

Introduction to Quantitative Data Analysis

Sociology 400

Fall 2012

Professor: Quincy Thomas Stewart

Teaching Assistant

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COURSE DESCRIPTION: Social scientists use quantitative methods to explore and test hypotheses, describe patterns in survey and census data, analyze experimental findings, and dynamically model social relations among individuals and groups. The aim of this course is to introduce students to the basic concepts of quantitative methods as they relate to social research, and lay the foundation for more advanced graduate-level courses in multiple regression, regression models for categorical dependent variables, event-history analysis, etc. Students in the course will learn to: use graphs, tables, and measures of central tendency and spread to summarize data; explain random sampling using probability concepts; explain what a sampling distribution is and give a rudimentary explanation of its role in inferential statistics; calculate and explain confidence intervals; test hypotheses about means, proportions, and pairs of means and proportions; test the hypothesis of independence in a contingency table; compute and interpret correlations and regressions for pairs of variables; and use Stata statistical software to perform basic statistical analysis.

COURSE REQUIREMENTS: The requirements include: class attendance and participation (10%), homework (15%), two short exams (40%), and a final paper (35%).

Attendance and participation: Class attendance, a very easy variable to measure, is based on your regular presence in class. Attendance is mandatory. Students will be penalized 4% of their final grade for each unexcused absence. I will excuse absences for sickness, religious holidays, in-patient hospital admissions, and military service. Please do not bring me documentation for any other reason.

Class participation will be measured through feedback for the course. I will require that you submit one comment, question, or suggestion regarding the course every other week for the first eight weeks of the quarter. If your last name begins with A-K, the comment or question is due on the 1st, 3rd, 5th, and 7th weeks of the quarter. If your last name begins with L-Z, the comment or question is due on the 2nd, 4th, 6th, and 8th weeks of the quarter. In addition, you may (but are not required to) submit a comment or question on the off weeks. A single sentence is sufficient, although longer comments-questions-suggestions are welcome. Questions-

comments-suggestions must be submitted by email to q-stewart@northwestern.edu by Mondays at 12 noon.

Homework: I will assign homework each week to be completed by the following week. The homework is designed to have you apply and interpret the material covered in the course. There will be both questions to be solved by hand (using formulas) and computer work. I include both types of questions to: 1) increase your comfort with manipulating equations and 2) introduce you to statistical computing.

Short Exams: There will be two short exams over the course of the quarter (15% each). Each exam will consist of several questions designed to assess your understanding of the material covered in class. The exams will consist of questions that you will solve by hand (i.e., without a computer). The questions will involve: estimating and interpreting statistics; explaining theorems; solving for unknown quantities; performing tests; and showing mastery of other relevant aspects of introductory statistics. The exams will focus on material covered up to the respective point in the course.

Final Paper: The final paper for the course takes the form of a research report or proposal. The paper should be no less than 10 pages of double-spaced 12-point text in times new Roman font (not including title page, abstract, references, notes, and tables/figures). Furthermore, the paper should be no longer than 14 pages (again, not including title page, abstract, references, notes, and tables/figures). The paper should include a short literature review that motivates and contextualizes the main question, a data section that reviews the data set and makeup of each variable, a methods section outlining the preliminary analysis, and a preliminary analysis of the data as they pertain to the motivating question. The analysis should be clear, concise and address the question in a fundamental way that adds to our understanding of the topic. Students will submit a proposal for the paper in about the fourth week of the quarter.

This paper is an assessment of your ability to apply the methods learned in this class to a real world problem that interests you. Although I will largely focus on your ability to assess the data and apply the methods, I will also give weight to your ability to independently conduct quantitative social research. The latter will center on how well you present the question/issue and situate it in the literature.

You may not use papers submitted to other courses, or submitted as B.A. or M.A. theses to satisfy this requirement. Students may submit a paper that is a more refined and substantially newer version of previous work. However, students must submit a copy of the previous paper with the proposal for their paper in the fourth week of the course.

CLASS AND OFFICE HOURS: The class meets on Wednesdays between 10:00 a.m. and 12:50 p.m. in University Hall room 412. The lab for the course will meet on Thursdays between 2:00 and 2:05pm in the Library in room B183. My office is located on the first floor of 1812 Chicago Ave in Room 109. I will be available in my sociology office on Mondays and Wednesdays between 1:00 p.m. and 2:00 p.m. and by appointment. I prefer that you make an appointment before you come during my office hours. When you come to my office for a meeting please **DO NOT** wear perfume or cologne. *I will have to ask you to reschedule our meeting if you wear perfume or cologne to an office meeting.* My office phone number is 491-

7044. My email address is q-stewart@northwestern.edu. I will be available for talking via email during my office hours.

TEXTBOOKS:

(Available at the Norris Bookstore)

Agresti, Alan and Barbara Finlay. 2009. *Statistical Methods for the Social Sciences*. 4th Edition. New York: Prentice Hall.

Alan C. Acock. 2010. *A Gentle Introduction to Stata, 3rd Edition*. College Station, Texas: Stata Press. Provides an introduction to Stata and serves as a compact Stata manual.

SCHEDULE:

- Week 1: 10/3 Introduction
Topics: Variables; Graphing Distributions; Measures of Central Tendency; Standardization.
- Week 2: 10/10 Descriptive Statistics
Topics: Standard Deviation; Variance; Measures of Distributional Position; Bivariate Plots; Slope and Intercept (Review of Algebraic Equation for a Line); Cross-Tabulations.
- Week 3: 10/17 Probability
Topics: Long-Run Argument; Rules of Probability; Independence; Discrete and Continuous Probability Distributions; Binomial Probability Distribution; Normal Probability Distribution
- Week 4: 10/24 Probability, cont.
Topics: Samples and Populations; Expected Value and Standard Error; z-scores; Law of Averages; Central Limit Theorem.
- Week 5: 10/31 Statistical Inference
Topics: Confidence Intervals; CIs for Means; CIs for Proportions; Sample Size.
Short Exam I: Material from weeks 1-4
- Week 6: 11/7 Significance Tests
Topics: Tests for Means and Proportions; Type-I and Type-II Errors; Limitations of Tests
- Week 7: 11/14 Significance Tests, cont.
Topics: Comparing Proportions; Comparing Means; Standard Error for a Difference; Experiments (i.e., Dependent Samples)

- Week 8: 11/21 Significance Tests, cont.
Topics: Contingency Tables; The χ^2 -Test; Tests of Independence; Tests of Association.
- Week 9: 11/28 Introduction to Regression
Topics: Scatterplots; The SD Line; Correlation Coefficient (Pearson); Changing SDs; Spearman Correlation; Kendall Correlation
Short Exam II: Material largely from weeks 5-8
- Week 10: 12/5 Introduction to Regression, cont.
Topics: Bivariate Linear Regression; Graph of Averages; Least Squares Method; Inferences for Slope Coefficients; Plotting Residuals; Model Assumptions
- Week 11: Final Papers Due at 5:00pm, 12/10/12