Course Syllabus

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Pitt Online

PIA 2022: Quantitative Methods

PREREQUISITE

There are no prerequisites for this course, except high-school-level math (algebra). However, quantitative methods are, of course, mathematical, and so the informal prerequisite is an openness to consider the usefulness of mathematical techniques in the study of policy.

GOALS OF THE COURSE

At the heart of public policy is the idea that one can *make a difference*. That is, if some policy action is taken, something will happen. At the heart of this course is a question: how do we know if this is the case? How do we know if there is a difference?

This is a course about using data and statistical techniques to study whether something has made a difference. This is an introductory course, and you should not think that by the time you finish this course you will be able to answer a question about difference unequivocally. (Indeed, as you will learn in this class, there are reasons that answering such a question is often impossible to do unequivocally.) However, you will gain a solid foundation in the principles of quantitative methods, and indeed the course may give you a different perspective on policy analysis in general.

TOPICAL OUTLINE

The course is divided into **5 Parts**:

PART 1: INTRODUCTION

We will discuss the syllabus and general outline and goals of the course.

PART 2: MEASURING SOMETHING, AND DESCRIBING THE DATA YOU HAVE

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. In these weeks, 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?

Lectures:

- The Idea of Measurement
- Describing Data: Distributions and Measures of Central Tendency and Variability

PART 3: INFERRING FROM DATA YOU HAVE TO OBSERVATIONS YOU HAVE NOT MEASURED

Almost always, the data that we collect comes from a “sample”—that is, a small part of a broader “population” of units (such as people, cities, countries, and so forth). And almost always, what most interests us is 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. This is one of the most important steps in quantitative analysis and involves assumptions about probability and distributions, so first we will have to learn a bit about these.

Lectures:

- The Normal Distribution, Probability, and Standard Scores
- Using Statistics for Inference and Estimation

PART 4: USING DATA TO ESTABLISH DIFFERENCES BETWEEN GROUPS WHEN A POLICY IS RANDOMLY ASSIGNED

Once we have used inference to learn descriptive information about groups, we can ask questions about whether groups are different or similar. Now you see where the preceding weeks have been leading in the context of this course: they have laid the groundwork for deciding whether two groups are different. With these tools, 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 this means (“random assignment”) and learn about policies around the world 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).

Lectures:

- Is There Really A Difference? Introduction to Statistical Hypothesis Testing
- The Basics of Experimentation and Testing for a Difference Between Means
- Testing for a Difference When a Policy Has Several “Levels”
- Testing for a Difference When There are Two Policies at Work

PART 5: USING DATA TO ESTABLISH DIFFERENCES BETWEEN GROUPS WHEN A POLICY IS NOT RANDOMLY ASSIGNED

In most settings, however, a policy is not randomly assigned. Understanding causal effects in these circumstances is considerably 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 (regression). 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 that can help (but usually not entirely solve) these issues, and which you can learn more about in other quantitative methods classes.

Lectures:

- Correlation: Understanding Covariation
- Regression Analysis: Predicting Linear Relationships

REQUIRED MATERIALS

Kiess, Harold O. and Bonnie A. Green. 2010. *Statistical Concepts for the Behavioral Sciences.* 4th ed. Boston, MA: Allyn & Bacon.

- **NOTE:** Please obtain the correct edition, ISBN-13: 978-0205626243.

RECOMMENDED MATERIALS

Berman, Evan M. 2007. *Essential Statistics for Public Managers and Policy Analysts*. 2nd ed. Washington, DC: CQ Press.

- **NOTE:** The edition for the Berman book is unimportant. It is suggested merely to provide more accessible examples.

Gohmert, Elizabeth, Quan Li, and Douglas Wise. 2021. *Easy R: Access, Prepare, Visualize, Explore Data, and Write Papers*. Thousand Oaks, CA: SAGE.

COURSE EVALUATION

Assignment Point Values

ITEM EVALUATED	PERCENTAGE OF FINAL GRADE
Homework (11 Problem Sets and one Writing Assignment)	40%
Quizzes	5%
Midterm Exam	25%
Final Exam	30%
Total	**100%**

Grading Scale

GRADE	POINTS
A	93-100
A-	90-92.999
B+	87-89.999
B	83-86.999
B-	80-82.999
C+	77-79.999
C	73-

	76.999
C-	70-72.999
D+	67-69.999
D	63-66.999
D-	60-62.999
F	LESS THAN 60

GRADING POLICY

- I will drop your lowest individual grade on an assigned problem set.
- Late assignments will be subject to a 25% per day lateness penalty, except under truly exceptional circumstances. “I had an extremely busy week,” is not an exceptional circumstance. **Please be aware of the due dates and times listed for each assignment.**
- Assignments must be submitted via the proper submission portal. Emailed assignments will not be accepted. **All assignments must be submitted in PDF format.**
- Numerical answers alone will not be accepted for full credit. To receive full credit, all steps of the assignment’s answers must be shown.

