

STAT/SOC/CSSS 221: Statistical Concepts and Methods for the Social Sciences

Instructor: Chris Adolph, Assistant Professor, Political Science and CSSS

Winter Quarter 2012
University of Washington

Class Meets

MWF 9:30–10:20 am
Electrical Engineering 105

Sections Meet

BA: 8:30–9:20 am, MGH 242
BD: 9:30–10:20 am, SAV 264
BE: 8:30–9:20 am, MGH 254
BB: 9:30–10:20 am, MGH 254
BC: 8:30–9:20 am, SAV 139
BF: 9:30–10:20 am, SAV 139

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Teaching Assistants

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Course description. We introduce basic statistical reasoning with an emphasis on problems encountered in social science research. We explore the use of statistical tools to answer scientific research questions, as well as the pitfalls associated with the misuse of statistics. Students should leave ready for more advanced statistics courses, and better armed to evaluate quantitative claims made by social scientists and in the media. Topics include: measurement and summary of data, exploratory data analysis, a few commonly-used probability distributions, statistical inference, and basic linear regression.

Course Website. Consult <http://faculty.washington.edu/cadolph/221> for homework, lecture notes, and announcements.

Course components. The course consists of two key components. A thrice-weekly lecture by your instructor will introduce statistical concepts and example cases. A twice-weekly quiz section with your TA will review statistical concepts, discuss the homework, and test your knowledge of the lecture *and* readings with brief weekly quizzes.

Prerequisites. No prior exposure to quantitative methods is assumed, nor is any mathematical training beyond basic high school math required. Students should be prepared to learn about basic quantitative tools and familiarize themselves with appropriate notation, including the lowercase Greek alphabet.

Office Hours and Extra Help. Course TAs will hold their office hours in the Statistics Study Center in Padelford B302: Kara Sylvester on Monday from 10:30 am–12:30 pm, Esther Chang on Wednesday from 10:30 am–12:30 pm, and Mark Wine on Wednesday from 2:30 pm–4:30 pm. The Statistics Department also makes additional tutors available for students in intro classes in Padelford B302 Tuesday (Noon–3 pm) and Wednesday (Noon–6 pm). Chris Adolph’s office hours will be held in Gowen Hall 145 on Wednesday from 10:30 am–Noon or by appointment.

Strategies for Success. Statistics is no harder than any other class at the University of Washington; indeed, it is increasingly central to many fields of study. However, unlike many classes at the UW, statistics courses are heavily *cumulative*, so that if you fall behind, it can be very difficult to catch up. If concepts aren’t clicking for you, don’t delay: seek help from your TA or instructor.

Academic Honesty. While each student is encouraged to seek help with challenging concepts or assignments, all homework, quizzes, and exams are each student’s responsibility, and should ultimately reflect each student’s own work. Any student caught cheating or plagiarizing by the instructor or TAs on any assignment or examination will receive a grade of **X** for the course and will be reported to the Dean’s office in the College of Arts and Sciences.

Academic Accommodations. To request academic accommodations due to disability, please contact Disabled Student Services, 448 Schmitz Hall, (206) 543-8924 (V/TTY). If you have a letter from Disabled Student Services indicating you have a disability that requires an academic accommodation, please present the letter to your instructor, and a suitable accommodation will be provided.

Courtesy in a Large Lecture. This is a large lecture class with short meetings, so a few basic courtesies will help everyone learn effectively. First, if you must be late, enter quietly, and if you must leave early, sit near the doors. Silence your phones before class begins, and refrain from talking, surfing the web, reading newspapers, or other distracting activities during class.

Course textbooks (available at the University Bookstore)

Required: David Moore, William I. Notz, and Michael A. Fligner. 2012. *The Basic Practice of Statistics*. 6th ed. W.H. Freeman.

Optional: Larry Gonick and Woollcott Smith. 1993. *Cartoon Guide to Statistics*. Collins Reference.

