PSC 200: Data Analysis I

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Course Description

How do we evaluate empirically the claims politicians make? How do we determine whether theories of political behavior are supported by evidence? What do reporters mean when they refer to a poll being accurate to $\pm 3\%$? In this course, students are introduced to data analysis, statistical inference, and research design relevant to political science research. Topics will include variable measurement, descriptive statistics, confidence intervals, hypothesis tests, correlation, and regression analysis.

Course Meeting and Credits. This course follows the College credit hour policy for four-credit courses. PSC 200 meets three times per week as follows:

Lectures:	Mon & Wed, 2-2:50, Gavett 208
Lab:	Fri, 2-2:50, Gavett 208

Attendance is required for lectures and lab sessions. During the labs, students will receive computer instruction, analyze data, discuss past homework problems, and start on new homework problems. The remaining credit hour is fulfilled through independent reading and a homework each week.

Prerequisites: PSC 200 is intended for students with no (or little) prior experience in statistics. Calculus, matrix algebra, and computer programming are not required and will not be used during the semester. Students are only expected to be familiar with basic (e.g., high school level) algebra.

In that spirit, students may *not* take PSC 200 if they have either (1) scored a 4 or 5 on the Advanced Placement exam in Statistics or (2) already taken another UR course in

statistics, such as ECO 230, PSC 205, PSY/CSP 211, or STT 211/212/213/214. Students who fall into one or both of these categories should ask me for alternative courses to take.

Grading

Course grades will be based on labs/homeworks (40%), a midterm exam (21%), a final exam (36%), and participation/attendance (3%).

The lowest of the homework grades will be dropped when calculating the final course grade. This is to allow for illness or other such unforeseen events. That said, you are strongly encouraged to complete ALL homework assignments. Unless otherwise noted, homeworks will be handed out in lab and are due the following week at the beginning of lab. Students must deliver their homework *in hardcopy* to the TA. Late assignments will be penalized one half-grade (e.g., B to B-) for each day they are late. Homeworks more than seven days late will receive a grade of zero. Finally, while you are encouraged to study together and to learn the software together, all assignments are to be completed individually.

Readings

The following texts are **required**:

- Alan Agresti, *Statistical Methods for the Social Sciences*. 5th edition.

  This is the main textbook for the course. The most recent version is the 5th edition. However, the 4th edition (2008, coauthored with Barbara Finlay) sells used for substantially less and is perfectly acceptable for this class, as is the 3rd edition (1997, also coauthored with Finlay). Note: If you purchase the 3rd or 4th editions, please compare the table of contents to the 5th edition's and make sure to do the appropriate reading each week. All three editions are very similar in terms of their tables of contents. However, there are a few differences.

- John Verzani, *SimpleR: Using R for Introductory Statistics*.

  This is a free PDF about R, the computer program we'll be using for statistical analysis.

Recommended:

- Larry Gonick and Woollcott Smith, *The Cartoon Guide to Statistics*.

  This is an inexpensive and humorous (in a geeky, dad-joke kind of way) introduction to statistics. It might be helpful to start a topic by reading from the *Cartoon Guide*, and then move on to the equivalent sections in Agresti.

Most of the "recommended reading" below consists of articles, with links to an online pdf version (e.g., via JSTOR). To access these, you must be on the UR network or have a VPN connection. Articles without a web link are available on the course blackboard page or in the library reserves. From time to time, these articles may become 'required' reading for homework assignments.

Statistical Program: R

Students will be required to complete homeworks using the R program for statistical analysis. Labs will be held in Gavett 208. However, most academic computing labs on campus have R installed either on Macs or Windows PC's (see the list of computing labs for more information).

R is free, so you may want to install it on your own computer. To do so, you can download R from

- Comprehensive R Archive Network (CRAN). This is the original and most up-to-date version of R. Towards the top of the page is a section titled "Download and Install R." Select your operating system (Mac, Windows, Linux) and follow the links.
- RStudio. This is an integrated environment for R. It contains an editor, console, help, and plot window all in one larger window. Many first-time R users prefer the RStudio environment. It is also free. Just click on the RStudio link at the beginning of this paragraph and follow the download instructions.

