

Public Policy 529.003: Statistics Fall 2020 Syllabus

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Office Hours: Tues. 12:00–1:30 ([Zoom](#)), Fri. 11:30–1:00 ([Zoom](#)), or by appointment

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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 measurement, data collection, descriptive statistics, probability theory, statistical inference for different types of data, and significance testing. As the augmented version of Public Policy 529, this course is aimed toward students who foresee themselves as practitioners of data analysis in their future careers.

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 from 1:00–2:20 pm in 1110 Weill Hall and via Zoom at <https://umich.zoom.us/j/98485297727>. Weekly section meetings are held on Fridays from 2:30–3:50 pm via Zoom at <https://umich.zoom.us/j/91933942733>.

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 will serve in that role for this course:

- Alan Agresti, *Statistical Methods for the Social Sciences*, 5th edition, (Pearson: 2017).

This book is available for purchase, though I recommend that you look around for various options to access the book. Rentals on amazon.com, for example, are considerably cheaper than purchasing the text.

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*, 4th edition, 2019. Available for download at <https://www.openintro.org/stat/textbook.php>.
- Barbara Illowsky and Susan Dean, *Collaborative Statistics*, 2012. Available for download at <https://tinyurl.com/y3s84pej>.

Both of these books 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. In general, the *Collaborate Statistics* book organizes the material in a manner that is more similar to this course than *OpenIntro Statistics*.

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

For statistical software, students may use either Stata or R to complete their work. 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*, 3rd edition, (SAGE Publications: 2019).

Of these two books, the Longest is a bit more oriented toward beginners 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 are thus 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 September 30 and November 16, 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 Monday, October 19, and the final exam will take place on Tuesday, December 15. 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 either the Stata or R statistical packages for homework assignments. R is an open-source program that is freely downloadable from <https://cran.r-project.org>. Students who use R are strongly encouraged to download the free RStudio Desktop companion application (<https://rstudio.com/products/rstudio/download/>) to serve as their interface with R. A time-limited license for Stata is available for purchase at student pricing from <https://www.stata.com/order/new/edu/gradplans/campus-gradplan/>. Both applications are very powerful. The learning curve for R is steeper, but it offers a lot of flexibility and will remain available to you at no cost. Stata provides an easier entry for basic stats and has excellent documentation.

Both applications are available on computers in the Ford School computer lab and all of the larger computer labs on campus. Additionally, students can remotely log into the university's Virtual Sites (see information at <https://documentation.its.umich.edu/node/312>) to access Stata when not on campus. Windows users can use the AppsAnywhere system (<https://its.umich.edu/computing/computers-software/campus-computing-sites/appsanywhere>) to run Stata on their local machine, which is much faster.

The Friday section will include help with the statistical computing skills required to complete course assignments, and the Canvas site provides many resources. Students who want additional training in using software for statistical work are encouraged to take one of the several courses offered in Ford that focus on learning software.

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.

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) and/or University Health Service (UHS). For a listing of other mental health resources available on and off campus, visit: <http://umich.edu/~mhealth/>.

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.

COVID-19 Statement

In order to participate in any in-person aspects of this course, including meeting with other students to study or work on a team project, you must follow all safety measures mandated by the State of Michigan, the University of Michigan and the Ford School. This includes maintaining physical distancing of six feet from others and properly wearing a face covering at all times while on campus. In addition, it is expected that you will protect and enhance the health of everyone in the Ford School community by staying home and following self-isolation guidelines if you are experiencing any symptoms of COVID-19, have been exposed to someone with COVID-19, are awaiting a test result, or have engaged in a higher-exposure activity such as a flying or attending an indoor social gathering of more than 10 people. If you are unable or unwilling to adhere to all prescribed safety measures, you will be accommodated through remote access to all aspects of this course. Additional information on public health safety measures is described in the [Wolverine Culture of Care](#) and the [University's Face Covering Policy for COVID-19](#).

August 31: Introduction

- Agresti, chapter 1.
- Harford, Tim. “Statistics, Fast and Slow.” *Financial Times*, April 13, 2018. See Canvas.

September 2: Measurement

- Agresti, section 2.1.
- Janet Buttolph Johnson and H.T. Reynolds 2008. “Measurement.” *Political Science Research Methods*, chapter 4.
- Additional resource: *OpenIntro Statistics*, sections 1.1–1.2; *Collaborative Statistics*, chapter 1.
- Additional resource: for those interested in learning about survey question design, UM experts Frederick Conrad and Frauke Kreuter offer a course through Coursera entitled “Questionnaire Design for Social Surveys.” Free to UM students. <https://www.coursera.org/learn/questionnaire-design?>

September 9: Sampling

- Agresti, sections 2.2–2.5.
- Additional resource: *OpenIntro Statistics*, sections 1.3; *Collaborative Statistics*, chapter 1.
- Additional resource: for those interested in a deep dive on sampling, UM expert James Lepkowski offers a course through Coursera entitled “Sampling People, Networks, and Records.” Free to UM students. <https://www.coursera.org/learn/sampling-methods>.
- See also a Coursera course by Frederick Conrad entitled “Data Collection: Online, Telephone and Face-to-face.” <https://www.coursera.org/learn/data-collection-methods>.

