POLI 7962
Seminar in Research Design and Quantitative Techniques
M 6:00 - 9:00 PM
Stubbs 210

Instructor

Christopher Weber, PhD
204 Stubbs Hall
Phone: 225.578.6395

Office Hours

M 1:00-4:00 PM and by appointment.

Teaching Assistant

Cassie Black
325 Stubbs Hall

TA Office Hours

T 11:00 AM-2:00 PM and by appointment.

Objectives

The purpose of this course is to introduce students to a range of basic statistical and data analytic techniques necessary to understand and conduct quantitative social science research. The development of such methodological skills has become increasingly important to social science. Social scientists are often asked to conduct quantitative research on their own, or at the very least, to be able to interpret, understand, and utilize research that employs quantitative methods. As such, you should not view this course as a "necessary evil," or an obscure requirement to fulfill your M.A. or Ph.D. requirements. Instead, it should be viewed as an integral part of your training as a social scientist, as the class will provide the requisite skills for practicing social science.

The topics in this course should not be considered exhaustive, and a thorough statistical background requires much more than will be covered in this class. This course provides the cornerstone to probability theory, as well as traditional (frequentist) methodology – i.e., the assumptions necessary to draw inferences about a population. The first portion of the class will focus on descriptive

statistics, namely, how can we best describe a large dataset with only a few parameters. The second half of the course will examine how we can extrapolate, or infer, particular aspects of the population from a subsample of a population. More specifically, we will establish the foundations for inferential statistics. Finally, we will conclude with a brief section on probability theory.

Several topics will be discussed in this course. First, we will discuss techniques common in univariate analysis – central tendencies, distributions, measures of variation and dispersion. We will then move to a more theoretical discussion of the philosophy of science, namely, hypothesis testing and operationalizing social constructs. Of primary interest in this section will be the estimation of population parameters (characteristics) based on information collected from random samples drawn from populations. Various techniques will be presented to compare samples, such as z-test, t-tests, the chi-squared statistic, and the F-test. In this section we will also explore the logic of experimental methods.

Next, we will transition to bivariate and multivariate statistical techniques. We will explore how to quantify relationships between two or more variables. Because social science often focuses upon the relationship between variables, special emphasis will be placed on establishing the direction and magnitude of relationships in populations and samples. At the end of the course, we will examine the basis of probability theory – specifically, sets, combinatorial methods, and Bayes' theorem. Please note that I reserve the right to make modifications to the syllabus, as well as administer in-class exams and extra readings/homework assignments. All assignments, projects, and tests should be done independently, unless otherwise noted.

Two major points need to be emphasized about this course. First, one of the best ways to learn about statistical techniques is to practice them as much as possible. Statistics does not come "naturally" to everyone (perhaps anyone), but with practice you will become well-versed in the topics explored in this class. Only by going through the process of computing the answers to statistical problems, will you develop the skills necessary to understand and conduct empirical research. A second point is that this class should give you the ability to effectively evaluate and communicate statistical research. Many have heard the phrase, "You can prove anything with statistics." Social scientists who are well-versed in statistics are able to differentiate good arguments from bad. If nothing else, my hope is to provide you with the tools necessary to make this important distinction.

Textbooks

David Knoke, George W. Borhnstedt, and Alisa Potter Mee. *Statistics for Social Data Analysis (4th Edition).* Thompson Wadsworth. ISBN 0-87581-448-4.

Pollock, Philip P. 2011. *A Stata Companion to Political Analysis (2nd Edition.* CQ Press. ISBN 978-1-60871-671-5.

Additional Required Readings

The University provides free software, Moodle, upon which I will rely in this class. Updates, additional readings, and other course material can be found here. I will also post grades here.

Please check this site regularly for course information. I will frequently send emails to the entire class through Moodle, so be sure you have the correct email on record.

Optional Readings

Jeff Gill. 2006. *Essential Mathematics for Political and Social Research.*

Timothy M. Hagle. 1995. *Basic Math for Social Scientists: Concepts* (Series in Quantitative Applications for Social Scientists). This is part of the Sage monograph series.

William D. Berry and Stanley Feldman. 1985. *Multiple Regression in Practice.* (Series in Quantitative Applications for Social Scientists). This is part of the Sage monograph series.

Gary King. 1989. *Unifying Political Methodology: The Likelihood Theory of Statistical Inference.* Cambridge: New York.