COVID-19 STATEMENT

I want to be frank. Life is challenging right now, and none of us are really okay. **We’re all just pretending.**

You most likely know people who have lost their jobs, have tested positive for COVID-19, have been hospitalized, or perhaps have even died. Most or all of you have had changes in your work responsibilities and increased family care responsibilities. You might be caring for extra people right now, and you are likely facing uncertain job prospects (or have been laid off!).

I’m fully committed to making sure that you learn everything you were hoping to learn from this class! I will make whatever accommodations I can to help you understand the class material. Under ordinary conditions, I am flexible and lenient with grading and course expectations when students face difficult challenges. Under current conditions, that flexibility and leniency is intensified.

If you tell me you are having trouble, I will not judge you or think less of you. I hope you'll extend me the same grace.

You *never* owe me personal information about your health (mental or physical).

If you need extra help, or if you need more time with something, or if you feel like you're behind or not understanding everything, **do not suffer in silence!** Talk to me! I will work with you. **I promise.**

Please email me to set up a time to meet over Zoom, or we can have an email dialogue, if you prefer.

I want you to learn lots of things from this class, but I primarily want you to stay healthy, balanced, and grounded during this crisis.

LEARNING PROCESS AND EVALUATION

My hope is that this course will change the way you think about analysis, not just quantitative analysis. However, there is no way to get around the mathematics in this course, and that instills fear for many students. More directly, they are afraid that they are not good at mathematics, which means they will not get a good grade in the class.

My job is to convey this material to you in a way that helps you learn it. In an ideal world, I would not have to give grades, as the objective of the course has nothing to do with grades. However, grades are (unfortunately or fortunately) a useful motivator in the process of learning. Grades are therefore used in this class in a way that I hope maximizes their usefulness in terms of your learning.

These are the steps to learning in this class:

1. **Read the material for each lecture before viewing that lecture**. This will be your first exposure to the substance of that week in the course. A detailed list of readings is found within the course modules. It is highly recommended that, at some point during the week, you try to do several of the review problems throughout each chapter. The answers are in the back of the book or easily found in the text, and these can be very helpful in preparing for the exams and identifying topics you need to understand better. Some students may prefer to do this after the week's lecture or even after the week's recitation.
2. **Attend class.** Lectures will go over the material in the book and then augment it with examples we will do together. In class sessions, I will often draw on Microsoft Excel and the statistical software R.
3. **Attempt the weekly assignment on your own.** After viewing the lecture each week, you will complete a homework assignment and submit via Canvas. These assignments are arguably the most important part of this class for you, as they are when you process the material by using it to do something. Make sure to use the software package indicated on the assignment; failure to do so will result in a score of zero. You should attach relevant computer output to your completed assignment and annotate it (that is, indicate what the output is telling us). However, when including output, please only include what is relevant (use a cut-and-paste command to eliminate extraneous material). In

extreme circumstances, points will be deducted for excessive extraneous material. To incentivize you to put sufficient effort into these assignments, they will be worth 40 percent of your total grade, the largest share of any individual component of your grade. In order to account for life's ups and downs, I will drop your lowest individual grade on a weekly assignment.

4. **Engage in discussion with your fellow students about the weekly assignment and to clarify any remaining issues before submitting it.** You are allowed to consult with other students on your weekly assignments, though the work you turn in must be your own. Ideally, you will arrive at these discussions with few if any questions, but they provide a fallback option in case you still do not understand something. If, at the end of a meeting with a group of students, you still do not understand something, please speak to myself or the TA.
5. **Contact the instructor for help before the assignment is due.**
6. **Review graded assignments and quizzes.** When you receive a graded assignment, review any mistakes you made, and make sure you understand your errors. Doing this while the material is fresh is in your head will make it easier to retain the material. If you do not understand your errors, follow up with questions in recitation or office hours.
7. **Study for the exams.** 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 for you. "Then why have exams?" you might ask. The reason is that many of you will be tempted to rely on others in preparing your weekly assignments, and this will mean you will not learn 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. The exams are therefore to motivate you in this regard.

You may not speak with anyone, or get assistance from anyone, during the exams. Other details about the exams will be available as they approach.

COMMUNICATION AND OFFICE HOURS

The best way to reach me is by email. For emails sent between Monday and Thursday, inclusive, please allow me up to 48 hours to respond. For those sent between Friday and Sunday, inclusive, please allow me up to 96 hours to respond. If you would like to schedule an appointment with me to discuss topics from the class in depth, please send me an email.