September 14: Descriptive Statistics

- ▷ Problem Set 1 due Monday, September 14.
- Agresti, chapter 3.
- Additional resource: *OpenIntro Statistics*, chapter 2; *Collaborative Statistics*, chapter 2.

September 16 & 21: Probability

- ▷ Problem Set 2 due Monday, September 21.
- Agresti, section 4.1. Reading from the Additional resource is strongly recommended for the lectures on probability.
- Additional resource: *OpenIntro Statistics*, sections 3.1–3.3; *Collaborative Statistics*, chapter 3.

September 23 & 28: Probability Distributions

- ▷ Problem Set 3 due Monday, September 28.
- Agresti, sections 4.2–4.3.
- Additional resource: *OpenIntro Statistics*, sections 3.4–3.5, 4.1, and 4.3; *Collaborative Statistics*, sections 4.1–4.5, 5.1–5.3, and chapter 6.
- For more on the binomial distribution, see <https://tinyurl.com/ydalpxke>.

September 30: Sampling Distributions

- ⇒ Quiz on Wednesday, September 30. ⇐
- Agresti, sections 4.4–4.7 and pp. 118–123.
- Additional resource: *Collaborative Statistics*, chapter 7.

October 5: Statistical Inference (Estimation)

- ▷ Problem Set 4 due Monday, October 5.
- Agresti, sections 5.1–5.4 and 5.6.
- Additional resource: *OpenIntro Statistics*, sections 5.1–5.2 and 7.1.1–7.1.4; *Collaborative Statistics*, chapter 8.
- Glenn Kessler. “Did Exactly 4,645 People Die in Hurricane Maria? Nope.” *Washington Post*, June 1, 2018. See Canvas.
- Rink Hoekstra et al. (2014). “Robust Misinterpretation of Confidence Intervals.” *Psychonomic Bulletin & Review* 21(5): 1157–1164. See Canvas.

October 7: Significance Tests

- Agresti, sections 6.1–6.5.
- Additional resource: *OpenIntro Statistics*, sections 5.3, 6.1, 7.1.5; *Collaborative Statistics*, chapter 9.

October 12 & 14: Significance Tests continued

- ▷ Problem Set 5 due Monday, October 12.
- Agresti, sections 6.6–6.8.
- Aaron E. Carroll (2018). “Congratulations. Your Study Went Nowhere.” *The New York Times*, September 24, 2018.

October 19: Midterm Exam

October 21: Experimental Design and Causality

- “Research Design,” in Kellstedt and Whitten, *The Fundamentals of Political Science Research*, 2009, chapter 4. See Canvas.
- Additional resource: *OpenIntro Statistics*, section 1.4.
- Jean Drèze (2018). “Evidence, Policy, and Politics.” *Ideas for India*. <http://www.ideasforindia.in/topics/miscellany/evidence-policy-and-politics.html>.

October 26 & 28: Statistical Inference (Comparison of Two Groups)

- ▷ Problem Set 6 due Monday, October 26.
- Agresti, chapter 7.
- Melissa Healy (2018). “Coroner sent letters to doctors whose patients died of opioid overdoses. Doctors’ habits quickly changed.” *Los Angeles Times*, August 9, 2018. See Canvas.
- Additional resource: *OpenIntro Statistics*, sections 6.2 and 7.2–7.4, or *Collaborative Statistics*, chapter 10.

November 2 & 4: Association Between Categorical Variables

- ▷ Problem Set 7 due Monday, November 2.
- Agresti, chapter 8.
- Additional resource: *OpenIntro Statistics*, sections 6.3–6.4, or *Collaborative Statistics*, chapter 11.

November 9: ANOVA

- Agresti, sections 12.3–12.4.
- Additional resource: *OpenIntro Statistics*, section 7.5, or *Collaborative Statistics*, chapter 13.

November 11: Correlation Analysis

- ▷ Problem Set 8 due Wednesday, November 11.
- Agresti, section 9.4.
- Additional resource: *OpenIntro Statistics*, section 8.1.4, or *Collaborative Statistics*, sections 12.6–12.7.

November 16 & November 18: Linear Regression

⇒ Quiz on Monday, November 16. ⇐

- Agresti, sections 9.1–9.3 and 9.5.
- Additional resource: *OpenIntro Statistics*, sections 8.1–8.2 and 8.4, or *Collaborative Statistics*, sections 12.1–12.5 and 12.8–12.9.

November 23 & 25: Thanksgiving Break

November 30: Introduction to Multivariate Relationships

- ▷ Problem Set 9 due Monday, November 30.
- Agresti, chapter 10, sections 11.1–11.3.
- *OpenIntro Statistics*, sections 9.1–9.2 and 9.4.

December 2: Power Analysis.

- *OpenIntro Statistics*, section 7.4.

December 7: Review

- ▷ Problem Set 10 due Monday, December 7.

Tuesday, December 15, 10:30–12:30 pm: Final Exam