

PS 103

Political Science Research Methods

Spring 2021

Schedule: T/Th 10:30–11:45

Syllabus Last Updated: April 9, 2021

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<http://calendly.com/profschaffner>

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Course description

Political scientists frequently use quantitative methods to address questions about citizens' political attitudes, elections, wars, policy outcomes, and other important political phenomena. This course will consider the general concepts underlying empirical research, including causal inference, research design, statistical analysis, and programming. The goal is to help students become informed consumers of quantitative social science research and provide them with useful tools for undertaking empirical research of their own.

Learning objectives

By the end of this course, students should be able to:

- Apply basic concepts from probability theory and causal inference to social science research questions.
- Make inferences about population means and proportions from samples.
- Correctly conduct and interpret hypothesis tests.
- Present data using graphics and descriptive statistics in a clear and informative manner.
- Understand linear regression in theory and practice (e.g., read and interpret regression tables in academic articles).
- Conduct statistical analyses using R.
- Work collaboratively with other students to develop a research question, hypothesis, and design, analyze, and present your findings in a clear and logical manner.

Approach

The best way to learn statistics and programming is to “learn by doing.” We will therefore often combine traditional lecturing with a hands-on approach. Many topics will be broken up into sections: I will first explain a concept, we will write code to implement the concept in practice, and/or students will work in groups or on their own on in-class exercises.

Course Modality

Due to the pandemic, this course will be conducted entirely online. Lectures on key concepts will typically be delivered synchronously on Zoom. Tutorials on writing code to implement these concepts will typically be pre-recorded; this will allow you to pause the tutorial if you run into an issue and then re-start once you have resolved the issue. We will also set aside time during synchronous meeting times so that I can address questions regarding these tutorials.

To help ensure ease of communication among members of the class, we will have a Slack workspace dedicated to the course. This is a platform where you can send either direct or broadcast messages to myself, the TA, and others in the class. It is also a platform where I will make class announcements. I encourage you to install the Slack app on your computer and/or mobile device so that you get in the habit of checking it regularly.

Textbook

The following textbook is required.¹

- David Diez, Mine Cetinkaya-Rundel, Christopher D Barr. OpenIntro Statistics (4th Edition). Download for free (or pay what you want) here: <https://leanpub.com/openintro-statistics>. Hard copy available on Amazon.com for \$20.

Other resources

Other course materials will be posted on Canvas. I also recommend using as many other resources as you need to supplement the required materials. These are optional, but here are a couple I have found to be helpful:

- [Khan Academy videos on probability and statistics](#)
- [Statistics Done Wrong](#): free online textbook helpful for better understanding statistical significance and hypothesis testing

Statistical software and consulting

The software of the course is the free and open source R programming language and RStudio, a user-friendly interface for R. You will execute all programming code within the RStudio environment and use RMarkdown for all problem sets. We will go over what this means during the first class.

Because this class will be conducted entirely online, this semester I am asking students to work in R Studio Cloud rather than install R Studio on your own laptop, at least during the first half

¹Though keep in mind the following sentiment, articulated by political scientist Christopher Achen giving advice for students in a political methodology course: “Ah, the textbook. You will almost certainly dislike the text—virtually every student does, no matter which book is chosen... No text works well for everyone, and no text works well all the time for anyone.” – *The Political Methodologist*. 10(2): 11. It is suggested you use other resources to supplement your learning (see “Other resources” section).

of the semester. R Studio Cloud is a web-based version of R; the free license has limitations in terms of storage capacity and the number of projects you can create, so later during the semester I will provide instructions on how to install R on your own machine. To use R Studio Cloud, all you need is an internet connection and a web browser. You can sign up for an account here: <https://rstudio.cloud/>

If you have problems using R or with statistical analysis throughout the term, please consult the following resources in this general order:

1. Help from within R: Simply type `?` for any R command in the command window and the help file for that command will appear. For instance, type `?summary` for more information on the `summary` command.
2. Type your specific question, problem, or error message into <https://rseek.org/>, a custom search engine that basically filters Google results for R-relevant information.
3. Type your specific question, problem, or error message into Google. Someone has likely asked a similar question in the past. Sites such as Stack Overflow (<https://stackoverflow.com/questions/tagged/r>), a question and answer site for programmers, contain answers to many basic, intermediate, and advanced questions. Your ability to search for and find answers to these questions independently is an important but often unrecognized component of learning a statistical programming language.
4. Consult the following online learning resources:
 - R Cookbook: <http://www.cookbook-r.com/>
 - Quick-R: <https://www.statmethods.net/index.html>
5. Post your issue to the #R-help channel on the class's Slack workspace. You will get a response from me, the TA, or other students in the class and this might help other students who have run into the same problem.
6. Contact the Tufts Data Lab for data analysis assistance: <https://sites.tufts.edu/datalab>
7. Contact me or the TA via email, during office hours, or schedule an appointment (see below for more information on office hours and appointments). Note: when you contact me or the above consultants for R help, please send/bring a precise description of your problem along with your code, data, and a screenshot of the R output, which will help us more quickly diagnose the problem.

