PIA 2022: INTRODUCTION TO QUANTITATIVE METHODS

Fall 2022

Lecture: Tuesdays, 6:00pm –9:00pm;
Classroom: 125 Frick Fine Art Building

Instructor: Rena Sung
Office Hours: Tuesdays from 4:30pm-5:30pm (Room: TBD and by appointment)
E-mail: res176@pitt.edu

M, 3:00PM – 4:55PM (Section 1025, Room 3610 Posvar): Xin Han
T, 1:00PM - 2:55PM (Section 1030, Room 3911 Posvar): Rachel Travis
TH, 6:00PM – 8:00PM (Section 1040, Room 3800 Posvar): Rachel Travis
F, 9:00AM – 11:00AM (Section 1035, Room 3800 Posvar): Xin Han

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COURSE DESCRIPTION

This is an introduction to Quantitative Analysis. Achieving basic quantitative literacy is important for anyone interested in public policy. The widespread availability of data and the ease of access to software with which to analyze data has helped us find meaningful implications about what is happening around us. This course will provide you with a solid foundation in the principles of quantitative analysis and how this relates to the study and practice of public policy. It will strengthen your ability to ask good questions of statistics presented to you and lay the foundation for your own use of statistics in policy research.

PRE-REQUISITES

There are no pre-requisites for this course, except high-school level math (algebra). However, quantitative methods are, of course, mathematical, and so the informal pre-requisite is a willingness to learn about mathematical techniques used to study policy.

Learning Objectives

- Understand quantitative methods used in public policy and administration field
- Be able to read and interpret statistical information

- Be able to perform statistical analysis using R (Create basic graphs in R, Calculate descriptive statistics, Calculate basic inferential statistics, Import and analyze simple data sets)
- Demonstrate an ability to apply various statistical tool to solve policy problem

TEXTBOOK AND INSTRUCTIONAL SESSIONS

Harold O. Kiess and Bonnie A Green. 2010. Statistical Concepts for the Behavioral Sciences. Fourth Edition. Boston: Allyn & Bacon.

Please get the correct edition. All chapters listed below are from this book.

SOFTWARE

In this class we will use the computer programs R and Rstudio to conduct data analysis. No textbook needed for R. I will provide separate notes on R so that you can practice.

Please download both R and RStudio as RStudio requires the installation of R. R and RStudio are widely used in academia, government and business for data analysis and they are free!

Download R here: https://www.r-project.org/ (You will be asked to choose a CRAN, which is a package repository storing versions of codes and documentation for R. You can choose any CRAN for your convenience and I choose Statlib because it is located in Pittsburgh)

Download RStudio here: https://www.rstudio.com/products/rstudio/download/#download

LEARNING AND EVALUATION

This course will help you become a more critical consumer and producer of statistics. Doing so necessarily involves math, which instills fear in many students. Students worried about their math skills may be concerned about earning a good grade. I am confident that you will learn much and do reasonably well in the course if you follow this advice:

1. *Review the material after class.* I put more emphasis on reviewing the material after class than reading it before class (but they are both important!). There will be a few weeks for which you will be asked to read an article before class. I will let you know in advance.

2. *Complete all homework assignments (35%).* After class each week (save a few exceptions), a homework assignment will be posted on Canvas. The assignments will usually involve problems from the textbook and questions related to a specific data set or exercises to be completed in R. The assignments are arguably the most important part of class in terms of helping you to learn the material.

   I will post assignments following class and they will be due before the start of the next class. Late work will be penalized unless you have requested an extension or due to exceptional

circumstance. As discussed further below under policies, if you need an extension please communicate that to the instructor.

To do well on assignments, I encourage you to start them well in advance of the due date. To account for life's ups and downs, I will drop your lowest individual grade on a weekly assignment. Grading will be rough: a zero for a missing assignment; 1 for incomplete work; and 2 for complete homework.

3. *Attend your recitation section*. Because you will (ideally) have attempted your homework assignment *before* recitation section, you will be able to ask questions and clarify what is needed to complete your weekly assignment.

