

QUANTITATIVE ANALYSIS FOR PLANNERS

UPPP 214

Course Code 53344

Spring 2020

Mondays & Wednesdays 9:30-10:00am

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Course Description

This class introduces a mindset and tools to think and learn with quantitative data. In your career as a planner, you will invariably encounter quantitative data and analyses. They will appear in numerous forms, including demographic projections, public opinion surveys, cost-benefit analyses, and published research reports. By learning how to understand and interpret those numbers and their associated statistics, you will be better equipped to evaluate policy decisions and think through their potential consequences. You will additionally be able to judge the quality of statistics presented in reports and the media and what lessons you can or should infer from them.

This class will teach you how to formulate clear questions and answer those questions effectively using quantitative approaches. Specifically, we will cover descriptive statistics (using data to describe the state of the world), probability and sampling theory (understanding the variability and limitations inherent in social data), and inferential statistics (drawing broader conclusions about a population from a limited dataset). Additionally, because many statistical tools are best tackled using computational approaches, we will spend ample time in class practicing using computer programs to run statistical analyses.

This course trains urban planning students on the following core knowledge, skills and values to help prepare them to secure professional employment, perform effectively as planners, and participate meaningfully in the planning profession:

- General Planning Knowledge: Purpose and Meaning of Planning; The Future
- Planning Skills: Research; Written, Oral and Graphic Communication; Quantitative and Qualitative Methods

Expected Learning Outcomes

1. You will be able to use exploratory data analysis and visualizations (e.g., box plots, histograms) to describe the structure of variables and datasets.
2. You will be able to describe why probability and randomness matter in planning and policy and apply basic approaches to quantify that probability.
3. You will be able to select, apply, and interpret the results of basic inferential tests, including a t-test, chi-squared test, univariate regression, and ANOVA.
4. You will be able to interpret statistical results from published literature.
5. You will be able to use Microsoft Excel to perform basic statistical tests.

Textbooks and Other Learning Resources

I have always found it useful to have multiple avenues for learning about quantitative analysis. Because some of the concepts we will cover in class may not be immediately intuitive, having a range of different explanations and media to explore and practice the concept will help you find one that makes each concept clear for you as a learner.

This primary, **required** textbook for this class is *Statistics for People Who (Think They) Hate Statistics, Microsoft Excel 2016 Edition* by Neil J. Salkind (ISBN 978-1483374086). This is a clear, engaging, and sometimes humorous take on the statistical approaches we'll discuss in class. The text can be purchased at the Hill or on Amazon. You are welcome to purchase another edition of the text (esp. the 5th or 6th edition), but be warned that they do not have the sections on using Excel, which will be our primary computational tool.

For the sections on Probability and Sampling, we will use the online text provided by Carnegie Mellon's Open Learning Initiative (<https://oli.cmu.edu>).

For more visual learners, a recommended resource to supplement the textbook and in-class activities is the *Cartoon Guide to Statistics* by Woollcott Smith (ISBN 0062731025).

Additionally, I highly recommend Khan Academy (www.khanacademy.org). They provide free, high quality videos on many of the topics we'll be covering in class, and are a great way to review concepts we discuss.

Required Statistical Software

You will need access to Microsoft Excel with the Data Analysis toolpak. This is available on all recent PC versions of Microsoft Excel and on Excel for Mac 2016. If you have Excel for Mac 2011, you can use StatPlus, which has many of the same capabilities (download at <https://www.analystsoft.com/en/products/statplussmacle/>).

Microsoft Office (including Microsoft Excel) is available freely for all UCI students (see <https://www.oit.uci.edu/help/microsoft/software-for-students/office-365-pro-plus/>) or is available on all campus computers.

Course Structure

Each class session will have four components: pre-recorded videos to watch prior to the scheduled course time, one or two practice problems, a short graded quiz, and a real-time zoom meeting.

- For each session, I will provide one or more pre-recorded videos covering that day's content. Often, we will have one video about the statistics, and a second about applying the statistics in excel. Students are expected to watch these videos prior to the scheduled course meeting time.
- During the videos, I will give you practice problems. Please pause the video and try them out to make sure you're following along! I would normally have you complete these in small groups in class, so you are welcome to play with these problems as you like.
- You will also complete a short, pass/fail quiz, designed to help you make sure you're getting the concepts. You can retake the quiz as many times as you like prior to the deadline. This is described in more detail below under assignments.
- Finally, every class session will have a 30-minute meeting via Zoom. During these sessions, we will go over assignments (quizzes & problem sets) and answer any student questions about the material.

Course Assignments

1. Bi-weekly Quizzes

Prior to every class, there will be a short quiz to test your comfort with topics covered in that day's videos. The quizzes are due by 9am on the day of class. The quizzes are designed for you to practice class concepts in a low stakes setting, and as such are graded credit/no credit (full credit for completing a quiz by its deadline). Late quizzes will get 20% off if submitted between 9am and the start of class, and 40% off if submitted after the start of class.

