CSSS/STAT/SOC 321: Case-Based Statistics I

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

Fall Quarter 2012
University of Washington

Class Meets
MWF 10:30–11:20 AM
Savery Hall 166

Section Meets
Tuesday, 10:30–11:20 AM
Savery Hall 168

Lab Meets
Thursday, 10:30–11:20 AM
Smith Hall 220

Office
Gowen Hall 145
cadolph@uw.edu

Teaching Assistant
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Course description. We introduce basic statistical reasoning with an emphasis on the problems encountered in social science research. The course focuses on examples and tools, and requires students to actively engage in statistical analysis through labs and hands-on problems. Statistical topics covered include measuring and summarizing data, exploratory data analysis, basic probability concepts, commonly used probability distributions, statistical inference, and, time permitting, basic linear regression.

Course components. The course consists of two key components. A thrice-weekly lecture by your instructor will introduce statistical concepts and example cases, and a Tuesday section gives you a chance to review the lectures and homework. But the only way to really learn social statistics is to immerse yourself in actual data and do you own data analyses, which will happen in a Thursday lab session, led by your TA.

Prerequisites. No prior exposure to quantitative methods is assumed, nor is any mathematical training beyond basic high school math required. A willingness to learn mathematical and computer skills is required.

Course Evaluation. Course evaluation will be based on lab work (15%), homework (35%), an in-class midterm exam (20%), and a final exam during exam week (30%).

Office Hours. Chris Adolph holds office hours Monday, 12:30–2:00 PM in Gowen 145, and by appointment. Aaron Erlich holds office hours Monday and Thursday, 12:30–1:30 PM in Smith 43.

Course Website. Consult `http://faculty.washington.edu/cadolph/321` for homework, lecture notes, and announcements.

Software. Many software packages provide tools for statistical analysis. We will use two of the simplest: Excel and Stata. Excel has rudimentary tools for recording and summarizing data. Stata offers a wider suite of statistical tools, better graphics, and a simple command-line interface.

Strategies for Success. 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. The Statistics Department also makes additional tutors available for students in intro classes in Padelford B302, times TBA.

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.

Academic Honesty. While each student is encouraged to seek help with challenging concepts or assignments, all homework 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.

Course textbooks

Required

Neil A. Weiss. 2011. *Introductory Statistics*. 9th Ed. Addison-Wesley. ISBN: 978-0321691224. $123.53 on Amazon (hardback).

Alan C. Acock. 2010. *A Gentle Introduction to Stata*. 3rd Ed. Stata Press. ISBN: 978-1597180757. $49.68 on Amazon (paperback).

Recommended

Larry Gonick and Woollcott Smith. 1993. *The Cartoon Guide to Statistics*. HarperPerennial. ISBN-13: 978-0062731029. $11.61 on Amazon (paperback).

Key Dates

Friday 10/26: Midterm Review

Monday 10/29: **MIDTERM EXAM**

Monday 11/12: Veteran's Day – No Class

Wednesday 11/21 – Friday 11/23: Thanksgiving Holiday – No Class

Friday 12/7: Final Review

Monday 12/10: **FINAL EXAM** IN SAVERY HALL 166, 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 varying depending on student needs. 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?

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

Read: Weiss, ch. 1 and 2.
Optional: Gonick & Smith, ch. 1.

2. Summarizing Data

Measures of central tendency: mean, median, and mode. Measures of variation: range, variance, standard deviation, quantiles. Exploring data with graphs.

Read: Weiss, ch. 3; Acock, ch. 1.1–1.4, 4, 5.4 and pp. 94–97.
Optional: Gonick & Smith, ch. 2.

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: Weiss, ch. 13.3 and 14; Acock, ch. 5.6, 5.7, 6.1, and 6.2.

4. Probability: Basic concepts

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

Read: Weiss, ch. 4.1–4.7; Acock, ch. 3.
Optional: Gonick & Smith, ch. 3.

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:* Weiss, ch. 5.1–5.3, 6.1–6.4, and 7.1–7.3. *Optional:* Gonick & Smith, ch. 4, 5, and 6.

6. Confidence Intervals and Statistical Significance

Inference about a population mean from a sample. Comparison of two sample means. Inference about a proportion from a sample. Interpretation of a confidence interval. Interpretation of a significance level.	*Read:* Weiss, ch. 8.1–8.4, 9.1–9.6, 10.1–10.3, and 12.1–12.2; Acock, ch. 7.1–7.4. *Optional:* Gonick & Smith, ch. 7, 8, and 9.

7. Tabular Data

Statistical inference for categorical variables. Independence. χ^2 tests.	*Read:* Weiss, ch. 13.1–13.4; Acock, ch. 7.5–7.8.

8. Bivariate Regression

Least squares principle. Standard errors of regression coefficients. Goodness of fit of linear models.	*Read:* Weiss, ch. 15.1–15.3; Acock, ch. 8. *Optional:* Gonick & Smith, ch. 11.

9. Multivariate Regression

Controlling for confounders. Interpreting partial regression coefficients. Non-linear transformations. Interactive effects.	*Read:* Acock, ch. 10.1–10.3, 10.5–10.7, 10.8–10.11, plus supplementary readings to be provided.