PLAGIARISM

Students in this course will be expected to comply with the **University of Pittsburgh's Policy on Academic Integrity (http://www.cfo.pitt.edu/policies/policy/02/02-03-02.html)** . 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. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

ACADEMIC INTEGRITY

All students are expected to adhere to the standards of academic honesty. Any student engaged in cheating, plagiarism 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 (https://www.provost.pitt.edu/faculty/academic-integrity-freedom/academic-integrity-guidelines)** . This may include, but is not limited to the confiscation of the examination of any individual suspected of violation the University Policy. Furthermore, no student may bring any unauthorized material to an examination including dictionaries and programmable calculators.

STUDENTS WITH DISABILITIES

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of Disability Resources and Services, 140 William Pitt Union, at 412-648-7890 or 412-383-7355 (TTY) as early as possible, but no later than the fourth week of the term or visit the **Office of Disability Resources website (http://www.drs.pitt.edu)** as early as possible, but no later than the 4th week of the term. DRS will verify your disability and determine reasonable accommodations for this course.

ACCESSIBILITY

Canvas is ADA Compliant and has fully implemented the final accessibility standards for electronic and information technology covered by Section 508 of the Rehabilitation Act Amendments of 1998. Please note that, due to the flexibility provided in this product, it is possible for some material to inadvertently fall outside of these guidelines.

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Course Summary:

Date	Details	
Sun Aug 23, 2020	**M01 Discussion: Introductions**	to do: 11:59pm

Date	Details	
Sun Aug 30, 2020	M02 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278153)	due by 11:59pm
	M02: Problem Set 1 (https://canvas.pitt.edu/courses/58444/assignments/278155)	due by 11:59pm
Sun Sep 6, 2020	M03 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278142)	due by 11:59pm
	M03: Problem Set 2 (https://canvas.pitt.edu/courses/58444/assignments/278156)	due by 11:59pm
Sun Sep 13, 2020	M04 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278141)	due by 11:59pm
	M04: Problem Set 3 (https://canvas.pitt.edu/courses/58444/assignments/278157)	due by 11:59pm
Sun Sep 20, 2020	M05 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278137)	due by 11:59pm
	M05: Problem Set 4 (https://canvas.pitt.edu/courses/58444/assignments/278158)	due by 11:59pm
Sun Sep 27, 2020	M06 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278140)	due by 11:59pm
	M06: Problem Set 5 (https://canvas.pitt.edu/courses/58444/assignments/278159)	due by 11:59pm
Sun Oct 4, 2020	M07 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278147)	due by 11:59pm
	M07: Problem Set 6 (https://canvas.pitt.edu/courses/58444/assignments/278160)	due by 11:59pm
Sun Oct 11, 2020	M08 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278148)	due by 11:59pm

Date	Details	
	Midterm Concepts/Application Section (https://canvas.pitt.edu/courses/58444/assignments/278146)	due by 11:59pm
	Midterm Calculation Section (https://canvas.pitt.edu/courses/58444/assignments/278139)	due by 11:59pm
Sun Oct 18, 2020	M09 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278143)	due by 11:59pm
	M09: Problem Set 7 (https://canvas.pitt.edu/courses/58444/assignments/278161)	due by 11:59pm
Sun Oct 25, 2020	M10 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278145)	due by 11:59pm
	M10: Problem Set 8 (https://canvas.pitt.edu/courses/58444/assignments/278162)	due by 11:59pm
Sun Nov 1, 2020	M11 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278144)	due by 11:59pm
	M11: Problem Set 9 (https://canvas.pitt.edu/courses/58444/assignments/278163)	due by 11:59pm
Sun Nov 8, 2020	M12 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278151)	due by 11:59pm
	M12: Problem Set 10 (https://canvas.pitt.edu/courses/58444/assignments/278164)	due by 11:59pm
Sun Nov 15, 2020	M13 Quiz (https://canvas.pitt.edu/courses/58444/assignments/278138)	due by 11:59pm
	M13: Problem Set 11 (https://canvas.pitt.edu/courses/58444/assignments/278165)	due by 11:59pm
Sun Nov 22, 2020	Final Exam (Calculation Section) (https://canvas.pitt.edu/courses/58444/assignments/278150)	due by 11:59pm

Date	Details	
	Final Exam (Multiple Choice Section) (https://canvas.pitt.edu/courses/58444/assignments/278149)	due by 11:59pm
	M14: Writing Assignment (https://canvas.pitt.edu/courses/58444/assignments/278166)	due by 11:59pm
	Midterm Multiple Choice and Short Answer Section (NOT USED) (https://canvas.pitt.edu/courses/58444/assignments/278154)	
	Module 13 Quiz (not used) (https://canvas.pitt.edu/courses/58444/assignments/278152)	