Course Evaluation

Homework (35%). Students will be assigned weekly homework problems from the text and instructor, to be turned in by the start of the quiz section listed as the due date. Late homeworks will not be accepted except in the event of a documented medical or family emergency.

Quizzes (20%). Students will take short weekly quizzes on the statistical concepts covered in class *and* the assigned readings. There will be seven total quizzes, each worth four percent of your final grade. Total quiz points in excess of 20 will be discarded. No make-ups will be offered for quizzes. Quiz absences will be excused only in the event of a documented medical or family emergency or by *prior arrangement by e-mail with the instructor*. The remaining quiz scores of students with an excused missed quiz will be adjusted to reflect the absence.

In-class midterm exam (20%). An in-class midterm exam will be given on Monday, February 6. An in-class review for the midterm will take place the preceding Friday.

Final Exam (25%). A final exam will be given during exam week in Electrical Engineering 105 on Wednesday, March 14 from 8:30 to 10:20 am. A review for the final will take place during the last regular lecture.

The midterm and final will be intentionally difficult to create an informative distribution of scores reflecting student effort and ability. Students should not expect to receive high raw scores on the exams. Final grades will be curved, however, using a method discussed later in the quarter.

Make-up midterm and final examinations will only be given in the event of a documented medical or family emergency, or by *prior arrangement by e-mail with the instructor* in the event of a documented and legitimate reason for absence. It is the responsibility of the student to show cause that a make-up should be given, and to coordinate with the instructor and TAs to schedule the make-up exam. The format of make-up exams is within the discretion of the instructor, and may involve the substitution of a paper for a timed exam.

Key Dates

Monday 1/16: Martin Luther King, Jr. Day—No Class

Friday 2/3: Midterm Review

Monday 2/6: MIDTERM EXAM

Monday 2/20: President's Day—No Class

Friday 3/8: Final Review

Wednesday 3/14: FINAL EXAM IN ELECTRICAL ENGINEERING 105, 8:30–10:20 AM

Course outline

Each of the topics below corresponds to roughly one week of material, though the pace of the course will vary depending on student needs, and small supplemental readings presenting examples may be added as the course progresses. Starred topics will be covered as time allows.

The assigned readings for each class are short, but information-packed. **Students will benefit from reading the relevant material in advance of the lectures, then reviewing the material again afterwards.**

1. What is Statistics?

Topics: Course introduction. Populations and samples. Internal and External Validity. Measurement and types of variables.

Read: Moore *To the Student* and Ch. 1.

2. Summarizing and Exploring Data

Topics: Measures of central tendency: mean, median, and mode. Measures of variation: range, variance, standard deviation, quantiles. Exploring data with graphs: barplots, time series plots, histograms, boxplots.

Read: Moore Ch. 2, 4.

3. Relationships in Data: A first pass

Relationships in quantitative data: scatterplots, correlation, linear relationships. Relationships in categorical data: Contingency tables. Relative risk. Simpson's Paradox.

Read: Moore Ch. 6, 8, 9.

4. Probability: Basic concepts

Understanding random situations. Events and sample spaces. Marginal and conditional probability. Independence.

Read: Moore Ch. 10, 12.

5. Random Variables and Statistical Inference

Probability distributions. Moments of a distribution. Normal and binomial* distributions. Random sampling and sampling distributions. Standard errors. Central Limit Theorem.

Read: Moore Ch. 11, 3, 13.

6. Confidence Intervals and Statistical Significance

Inference about a population mean from a sample. Comparison of two sample means. Interpretation of a confidence interval. Interpretation of a significance level.

Read: Moore Ch. 14, 15, 16, 18, 19.

7. Tabular Data

Statistical inference for categorical variables. Independence. Chi-square tests.*

Read: Moore Ch. 23.

8. Bivariate Regression

Least squares principle. Standard errors of regression coefficients. Goodness of fit of linear models.

Read: Moore Ch. 24.

9. Multivariate Regression*

Controlling for confounders. Interpreting partial regression coefficients. Non-linear transformations.* Interactive effects.*

Read: Moore Ch. 28 (To be provided).