University of Southern California
Sol Price School of Public Policy
International Public Policy and Management Program (IPPAM)
Fall 2014, 4 units

PPD 570: Applied Statistics for Planning, Policy, and Management
3650 McClintock Avenue, Suite 200
Los Angeles, CA 90089-1450

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sta•tis´•tics *n. Abbr.* **stat.** **1**. The mathematics of the collection, organization, and interpretation of numerical data; especially the analysis of population characteristics by inference from sampling. Used with a singular verb. **2**. A collection of numerical data. Used with a plural verb. [German *Statistik*, originally "political science dealing with state affairs," from New Latin *statisticus*, of state affairs, from Latin *status*, manner of standing, position, state. See **sta-**]

sta•tis´•tic *n.* **1**. Any numerical datum. **2**. An estimate of a parameter, as of the population mean, variance, or skew, obtained from a sample. [Back-formation from STATISTICS.]

Usage in **PPD 570**: The most important characteristic of a statistic is that it be a well-behaved random variable. If the statistic is not well enough behaved to have a known probability distribution, then there is usually no reason to be interested in it.

da´•ta *pl. n. Singular* **datum**. **1**. Information, especially information organized for analysis or used as the basis for a decision. **2**. Numerical information in a form suitable for processing by computer. [Latin, plural of DATUM]

Usage: *Data* is now used both as a plural and as a singular collection: *These data are inconclusive. This data is inconclusive.* The plural construction is the more appropriate in formal usage. The singular is acceptable to 50 percent of the Usage panel.

Usage in **PPD 570**: Find a source of online data.

sto•chas´•tic *adj.* **1**. Of, denoting, or characterized by conjecture; conjectural. **2**. *Statistics.* **a**. Random. **b**. Statistical. [Greek *Stockhastikas*, capable of aiming, conjectural, from *stokhazesthai*, to aim at, guess at, from *stokhos*, target, aim. See **stegh-**]

Usage in **PPD 570**: Realizations of stochastic variables take on random values distributed across some range. Some stochastic variables are vectors. Realizations of deterministic variables are nonrandom, possibly unknown, but by definition nonrandom.

em•pir'´•i•cal *adj*. **1**. Relying upon or derived from observation or experiment: *empirical methods, an empirical conclusion*. **2**. Guided by practical experience and not theory, especially in medicine. **em•pir´•i•cal•ly** *adv*.

Usage in **PPD 570**: In an experimental context, we use systematic empiricism to test existing theories and construct new ones. In a correlation context, we still rely on empiricism, but in a less controlled way.

em•pir•ic (em-pîr'ik, im-) n. **1**. One who believes that practical experience is the sole source of knowledge. **2**. A charlatan: *"we must not … prostitute our past-cure malady / To empirics'"*" (Shakespeare). [Latin *empiricus*, from Greek *emperikos*, from *empeira*, experience, from *empeiros*, experienced in **:** *en-*, in + peira, experiment, trial.

Usage in **PPD 570**: There isn't one. Nobody wants to be called an "empiric."

The point of statistics in applied social science is not to become more theoretical. The objective is to bring theory down to earth, and learn how to reconcile differences between what we believe with what we observe.

Overview

This is a first course in statistics for new graduate students with no substantive prior exposure to the field. The course is designed and delivered especially for USC Price School IPPAM students. No prior work in statistics is assumed, but students must be capable of performing mathematics at the level of 11th grade algebra. We will cover the fundamentals of probability and statistics without (much) compromise, and then treat some more ambitious topics in a survey fashion.

The lectures for this class will necessarily emphasize basic theory and procedures. There will be numerous applied examples. These applied examples are called "home work."

The lecture meetings will summarize and organize the ideas put forth in the readings. Attendance is important, and thus strongly encourage. As a matter of courtesy to all parties concerned, please arrive on time, and discuss any premature departures with me prior to the event.

I will communicate with you at your USC NetID, which is also your USC email address. You are accountable for the information content of the messages I send to you. I will also post key messages as announcements on the course website. My email address is above.

Objectives

This class is designed to provide you with:

1. a basic understanding of probabilistic and statistical concepts, with an emphasis on probability;
2. an ability to reason in probabilistic terms;
3. a set of accepted techniques that can be used to analyze, understand, and (hopefully) address many public policy and management problems and related research questions; and the means to acquire new skills in this dimension as needed;
4. an understanding of how to ask statistical questions, and how to treat the information needed to answer these questions or offered in response to these questions;
5. a basic familiarity with statistical computing standards; and
6. an understanding of why statistical analysis is a key element of your applied social science, graduate education, regardless of whether your objectives are further scholarship or professional practice.

