## Quantitative Techniques: Reasoning with Statistics

PLA4208
**Fall 2007**

**Lecture**: Wednesdays 9:00 – 11:00 (Avery 114)
**Lab Sections**: Wednesday & Thursday 4:00 – 6:00 (UP Studio Lab)

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| **Professor:** | Stacey Sutton | **Email:** | ss3115@columbia.edu |
| **Office:** | Buell Hall, room 204 | **Phone:** | (212) 854-5931 |
| **Hours:** | Tuesdays 12:00-1:00 and by appointment | | |
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### COURSE DESCRIPTION:

This course is designed as an introduction to basic statistical tools and quantitative methods for graduate students in urban planning. These will help you to become more critical consumers of statistical analyses, and to use statistical reasoning in making decisions. As the foundation for more advanced research methodologies and statistical analyses, this introductory course emphasizes developing the necessary skills for expressing statistical ideas in clear simple language, which is an essential skill for effective planning practitioners.

On a regular basis planners are called upon to either collect original data or obtain data from secondary sources. Therefore, planners must be comfortable summarizing, analyzing, and presenting quantitative data, and be comfortable developing logical empirically based arguments using statistical techniques and analytic methods. Additionally, urban planners are often called upon to review quantitative analyses and assess the validity of arguments made by others, as well as design independent research studies to test various hypotheses and make effective decisions. This course is intended to prepare graduate students in urban planning to critically review analyses prepared by others and to conduct basic statistical data analyses of your own.

Weekly lectures are complemented by statistical computer labs where students will learn to access public datasets (e.g., US Census, American Community Survey, General Social Survey, etc.), use statistical software (e.g., SPSS) and other software packages (e.g., Excel and PowerPoint) when analyzing, developing arguments and presenting statistical data.

### COURSE MATERIALS:

**Required Texts:** (available at the Columbia University bookstore and on reserve at Avery Library; Articles available on Courseworks)

**Healey, Joseph F. (2007)** *The Essentials of Statistics: A Tool for Social Science.* Thompson Publishing
- PRIMARY TEXTBOOK

**Required Supplementary Reading:** ADDITIONAL Journal articles will be added to Lectures and Labs to illustrate specific techniques and application.

Babbie, Earl. *The Practice of Social Research.* "Chp. 1: Human Inquiry and Science" and "Chp. 2: Theory and Research" <courseworks>

Babbie, Earl. *The Practice of Social Research.* "Chp. 4: Research Design," and "Chp. 5 Conceptualization, Operationalization and Measurement" (pages 86-137) <courseworks>

Freeman, David (1999) "Ecological Inference and the Ecological Fallacy" *International Encyclopedia of the Social and Behavioral Sciences* <courseworks>

LoPresti, Frank (2004) "Federal Census Files" Connect: Information Technology at NYU <courseworks>

Wolman, Harold, Edward W. Hill and Kimberly Furdell (2004) "Evaluating the Success of Urban Success Stories: Is Reputation a Guide to Best Practice?" *Housing Policy Debate*, 15(4): 965-997 <courseworks>

### Suggested Textbook:

Walsh, Anthony and Jane Ollenburger (2000) *Essential Statistics for the Social and Behavioral Sciences: A Conceptual Approach.* Prentice Hall Publishers

## Electronic Data & Resources:

| Select US Government Sites: | |
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| US Census Glossary (decennial census, ACS, CPS, terms, etc.) | http://www.census.gov/main/www/glossary.html |
| Data Access Tools | http://www.census.gov/main/www/access.html |
| American Fact Finder | http://factfinder.census.gov/servlet/BasicFactsServlet |
| American Community Survey | http://www.census.gov/acs |
| 2007 Statistical Abstract (since 1878) comprehensive summary of statistics on the social, political, and economic organization of the United States | http://www.census.gov/compendia/statab/ |
| County Business Patterns | http://www.census.gov/epcd/cbp/view/cbpview.html |
| Fedstats | http://www.fedstats.gov/ |
| State & County QuickFacts | http://quickfacts.census.gov/qfd/ |
| Bureau of Transportation Statistics | http://www.bts.gov/ |
| US Census Maps | http://www.census.gov/geo/www/maps/ |
| US Census Map Products | http://www.census.gov/geo/www/maps/CP_MapProducts.htm |
| CDC MAPPING | http://www.cdc.gov/nchs/products/pubs/pubd/other/atlas/atlas.htm |
| Other Sites for City and Regional Statistics | |
| New York City Department of Planning DataPlace | http://www.nyc.gov/html/dcp http://www.dataplace.org/ |
| Furman Center - New York City Housing and Neighborhood Information System | http://www.nychanis.com |
| Statistical Support | |
| UCLA: SPSS Tutorials and Statistical Support | http://www.ats.ucla.edu/STAT/spss/sk/ |
| Texas A&M: SPSS Tutorials and Statistical Support | http://www.stat.tamu.edu/spss.php |
| Data Access and Support | |
| Columbia University: Electronic Data Service: (212)854-6012, eds@columbia.edu | http://www.columbia.edu/acis/eds/dset_guides/censuscd/census40.html |
| Interuniversity Consortium for Political and Social Research (ICPSR) | http://www.icpsr.umich.edu/access/index.html |

