.

April 17: Review

▷ Problem Set 10 due Tuesday, April 17.

Monday, April 23, 4:00–6:00 pm: Final Exam