4. *Meet with fellow students to discuss the weekly assignment and clarify any remaining issues before submitting it*. You may consult with other students on your weekly assignments, though the work you turn in must be your own. What does this mean? It means that a group of students can discuss how to approach a problem, but each student should perform their own calculations and write their own answers. We will communicate via Piazza, an interactive platform for questions and discussions.

5. *Attend office hours.* The TAs and I will hold office hours throughout the semester. We are here to answer any questions you have about the material and to clarify points of confusion. Students should feel free to "show up" in groups (rather than individually) if there are common questions.

6. *Study for the exams (20% and 30% respectively)*. If you dedicate the necessary time to all of the above, the hope is that the two exams—a midterm and a final—will be straightforward. The main purpose of the exams is to keep you accountable. Many of you will be tempted to rely on others in preparing your weekly assignments, and this will mean you will not fully internalize the material. If you do not put in the necessary time on the weekly assignments, you will not learn, and you will not do well on the exams. On the other hand, if you understand the materials covered on the homeworks, you are more likely to do well on the exams.

Exams will be open book, open note, and take-home. However, you may not speak with anyone, or get assistance from anyone, during the exams. The midterm is worth 20% and the final is worth 30%. Additional details about the midterm and final will be available as they approach.

7. *Write a data report (due on 12/4).* You will be asked to write a data report based on your research question and a dataset addressing the question. The data report (Maximum 8 pages including figures and tables) will include 1) your research question, 2) descriptive statistics and source of your original data, 3) your hypothesis, 4) results of empirical analysis, and 5) summary.

Grading:

Weekly assignments: 35% (lowest individual assignment grade dropped)
Midterm exam: 20%
Data report: 15%
Final exam: 30%

COURSE OUTLINE

This course consists of four parts:

Part I: Statistics and their use: Measuring something and describing data you have

Why study statistics? The first step in quantitative analysis is being able to measure something of interest. Measurement is often far from straightforward, especially when dealing with the socially constructed concepts that policymakers deal with all the time. We will discuss the difficulties of measurement and then how to describe important aspects of the measures one collects. What does our data look like? What is the average measure of the people (or other units) we have measured? How much variation is there among people (or other units) in this regard? We will consider these questions and cover key concepts related to measures of central tendency and dispersion.

Part II Inferring from data you have to observations you have not measured

Usually we collect data from a "sample"— a subset of a broader "population" of units (such as people, cities, or countries). Usually we are interested in what is happening in the broader population, not just the sample. In these weeks, we will learn about descriptive inference: drawing conclusions about people (or other units) on which we do *not* have data by using data that we *do* have.

Part III: Using data to establish differences between groups when policy is randomly assigned

Once we have used inference to learn descriptive information about groups, we can ask questions about whether groups are different. With tools from Parts I-III, we can begin to consider two groups—for example, one that was subject to a certain policy and one that was not—and ask whether the two groups are substantively different.

In this part of the class, we will consider how to do this when units have been randomly assigned into the two groups. We will learn what random assignment means and learn about policies that can be analyzed in this way. We will then learn techniques that help us establish whether the resulting groups are indeed different (that is, whether the policy had an effect) or whether they are different due to random chance, sampling error, and the like.

Part IV: Using data to establish differences between groups when policy is not randomly assigned

In most settings, however, a policy is *not* randomly assigned. Understanding causal effects in these circumstances is more complicated. In these weeks, we will learn about the difference between correlation and causation, and how one might "predict" one variable by its correlation with another. We will finish by discussing the general difficulties involved in establishing a causal effect in these circumstances (that is, when a policy is not randomly assigned). In this discussion, you will be made aware of statistical techniques such as linear regression that can help (but usually not entirely solve) these issues, and which you can learn more about in other quantitative methods classes.

COURSE SCHEDULE

In addition to readings listed below, any additional readings not from Keiss and Green will also be linked in the appropriate weekly module. Any modifications to the schedule will be modified well in advance.