## COURSE REQUIREMENTS:

Students are expected to attend weekly lectures, complete required readings prior to class, and hand in homework assignments at the beginning of lecture. We will begin each session by reviewing homework problems and discussing related concerns. I will NOT accept late homework or other assignments.

This course is intended to enhance your analytical skills, particularly your capacity to use data to bolster arguments and to critique the empirical evidence and logic of others. We're regularly bombarded with statistics and quantitative data. Claims made with "numbers" typically hold sway in popular and political discourses. However, statistics also conflate or embellish claims. As planners, it's essential that we interpret evidence from multiple perspectives, gather and be prepared to discuss conventional applications of statistics – based on newspaper articles, professional journals, websites, etc. – particularly, how data is used, interpreted, skewed and alternative perspectives.

Students are expected to attend laboratory sessions on a weekly basis. During lab you will apply many of the concepts we discuss during lecture. The lab and lecture run parallel at times, yet diverge during the more theoretical and conceptual discussions of statistics.

This course emphasizes the conceptual and applied aspects of quantitative analysis. More often than not, planners, policymakers and other analytical professionals rely on statistical software and other technologies when asked to compare and contrast phenomena, select among myriad variables or options, estimate or predict outcomes, and map trends. Nevertheless, you are required to learn many of these concepts the old fashion way, by solving statistical problems manually. Since the aim of this course is to understand the logic of analytic approaches, interpret findings, and identify the strengths and limitations of various techniques for different contexts, you should not be satisfied with merely seeking the "correct" answer. You must always clearly demonstrate *how* you arrived at answers.

Your work will be evaluated on its substantive content, analytical rigor, and plausibility of your arguments, and the clarity of your writing.

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**Please review the academic integrity guidelines for Columbia University and for GSAPP**

*All questions of academic integrity will be taken up by GSAPP Officers. All cases will be processed based on an implicit understanding that the University code of ethics and academic integrity have been agreed to by all registered students*

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| Assignments: | Date | Weight |
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| Homework problems | ~weekly | 20% |
| Applied statistical analysis | | 5% |
| Mid term exam | 10/24 | 25% |
| Term Project Outline | 10/31 | 10% |
| Final Term Project | 12/o5 | 15% |
| Final exam | 12/12 | 25% |