Course Outline

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1 Course Introduction

Topics: Arrrgh! Why do I have to take this course?!

Required Reading:

- Agresti, chapter 1.

Recommended Reading:

- *Cartoon Guide*, chapter 1.
- Mike Adams. 1990. "The Dead Grandmother/Exam Syndrome." *Annals of Improbable Research*. (ONLINE)

HW 1: Intro to R

2 Basics of Data Analysis

Topics: Variables & Measurement, Sampling & Surveys, Randomization, Descriptive Statistics, Mean, Variance

Required Reading:

- Agresti, chapters 2–3.

Recommended Reading:

- *Cartoon Guide*, chapters 2, 6 (pp. 89–97).
- Bernard Grofman, William Koetzle, and Anthony McGann. 2002. Congressional Leaders 1965-96: A New Look at the Extremism Versus Centrality Debate. *Legislative Studies Quarterly.* (JSTOR)
- Michael McDonald and Samuel Popkin. 2001. "The Myth of the Vanishing Voter." *American Political Science Review*, Vol. 95, Issue 4: 963–974. (JSTOR)
- John Woolley. 2000. "Using Media-Based Data in Studies of Politics." *American Journal of Political Science*, Vol. 44, Issue 1: 156–173. (JSTOR)

HW 2: Variables & Measurement

HW 3: Descriptive Statistics

3 Probability

Topics: Probability Basics, Discrete & Continuous Variables, Normal Distribution, Conditional Probability

Required Reading:

- Agresti, sections 4.1–4.3.

Recommended Readings:

- *Cartoon Guide*, chapter 3.
- *Law, Probability, and Risk*, Vol. 5, Issue 2 (2006):
  - Peter Tillers and Jonathan Gottfried. "Case Comment: *United States v. Copeland*: A Collateral Attack On The Legal Maxim That Proof Beyond A Reasonable Doubt Is Unquantifiable?"

* James Franklin. "Quantification Of The 'Proof Beyond Reasonable Doubt' Standard."
* Jack Weinstein and Ian Dewsbury. "Comment On The Meaning Of 'Proof Beyond A Reasonable Doubt'."

HW 4: Probability

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4 Estimation and Inference

Topics: Sampling Distributions, Central Limit Theorem, Estimators & Their Properties, Confidence Intervals

Required Reading:

- Agresti, sections 4.4–4.7, 5.1–5.4, 5.6.

Recommended Reading:

- *Cartoon Guide*, chapters 6–7.

HW 5: Probability and Sampling Distributions

HW 6: Estimators and Confidence Intervals

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5 Midterm Review

Midterm reviews held during lecture and lab.

6 Midterm Exam

Covers all material to date.

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7 Hypothesis Tests

Topics: Hypothesis Tests, Type I and II Errors

Required Reading:

- Agresti, 6.1–6.5.

Recommended Reading:

- *Cartoon Guide*, chapter 8.

Lab will cover midterm answers and grades.

8 Comparing Two Groups

Topics: Difference of Means, Difference of Proportions

Required Reading:

- Agresti, sections 7.1–7.4.

Recommended Readings:

- *Cartoon Guide*, chapter 9.
- James Payne. 1982. Career Intentions and Electoral Performance of Members of the U. S. House. *Legislative Studies Quarterly.* 7(1):93-99. (JSTOR)

HW 7: Hypothesis Tests & Difference of Means/Proportions

9 Research Design

Topics: Types of Research Design, Internal & External Threats to Validity, Experimental Data

Required Reading:

- James McDavid & Laura Hawthorn. 2005. *Research Designs for Program Evaluations.* Chapter 3. (Sage Proof)(Google Books)
- Research Methods Knowledge Base, Section on Design

Recommended Readings:

- *Cartoon Guide*, chapter 10.
- Thomas Walker, Lee Epstein and William Dixon. 1988, "On the Mysterious Demise of Consensual Norms in the United States Supreme Court." *Journal of Politics*, Vol. 50, Issue 2: 361–389. (JSTOR)
- Valeria Hoekstra and Jeffrey Segal. 1996. "The Shepherding of Public Opinion: The Supreme Court and *Lamb's Chapel*." *Journal of Politics*, Vol. 58, Issue 4: 1079–1102. (JSTOR)
- Daniel Posner. 2004. "The Political Salience of Cultural Difference: Why Chewas and Tumbukas are Allies in Zambia and Adversaries in Malawi." *American Political Science Review*, Vol. 98, Issue 4: 529–545. (JSTOR)