Part I Statistics and Their Use

August 30 (week 1): Introduction to Statistics, Inference, Measurement and Research

- Chapters 1-2 in Kiess and Green.
- Pittsburgh report on inequality by gender and race (summary and introduction)

RECITATION WEEK 1

September 6 (week 2): Measures of Central Tendency and Variability

- K&G Chapters 3, 4, 5,
- Pittsburgh inequality by gender and race: sections "Poverty and Income" + page 82, and "Summary"

Part II: Inferring from data you have to observations you have not measured

September 13 (week 3): The Normal Distribution, Probability and Standard Scores

- K&G chapters 6

Finish assigned sections of Pittsburgh inequality report if you have not done so

September 20 (week 4): Using Statistics for Inference and Estimation

- K&G Chapter 7

Part III Using data to establish differences between groups when a policy is randomly assigned

September 27 (week 5): Introduction to Statistical Hypothesis Testing: Is There Really A Difference?

- K&G Chapter 8

October 4 (week 6): Midterm on weeks 1-5

- Take-home online

October 11 (week 7): The Basics of Experimentation and Testing for a Difference between Means

- K&G Chapter 9

October 18 (week 8): The Basics of Experimentation and Testing for a Difference between Means, continued

- K&G Chapter 9
- Optional additional reading
  The first 8 pages of "The Cult of Statistical Significance" by Ziliak and McCloskey

October 25 (week 9): Difference in Differences and Categorical Testing.

- "Estimating Policy Effects Using a Difference-in-Difference Approach" (Weber)
- "Expansion in Direct Payments Did Not Lead to More Crop Production" (Weber and Key)

November 1 (week 10): Testing for a Difference When a Policy has Several Levels

- K&G Chapter 10

Part IV: Using data to establish differences between groups when policy is not randomly assigned

November 8 (week 11): Correlation and covariation

- Chapter 13

November 15 (week 12): Introduction to bivariate regression

- Chapter 14

November 22 No class – Thanksgiving break

November 29 (week 13): Finish regression (interpretation, application)

- Chapter 14
- Optional additional examples:
  - Snyder, Donald. 1989. "Speeding, Coordination, and the 55-MPH Limit-Comment." *American Economic Review* 79(4): 922-925.
  - Neumayer, Eric. 2003. "The Determinants of Aid Allocation by Regional Multilateral Development Banks and United Nations Agencies." *International Studies Quarterly* 47(1): 101-122.

December 6 (week 14)**:** Review for Final
Final exam available from December 7 to December 13

Policies

Your Well-Being Matters

Graduate school can be an exciting and challenging time for students. Taking time to care for yourself and seeking appropriate support can help you achieve your academic and professional goals. You are encouraged to maintain a healthy lifestyle by eating a balanced diet, exercising regularly, avoiding drugs and alcohol, getting enough sleep, and taking time to relax.

It can be helpful to remember that we all benefit from assistance and guidance at times, and there are many resources available to support your well-being while you are at Pitt. If you or anyone you know experiences overwhelming academic stress, persistent difficult feelings and/or challenging life events, you are strongly encouraged to seek support. In addition to reaching out to friends and loved ones, consider connecting with a faculty member you trust for assistance connecting to helpful resources. The University Counseling Center is also here for you. You can call 412-648-7930 at any time to connect with a clinician.

If you or someone you know is feeling suicidal, please call the University Counseling Center at any time at 412-648-7930. You can also contact Resolve Crisis Network at 888-796-8226. If the situation is life threatening, call Pitt Police at 412-624-2121 or dial 911.

Academic Integrity

All students are expected to adhere to the standards of academic honesty. Any student engaged in cheating, plagiarism, or other acts of academic dishonesty would be subject to disciplinary action. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity http://www.provost.pitt.edu/info/ai1.html. This may include, but is not limited to the confiscation of the examination of any individual suspected of violating the University Policy.

Disability Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu, (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Helpful Resources

1. Canvas online student toolkit: https://teaching.pitt.edu/featured/online-student-toolkit-canvas-course/
2. Two approaches to reading efficiently
    a. https://twitter.com/garritzmannj/status/1334482798535725057?s=20
    b. https://twitter.com/chrmosimann/status/1308227997640478720?s=20