Office hours and communication

Office hours are designated times faculty members set aside each week specifically for students to visit. These hours are your chance to come by and ask questions about the course material or college in general. Office hours are most helpful if you have done some studying or attempted to solve a problem and discovering what you need help with before coming to my office. Then, when you come in with substantive and specific questions about course material, I can try to explain a different way or help you work through a problem.

Because I am holding office hours on Zoom, I do ask that you book a time in advance to ensure that we will be able to meet. You can check my availability each week and schedule a time to come in using the following link: <http://calendly.com/profschaffner>. You can book any time listed there, even if it is outside my normal office hours. For an office hours meeting with Zach

(the TA) you can book here: <https://calendly.com/zach-l-hertz/office-hours>. If no slots are available, please email me or Zach to figure out an alternate meeting time.

I make announcements via Canvas, on Slack, and in class.

Academic integrity

Tufts holds its students strictly accountable for adherence to academic integrity. The consequences for violations can be severe. It is critical that you understand the requirements of ethical behavior and academic work as described in Tufts' Academic Integrity handbook. If you ever have a question about the expectations concerning a particular assignment or project in this course, be sure to ask me for clarification. The Faculty of the School of Arts and Sciences are required to report suspected cases of academic integrity violations to the Dean of Student Affairs Office. If I suspect that you have cheated or plagiarized in this class, I must report the situation to the dean.

Academic Support at the StAAR Center

The StAAR Center (formerly the Academic Resource Center and Student Accessibility Services) offers a variety of resources to all students (both undergraduate and graduate) in the Schools of Arts and Science, Engineering, the SMFA and Fletcher; services are free to all enrolled students. Students may make an appointment to work on any writing-related project or assignment, attend subject tutoring in a variety of disciplines, or meet with an academic coach to hone fundamental academic skills like time management or overcoming procrastination. Students can make an appointment for any of these services by visiting our website: go.tufts.edu/StAARCenter

Students with disabilities

Tufts University values the diversity of our students, staff, and faculty; recognizing the important contribution each student makes to our unique community. Tufts is committed to providing equal access and support to all qualified students through the provision of reasonable accommodations so that each student may fully participate in the Tufts experience. If you have a disability that requires reasonable accommodations, please contact the StAAR Center (formerly Student Accessibility Services) at StaarCenter@tufts.edu or 617-627-4539 to make an appointment with an accessibility representative to determine appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively, making timeliness a critical aspect for their provision.

Mental health and wellness

There are a number of resources available to you on campus to support your wellness, including your advising dean and Counseling and Mental Health services <http://students.tufts.edu/health-and-wellness/counseling-and-mental-health>. I encourage you to use these resources to take care of yourself throughout the term, and to come speak to me if you experience difficulties. If you encounter financial challenges related to this class, please let me know.

Assignments and grading

Grades will be based on the components below and final course grades will be curved to ensure that the class median grade is at least a B+. All work is due at the time specified; any changes to the deadlines listed below will be announced on Canvas and in class. Late work will not be accepted without written permission from me well in advance of the deadline. There are no make-up exams or quizzes.

Quizzes – 10%

There will be a short, open-book quiz administered on Canvas before many classes. Quizzes become available after the previous class ends and are available until 15 minutes before the next class begins. These are designed to ensure students are not falling behind and that they arrive to class prepared to engage with the lecture material and other activities. You should complete these quizzes yourself with no assistance from your colleagues; you may not discuss them with other students prior to class. Each student's two lowest quiz grades will be dropped in final grade calculations.

Problem sets – 20%

Many weeks you will be assigned short, take-home problem sets. For each problem set, you will create a PDF and .rmd file using RMarkdown in which your code, output, and answers are embedded. Title your documents `problemsety_XXXXXX.pdf` and `problemsety_XXXXXX.rmd` where `y` is the problem set number and `XXXXXX` is your student ID, list your student ID as the “author” in Markdown, and upload the assignment to Canvas before class begins.

These are individual assignments that you should prepare yourself. You may work in groups of up to 4 people to complete the assignment, though you are not required to work in groups at all. You need to produce your own code and write your own answers to each question. You should never copy another person's code/answers or email your code/answers to another person. This is a violation of the academic honesty policy. It is *not* a violation of the academic honesty policy to copy code from Stack Overflow or other websites and online forums, since that is a useful way to learn how to understand and use code. If you do copy code from the internet, please include a link to the site where you obtained the code in your submitted problem set.

Midterm exam – 20%

The midterm exam will be held online on March 18th and will cover the material covered in class up to that point. There will be both a paper and online/coding component. Students must work independently on the exam.