2. Problem Sets

You will complete four problem sets to practice using statistical concepts introduced in the lectures and readings. You may discuss the problem sets with other students, but you must each turn in your own assignment. When you submit your problem sets, please upload both your excel spreadsheet showing your calculations and your written answers (can be in excel or word) on Canvas. For ease of grading, please make a separate tab in excel for each section of the problem set.

Problem sets will be posted at least two weeks before they are due, so you have ample time to complete them.

Problem sets are due at the beginning of class on the day listed. Grades will be deducted by 5% for each day the assignment is late. We will go over each problem set during the following class session; assignments submitted after we've discussed them in class will receive a maximum grade of 50%.

If you need an extension on a problem set, please discuss this with Prof. Ulibarri at least 24 hours before the assignment is due.

3. Mid-Term Exam

On April 27, there will be a midterm exam covering material from weeks 1-5. The exam will be open book, open note.

4. Paper Review

In order to practice reading published statistics with a critical eye, you will submit a written review of a published report or journal article that uses quantitative data analysis. In a guided series of questions, you will evaluate the paper's research question, data sources, and analysis, interpret its results, and discuss its strengths and limitations. The review is due at the start of class on June 3 and will be submitted through Canvas.

5. Final Exam

On June 10, there will be a final exam covering material from all weeks of the course. The exam will be open book, open note.

Grading Breakdown (ABCD/F or P/NP)

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|-----------------------------|-----|
| Quizzes (.5% each x 20) | 10% |
| Problem Sets (10% each x 4) | 40% |
| Mid-Term Exam | 15% |
| Paper Review | 15% |
| Final Exam | 20% |

Course Outline

| Class | Date | Topic | Readings | Assignment |
|--|------|---|---|------------------|
| <i>Descriptive Statistics & Probability</i> | | | | |
| 1.1 | 3/30 | Why numbers matter for planning, asking questions with data, types of variables | Ch. 1 | |
| 1.2 | 4/1 | Measuring center, intro to Excel | Ch. 2 | |
| 2.1 | 4/6 | Measuring variation | Ch. 3 | |
| 2.2 | 4/8 | Data visualization | Ch. 4 | |
| 3.1 | 4/13 | Probability 1 | CMU Module 8, 9 | PS 1 due |
| 3.2 | 4/15 | Probability 2 | CMU Module 10 | |
| 4.1 | 4/20 | Populations and samples | CMU Module 6 | |
| 4.2 | 4/22 | Research questions and hypotheses, review | Ch. 7 | PS 2 due |
| 5.1 | 4/27 | MIDTERM EXAM | | |
| <i>Inferential Statistics</i> | | | | |
| 5.2 | 4/29 | Normal curve, z-scores, statistical significance | Ch. 8, 9 | |
| 6.1 | 5/4 | Hypothesis testing for 1 variable, 1 sample | Ch. 10 | |
| 6.2 | 5/6 | Hypothesis testing for 1 variable, 2 samples | Ch. 11 | |
| 7.1 | 5/11 | Hypothesis testing for 1 variable, 2 samples | Ch. 12 | PS 3 due |
| 7.2 | 5/13 | Bivariate & multivariate data 1: ANOVA | Ch. 13 | |
| 8.1 | 5/18 | Bivariate & multivariate data 2: Correlation | Ch. 5,15 | |
| 8.2 | 5/20 | Bivariate & multivariate data 3: Regression | Ch. 16 | |
| 9.1 | 5/25 | MEMORIAL DAY (no class) | | |
| 9.2 | 5/27 | Bivariate & multivariate data 4: Multivariate regression | http://www.biddle.com/documents/bcg_comp_chapter4.pdf | PS 4 due |
| 10.1 | 6/1 | Bivariate & multivariate data 5: Logistic regression | Reading tba | |
| 10.2 | 6/3 | Machine Learning | Reading tba | Paper review due |
| 11 | 6/10 | FINAL EXAM (8-10am) | | |

Ownership of Course Materials

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Similarly, you own the copyright in your original papers and exam essays. If I am interested in posting your answers or papers on the course web site, I will ask for your written permission.

Course Policies

DROPS must be submitted by 5PM of week 2 using WebReg system.

ADDs must be submitted by 5PM of week 3 using WebReg system.

CHANGE must be submitted by 5PM of week 2 using WebReg system. From week 3 through 6, you must use the Student Access system to submit a request for a grade option change. No exceptions will be considered after week 6.

Students with Disabilities

If you anticipate needing any type of an academic accommodation in this course or have questions about physical access, please discuss this with me during the first week of class AND please register with the Disability Services Center (<http://www.disability.uci.edu/>). In order for you to receive any type of academic accommodation, I will need formal notification from the Disability Services Center during the first two weeks of the quarter of the type of academic accommodations to which your disability entitles you.