## COURSE SCHEDULE:

| | TOPICS COVERED | READING DISCUSSED |
|---|---|---|
| **Week ONE** **9/5** | **Introduction**<br>· What are statistics and how are they useful?<br>· Scientific inquiry<br>· Levels of measurement | **Healey** - chapters 1 & 2<br><br>**Babbie, Earl.** "Chp. 1: Human Inquiry and Science" and "Chp. 2: Theory and Research" |
| HOMEWORK: | Review chapters 1&2<br>Read Chapters 3&4 and Babbie | |
| LAB | SIGN UP FOR LAB SESSION: WED or THUR | |
| **Week TWO** **9/12** | **Descriptive Statistics:**<br>· Using descriptive statistics<br>· Measures of central tendency<br>· Measures of dispersion | **Healey** - chapters 3 & 4<br><br>**Babbie, Earl.** Chaps. 1 &2 |
| HOMEWORK: | Problem set posted on Courseworks<br>Corresponds with chp 1-4 and Babbie<br>Begin Census data "scavenger hunt" | |
| LAB | Introduction to SPSS and other software | |
| **Week THREE** **9/19** | **Accessing Data, Using Datasets**<br>· Gathering, interpreting and presenting trend data<br>· Understanding the US Census<br>· The strengths and limitations of survey data<br>· Guest Lecturer - from CU EDS | **LoPresti, Frank.**<br><br>**Wolman, et al**<br><br>**US Census Glossary:** http://www.census.gov/main/www/glossary.html |
| HOMEWORK: | Continue with data "scavenger hunt" assignment | |
| LAB | Explore datasets : Census (Factfinder), American Community Survery, BLS, PUMS, etc., | |
| **Week FOUR** **9/26** | **The Normal Curve**<br>· Standard (z) scores<br>· Using the normal curve to estimate probabilities<br>· Extrapolation and forecasting<br>· *Discuss Term Project* | **Healey** - chapter 5 |
| HOMEWORK: | Problem set for CHP 5 - posted on Courseworks | |
| LAB | Download, clean, and recode data, etc. | |
| **Week FIVE** **10/3** | **Introduction to Inferential Statistics:**<br>· How are samples selected?<br>· Simple random sampling and other sample techniques<br>· Sampling distribution, sample, population<br>· Estimation and confidence intervals | **Healey** - chapter 6<br><br>**Freeman, David** "Ecological Inference and the Ecological Fallacy" |
| HOMEWORK: | Problem set for Inference (chp 6) - posted on Courseworks | |
| LAB | Descriptive statistics and visualizing data | |
| **Week SIX** **10/10** | **Hypothesis Testing I: Making decisions about a population using one sample estimate** | **Healey** - chapter 7 |

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| | · Null and research hypothesis<br>· Decision rules and the critical region<br>· Test of significance | |
| HOMEWORK: | Problem set for hypothesis testing - posted on Courseworks | |
| LAB | Statistical testing: two sample means | |
| **Week SEVEN 10/17** | **Hypothesis Testing II: Two sample means**<br>· Testing difference between two samples<br>· Difference of means<br>· Difference of proportion | **Healey - chapter 8** |
| HOMEWORK: | Problem set for hypothesis testing & Midterm Review questions | |
| LAB | Technical skill development & Mid term review | |
| **Week EIGHT 10/24** | **MIDTERM EXAM (In-Class)** | |
| LAB | No Lab | |
| **Week NINE 10/31** | **Hypothesis Testing: Chi Square – Testing relationships between two or more variables**<br>· Contingency tables - bivariate relationships<br>· The chi-square distribution and statistic<br>· Sample size considerations | **Healey - chapter 10** |
| HOMEWORK : | **Term Project OUTLINE** | |
| LAB | Statistical testing | |
| **Week TEN 11/7** | **Research Design Techniques**<br>· Causal explanations<br>· Experimental design<br>· Survey design and implementation | **Babbie, Earl**<br>Chaps 4 & 5 |
| HOMEWORK: | Problem set posted on Courseworks | |
| LAB | | |
| **Week ELEVEN 11/14** | **Bivariate Measures of Association: Introduction**<br>· Measuring the strength of the association<br>· Bivariate tables for nominal variables<br>· Measuring the direction of the relationship | **Healey - chapter 11**<br>(11.1-11.4)<br>**Healey - chapter 12**<br>(12.1-12.4) |
| HOMEWORK: | Problem set posted on Courseworks | |
| LAB | | |
| **Week TWELVE 11/21** | **Bivariate Regression & Correlation**<br>· The regression line and linear relationships<br>· Coefficient of correlation (r)<br>· Coefficient of determination ($R^2$)<br>· Explained and unexplained variation<br>· Test of significance for r | **Healey - chapter 13** |
| HOMEWORK: | Problem set posted on Courseworks | |
| LAB | Correlation; Statistical significance; Simple linear regression; Time for question related to projects | |

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| **Week THIRTEEN<br>11/28** | **Correlation and Multiple Regression**<br>· Correlation, prediction and causation<br>· Assumptions and limitations | **Healey - chapter 14** |
| HOMEWORK : | Problem set posted on Courseworks | |
| LAB | Multiple regression; Time final project questions | |
| **Week FOURTEEN<br>12/5** | · Brief Discussion of Term Project<br>· Course Overview<br>**Term Project DUE** | |
| LAB | REVIEW SESSION | |
| **Wednesday 12/12** | **(In- Class) FINAL EXAM** | |
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