Research project – 25%

You will be assigned to a group of about 4 students early during the term. You will work together to create a poster presentation and to write-up a description of your results. You will formulate a research question, design and execute a plan to study that research question, and create a research poster in which your research hypothesis and design are articulated and the results are presented and interpreted. The write-up of your results will be submitted as a double-spaced paper no longer than 1,000 words.

We will discuss the project in more detail in class. A one page, single-spaced, 12-point-font proposal is due on 3/25 on Canvas by 10:30am. A research poster and the final write-up interpreting your results, as well as your R script file that replicates all analyses, will be due the last day of class on 5/4. Failure to meet any of these deadlines will result in a reduced project grade. You will be evaluated on the quality of the proposal, analysis, and final poster/write-up. Do not worry about having statistically significant results! You will not be evaluated on whether your hypothesis was supported.

Research project components – 20%

- Research proposal (3/10 10:30am)
- Poster session and write-up of results due (5/4)

Peer evaluations – 5%

To help ensure that each team member is actively contributing to the research project's success, students will be asked to anonymously evaluate their teammates' and their own contributions, effort, and performance. The end-of-term evaluations will be submitted once the research project is complete and the average of scores you receive from your teammates will be worth 5% of your research paper grade. You will receive a 0 for this portion of your grade if you do not submit end-of-term evaluations for the rest of your team.

Final exam – 25%

A comprehensive final exam will be held online on the day assigned by the college registrar. Students must work independently on the exam. We will review for the final exam on the last day of class.

Course Schedule

Note: The syllabus and course schedule may be modified at any time. Please consult the current version of the syllabus posted on Canvas.

T 2/2 – Why statistics for politics?

- Obtain textbook!
- Take course survey on Canvas

Th 2/4 – R Tutorial (Asynchronous)

- Take course survey if you haven't already
- Create an R Studio Cloud account
- Watch R Tutorial and R Markdown Tutorial videos
- Complete R Markdown assignment

T 2/9 – Inference

- Barakso, Sabet, and Schaffner Introduction and Ch. 1

Th 2/11 – Measurement and data collection

- Barakso, Sabet, and Schaffner Ch. 4

Th 2/18 – Sampling and survey problems

- OpenIntro 1.1–1.3
- Nate Cohn: [A 2016 Review](#)
- *Problem set 1 assigned*

T 2/23 – Descriptive statistics

- OpenIntro Ch. 2
- Problem set 1 due

Th 2/25 – Descriptive statistics (cont.) & Probability distributions

- OpenIntro Ch. 3 & 4.1
- *Problem set 2 assigned*

T 3/2 – Confidence intervals

- OpenIntro 5.1–5.2 & 7.1–7.1.4 (stop on p. 257)
- Problem set 2 due

Th 3/4 – Confidence intervals (cont.) & Hypothesis tests

- OpenIntro 5.3 & 7.1.5
- *Problem set 3 assigned*

T 3/9 – Confidence Intervals and Hypothesis tests in R (Asynchronous)

Th 3/11 – Type I and Type II errors

- Review OpenIntro 5.3.3

- Barakso, Sabet, and Schaffner Chapter 2
- Problem set 3 due
- *Research project groups assigned*

Th 3/16 – Midterm exam review

- Study!

Th 3/18 – Midterm exam

- Study!

T 3/23 – Differences of means and proportions

- OpenIntro 6.2 & 7.2–7.3
- *Problem set 4 assigned*

Th 3/25 – Differences of means and proportions (cont.)

- Research proposals due on Canvas by class

T 3/30 – Associations between categorical variables (chi-squared)

- OpenIntro 6.3–6.4
- Problem set 4 due

Th 4/1 – Flex day

- TBA

T 4/6 – Linear regression and correlation I

- OpenIntro 8.1–8.3
- *Problem set 5 assigned*

Th 4/8 – Linear regression and correlation II

- OpenIntro 8.4

T 4/13 – Linear regression III

- Problem set 5 due

Th 4/15– Multivariate relationships & Multiple regression

- OpenIntro Ch. 9 (but not 9.5)
- *Problem set 6 assigned*

T 4/20 or 4/22– Research group meetings w/ Prof. Schaffner

- Sign-up for meeting time on Calendly

T 4/27 – Multiple regression (cont.)

- Read resources for creating poster presentation (links in research project guidelines page on Canvas)
- Problem set 6 due by 12pm

Th 4/29 – Causation wrap-up & Experiments

- Costas Panagopoulos, “Extrinsic Rewards, Intrinsic Motivation and Voting”
 - Goal: Understand Table 2
- Barakso, Sabet, and Schaffner Ch. 5

T 5/4 – Final exam review

- Research posters due on Canvas before class
- Write-up due on Canvas before class
- Final exam review

S 5/9 - M 5/10 – Final exam on Canvas

- Study!