HW 8: Research Design

10 Crosstabs & Association

Topics: Cross-Tabulations, Goodness of Fit, Chi-Square Test, Measures of Association

Required Reading:

- Agresti, chapter 8

Recommended Readings:

- Lee Epstein and Charles Hadley. 1990. "On the Treatment of Political Parties in the U.S. Supreme Court, 1900–1986." *Journal of Politics*, Vol. 52, Issue 2: 413–432. (JSTOR)
- Roy Licklider. 1995. "The Consequences of Negotiated Settlements in Civil Wars, 1945–1993." *American Political Science Review*, Vol. 89, Issue 3: 681–690. (JSTOR)

HW 9: Crosstabs & Association

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11 Correlation and Bivariate Regression

Topics: Linear relationships, Correlation, Bivariate Regression, Regression Assumptions

Required Reading:

- Agresti, chapter 9.

Recommended Readings:

- *Cartoon Guide*, chapter 11.
- W.S. Robinson. 1950. "Ecological Correlations and the Behavior of Individuals." *American Sociological Review*, Vol. 15, Issue 3: 351–357. (JSTOR)
- Edward Tufte. 1973. "The Relationship Between Seats and Votes in Two-Party Systems." *American Political Science Review*, Vol. 67, Issue 2: 540–554. (JSTOR)

HW 10: Correlation & Bivariate Regression

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12 Multiple Regression

Topics: Multiple Regression, R^2, F-Test, Dummy Variables, Interaction Terms, Quadratic Terms

Required Reading:

- Agresti, chapters 10, 11.1-11.5, 12.1, 13.1-13.3, 14.1-14.3, 14.5

Recommended Readings:

- Mark Duggan. 2001. "More Guns, More Crime." *Journal of Political Economy*, Vol. 109, Issue 5: 1086–1114. (JSTOR)
- Steven Fish. 2002. "Islam and Authoritarianism." *World Politics*, Vol. 55, Issue 1: 4–37. (JSTOR)
- Bruce Russett. 1982. "Defense Expenditures and National Well-being." *American Political Science Review*, Vol. 76, Issue 4: 767–777. (JSTOR)

HW 11: Bivariate & Multiple Regression

HW 12: Multiple Regression: Dummies, Interactions, & Quadratic Terms

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13 Logistic Regression (if time permits)

Topics: Regression with Binary Data, S-curve, Likelihood Ratio Test

Required Reading:

- Agresti, chapter 15.1-15.3

Recommended Readings:

- John Oneal and Bruce Russett. 1997. "The Classical Liberals Were Right: Democracy, Interdependence, and Conflict, 1950–1985." *International Studies Quarterly*, Vol. 41, Issue 2: 267–294. (JSTOR)

HW 13: Logistic Regession

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14 Final Exam Review

Final exam reviews held during lectures and lab the last week of class.

15 Final Exam (TBD: Finals Week)

Covers all material to date.

Other Important Items

Course Organization. The course organization may be adjusted/optimized during the semester according to the pace of learning and the priority of topics. Students are responsible for attending lectures and maintaining an awareness of any changes to the course materials, homework requirements, or exam dates.

Student Disability Accommodation: I am happy to work with any student who requires an accommodation due to a disability. It is important that students first contact the Office of Disability Resources. They will discuss any barriers a student is experiencing, explain the process for establishing academic accommodation, and coordinate with me concerning the accommodation. You can reach the Office of Disability Resources at disability@rochester.edu or (585) 276-5075.

Academic Honesty. Students are expected to be familiar with the University's policies on academic honesty. If I suspect a student has violated the University's academic honesty policies, I am required to initiate the procedures detailed on that webpage. Punchline: don't cheat. If in doubt about what is acceptable behavior concerning completing an exam or homework, please ask me.

Updated: 1/14/19