Statistical Software

I ask that you purchase a copy of `Stata` (Version 9, 10, 11, or 12 is fine). This can be purchased at a significantly discounted student rate on Tigerware. Students may purchase a one year license, Stata Intercooled, or the more expensive Stata Special Edition. Please avoid the Stata Student Edition. There are far too many restrictions and you will not be able to work through all the required assignments. While initially expensive, Stata is perhaps the most widely used and flexible statistical package in the social and basic sciences. Also, subsequent statistics classes in this department will require or encourage you to purchase Stata. We will periodically hold Stata workshops throughout the semester, and you should feel free to bring your laptops to class if you would like to work through examples.

There will be several Stata "labs" held throughout the semester. If you have a laptop, or access to a laptop, you should bring it to these labs. All the syntax we use will be made available on Moodle, as well as Stata screenshots and detailed instructions. It is your responsibility to attend these training labs. While I am more than willing to provide instruction and guidance, I will not go through the lab material multiple times. If you miss the lab material, it is your responsibility to learn the material, either on your own or with the help of your classmates. You should direct technical questions to the TA assigned to this course, Cassie Black. Cassie will help you get data into Stata and troubleshoot issues regarding installation and analysis.

My Teaching Policy

Some students enter this course thinking it is far removed from what they will do in their professional careers. After all, why does a theorist need to know how to conduct an experiment or run a correlational analysis? In reality, this course is essential to your development as an ethical and

knowledgeable social scientist.

Understanding the foundations of statistics is a skill that is important in evaluating the trustworthiness and credibility of existing social science research. My job is to work with you to develop the skills necessary for you to critically and objectively evaluate scientific information. Throughout the semester I will reiterate this, but I am always available should you have any comments or concerns about the class. In addition to my office hours, I practice an "open door" policy. If my door is open, feel free to stop by. If I am not in, email me and I will get back to you in a timely manner. The concepts in this class may be difficult to grasp. It is your job to work hard this semester. It is my job to facilitate your learning of the material.

Expectations

• Students must read all assignments in the text and readings available on Moodle and emailed. There will be several in class exercises to illustrate research techniques. Quizzes on readings and notes may be administered at the professor's discretion.

• Cell phones must be set to silent. For your safety, I will bring my phone to every class, which I have subscribed to the LSU emergency text message service.

• Students should always bring a calculator to course. The calculator should handle square roots and exponents. *Please bring the calculator to every class*!

• Students should always come to class fully prepared and ready to learn.

• All the assignments and projects must be submitted at the beginning of the class. No late work will be accepted.

• Class attendance is extremely critical for this course. You are expected to come to every class. If you miss a class without providing a valid excuse in writing, your grade may be lowered.

• An in-class quiz may be given when three or more students miss a class.

• Come to class with assignments completed and reading material covered. Textbook reading assignments are listed in the syllabus. Thus, I will assume that you have read the assigned materials before the class and expect you to actively participate in class discussion.

• If you have a disability which may require accommodation, you should immediately contact the Office of Services of Students with Disabilities to officially document the needed accommodation. You should immediately contact the Office of Disability Service to officially document the needed accommodation. You can find more information at `http://appl003.lsu.edu/slas/ods.nsf/index`

• It is your responsibility to complete all works assigned in this course (e.g., tests, assignments) in full observation of the Academic Honor Code. Cheating, plagiarism or any form of academic dishonesty is unacceptable. University policies regarding academic honesty will be strictly enforced. If you have any questions about academic dishonesty, please speak either with me or with someone in the Office of the Dean of Students. You can also learn more about it at `https://paws002.lsu.edu`. If a student engages in any form of academic dishonesty this will be reported to the Dean of Students.

• Depending on where we are in the class, I may decide to alter a due date. Any changes will be announced in class. Makeup exams or assignments will be allowed only in the case of university excused absences. Documentation must be provided.

Grades

Grades will be determined as follows

• Midterm Exam (100 points)

• Final Exam (100 points)

• Problem Sets and Assignments 6×20 points=(120 points)

• Final Paper (100 points)

Grade Distribution

90%-100%	A
80%-89%	B
70%-79%	C
60%-69%	D
59% and below	F

Description

Homework assignments comprise a large part of your grade. In order to effectively comprehend and conduct quantitative research, it is important that you spend a fair amount of time outside of the classroom studying the material. It is extremely important that you keep up to date with the readings and homework. For this reason, I will not accept any late assignment, except under extraordinary circumstances.

The final project involves writing a research report. You can choose the topic, but you must be able to provide me with the data you use in this report. Thus, if you or your advisor has proprietary data which I cannot access, you cannot use this. I must be able to verify that you did all the necessary calculations honestly and accurately, which requires me being able to access any data you use. Your final report should be roughly 20 pages in length and include all the required sections of an American Psychological Association (APA) style or American Journal of Political Science (AJPS) style report: Title page, abstract, introduction, methods, results, discussion/conclusion, references, tables, figures, and appendix. Please follow APA or AJPS style for this report.

There will be an in-class midterm and comprehensive final exam. Both exams will be open book/open notes. In-class projects will be conducted throughout the semester and students will be asked complete these. Some of these projects might be made up outside of class if you have an excused absence, but others cannot be given outside of class. You need not prepare for these projects, but you should have paper, pens, and calculators available every class.

Course Outline

Please read all assigned readings prior to the listed meeting times. Please note that the course schedule is subject to change at my discretion. You are responsible for announced changes.

August 22. Introduction

• Knoke et al., Chapter 1.

August 29. Univariate Statistics and an Introduction to `Stata`

• Knoke et al., Chapter 2.

• Pollock, Chapter 1.

September 5. Labor Day. No Class.

September 12. Distributions and Sample Estimation of Population Parameters

• Knoke et al., Chapter 3.

• Pollock, Chapters 2 and 3.

→ Problem Set 1. Complete Exercise #1 in Chapter 2 of Pollock. Please type your answers to Parts A through D. Also, please include the Stata output. Note: You will need the disc that accompanies the Pollock text. In Knoke et al., chapter 2, complete problem # 1 and # 6 (p. 65). This problem set is due next week, September 19.

September 19. Pairwise Tests and Analysis of Variance

• Knoke et al., Chapter 4.

→ Problem Set 2. Complete Exercise #1 in Chapter 3 of Pollock. Please type your answers to Parts A through E. Also, please include the Stata output. Note: You will need the disc that accompanies the Pollock text. This problem set is due next week, September 26.

September 26. Simple Bivariate Relationships and `Stata` lab

• Knoke et al., Chapter 5.

• Pollock, Chapter 5.

Please bring your computer to this class (if you have stata on a laptop), as we will review stata syntax to analyze bivariate categorical data.

October 3. Bivariate Relationships and Midterm Review

• Pollock, Chapter 6.

→ Problem Set 3. On p. 107 of of Knoke et al., complete problem # 10. On pp. 136-137 of Knoke et al., complete problems # 1, 4, and 9. Problem set 4 will be due next week (October 10) and should be handed in prior to starting the midterm.

October 10. Midterm Exam

The exam will be open book and will cover chapters one through five of the Knoke et al text. You may use your textbook and notes. The exam will be done individually. You will have the entire course period to complete the exam. You should bring a calculator, blue book, and scratch paper to the exam.

October 17. Continuous Bivariate Relationships

• Knoke et al., Chapter 6.

→ Problem Set 4. Generate a research question, hypothesis, and propose a way to test this hypothesis. Find a dataset to explore this hypothesis. Explain what variables you will examine and what methods you will use. Please see me for comments or suggestions. This will be due on October 31.

October 24. Multivariate Relationships

• Knoke et al., Chapter 7.

• Pollock, Chapter 7

October 31. Ordinary Least Squares

• Knoke et al., Chapter 8.

→ Problem Set 5. In this problem set, please complete exercise #1 in Chapter 7 of Pollock (pp. 146-147). Also, answer question #3, chapter 7 in Knoke et al (p. 229). This problem set is due on November 14th.

November 7. Multiple Regression in `Stata`: Some Practical Considerations

• Knoke et al., Chapter 9.

November 14 An Introduction to Probability Theory

• John E. Freund, *Probability Theory and Applications*. (pp. 1-85). Available on Moodle.

November 21. Probability Theory and Bayes' Theorem

• John E. Freund, *Probability Theory and Applications*. (pp.86-165). Available on Moodle.

→ Problem Set 6. Complete the probability theory homework posted on Moodle. This will be due when you hand in the final exam..

→ Extra Credit. Complete the extra credit assignment on Moodle and hand it in by November 28. If done correctly, you will receive three points of extra credit towards your final exam grade.

November 28. Semester Wrap Up, Stata Workshop, and Final Exam Review

Please bring questions, concerns, and review topics to this class.

December 5-9. Final Exam.

The exam will be open book and will cover the material from the entire semester. You must arrange a place to take the exam, which should be completed some time during finals week. If you cannot find a place to take the exam, please let me know and I will help with accommodations. Every student must sign up for a slot no later than November 14. I will send the exam at the time requested and you will have 24 hours to complete and return it to Cassie. The exam should take no longer than 3 hours to complete. You are welcome to use your textbook and notes, but the exam must be completed individually.

December 5-9. Final Paper.

Please upload your final paper to the Moodle dropbox by no later than 5PM.