Lectures:

Lectures are offered weekly each Tuesday afternoon during the fall semester. We have only a very limited amount of time to cover this material, and routine attendance is strongly encouraged. If you do skip a class, the cost is yours, not mine.

This is a lecture-based course, but questions and informed discussions have an important role. Because this is a survey class treating a wide range of techniques, not all topics can be treated in the detail they merit. Questions concerning clarifications, extensions, and applications are welcome and always encouraged, but class members may sometimes find themselves asking reasonable, relevant questions that I will not take the time to answer during lecture. These questions can be pursued on the telephone, in email exchanges, or during office hours.

Evaluation

Objective measures include class participation (a whopping 15%, so make the most of it and speak up with questions and observations), homework exercises (25%, for which you may work together and receive copious assistance), lab participation and assignments (15%), a midterm examination, and a final examination (20%, take home, due on Thursday, December 11 at 5:00 PM). You may turn the final examination in ahead of schedule, but not after the due date.

Course Component	Weight
Homework: Average of 5	25%
Class Participation	15%
Lab and Lab Assignments	15%
Midterm Exam	15%

Final Examination (Dec 11)	20%
Floating Increment	10%
Total	100%

Incomplete grades can only be given if the terms of an incomplete grade are met. See *SCampus*, the USC Student Handbook, for the conditions under which students might legitimately request a grade of "incomplete." Homework assignments will be distributed via blackboard and are due on the schedule indicated. Class members should respect this schedule. Late work will normally be declined.

Homework assignments are for instruction as well as evaluation. I am willing to discuss the homework assignments during office hours, and in class for that matter. Anyone who wants a perfect score on any homework assignment can probably get one by asking for assistance.

These weights add up to 90%. An additional 10% will be added to the weight for that objective course component accounting for each student's best performance. There are many ways for a student to turn in a performance that reflects knowledge lower than his or her true state of information, but relatively few ways for a student to deliver a performance reflecting a better state of information than the state he or she actually has. Consequently, I place a premium on the importance of each student's best score because this score includes less bias than his or her lower scores. Consider the following example.

Student X:	**Score (out of 100)**	**Weight**	**Contribution**
Homework: Average of 5	90.	25%	22.50
Class Participation	88.	15%	13.20
Lab and Lab Assignments	85.	15%	12.75
Midterm Examination	82.	15%	12.30
Final Examination	93.	20%+10%=35%	27.90
Course Total			**88.65***

* This is probably an "A-," or at worst a "B+"

Cooperation is usually the least expensive means of overcoming difficulty, so I normally urge students to work homework assignments in teams. The final examination must be completed alone. You are strongly encouraged but not required to execute homework assignments in teams of two to four members. Team members will receive identical grades on group assignments. If you have not contributed to the completion of a homework assignment, please do not pester your colleagues to fraudulently append your name to their work. This would be a violation of University Conduct Code § 11.15, 11.17, 11.21, and 11.31. See the information below on academic integrity.

All homework should be submitted electronically as an email attachment to me at jmoore@usc.edu. Since we are a small class, lets skip the blackboard assignment manager. I will acknowledge your email submissions. Keep an electronic copy of your submissions for your records, in any event. Let me repeat that. Keep an electronic copy of your submissions for your records, in any event.

Website:

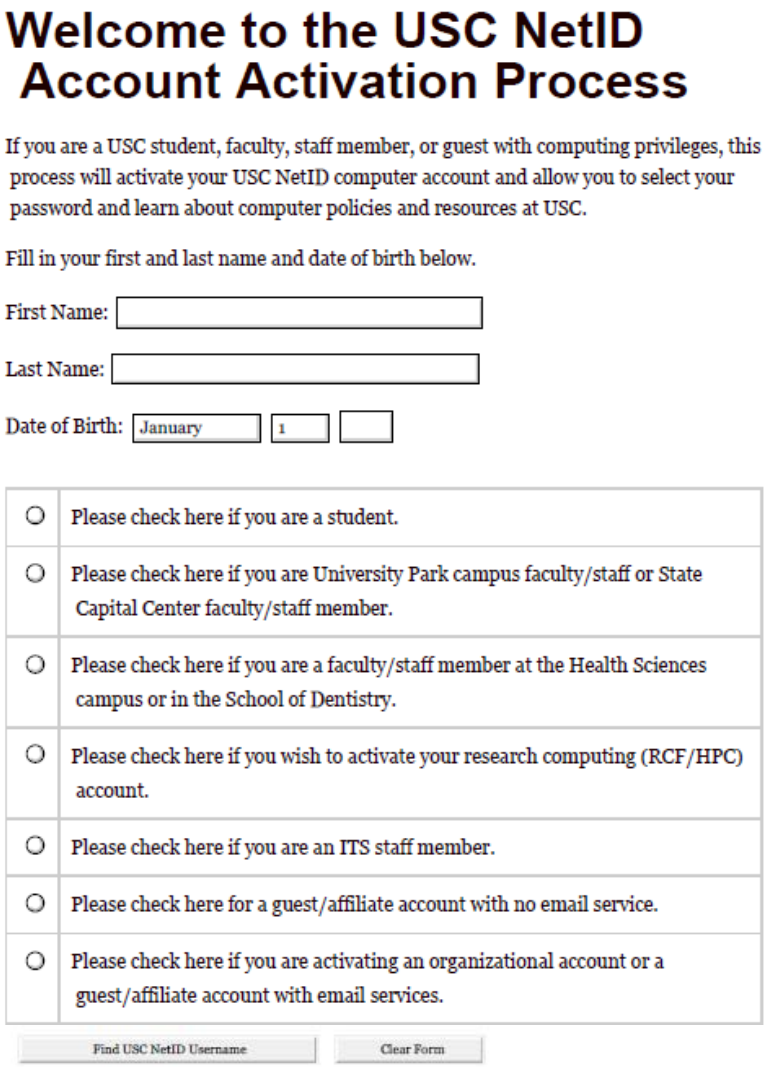
Most class handouts will be distributed through the course website https://blackboard.usc.edu/. There is additional information available at the website, more than we will use in our course. It is there for reference. You are not responsible for every document posted there. I will direct you to what you need to know.

You should use your USC NetID to log into this site. The site is password protected with the same password as your USC NetID. You may also view a record of your scores on the website if you access the site.

To log into the course website, you must execute the USC Information Technology Services (ITS) first login procedure. This is web based. Go to

https://secweb.usc.edu/cgi-local/firstlogin/showform?form=activate

You will see a screen like the one below.



Welcome to the USC NetID Account Activation Process

If you are a USC student, faculty, staff member, or guest with computing privileges, this process will activate your USC NetID computer account and allow you to select your password and learn about computer policies and resources at USC.

Fill in your first and last name and date of birth below.

First Name:

Last Name:

Date of Birth: January 1

○	Please check here if you are a student.
○	Please check here if you are University Park campus faculty/staff or State Capital Center faculty/staff member.
○	Please check here if you are a faculty/staff member at the Health Sciences campus or in the School of Dentistry.
○	Please check here if you wish to activate your research computing (RCF/HPC) account.
○	Please check here if you are an ITS staff member.
○	Please check here for a guest/affiliate account with no email service.
○	Please check here if you are activating an organizational account or a guest/affiliate account with email services.

Find USC NetID Username | Clear Form

A Few Points the Provost Would Like Me to Mention

Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, (www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

The Sol Price School of Public Policy adheres to the University of Southern California's policies and procedures governing academic integrity as described in *SCampus*. Students are expected to be aware of and to observe the academic integrity standards described in *SCampus*, and should expect those standards to be enforced in this course, because they will be.

Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website and contact information for DSP: http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Emergency Preparedness/Course Continuity in a Crisis

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.

Computing

Modern statistical procedures have been revolutionized by the availability of low cost computers. Our assignments are small and fundamental enough to be executed by hand with a calculator, but you are encouraged to organize your work with Excel if so inclined.

The course includes a computing lab experience to provide you hands on experience with statistical software, specifically the Strategic Analysis System (SAS, formerly the Statisitical Analysis System, http://www.sas.com/en_us/company-information.html). The labs are organized and led by our Course Assistants, Michael Lin [chengyil@usc.edu] and Luna Zhu [xiaoyue@usc.edu]
There will be about ten lab sections during the course of the semester, scheduled so as not to conflict with other IPPAM courses. The computing labs will meet on the following Mondays from Noon to 2:00 PM, starting September 8, 2014:

Week	Date	Time	Location
1			
2			
3	Monday, September 8	12-2:00 PM	To Be Announced (TBA)
4	Monday, September 15	12-2:00 PM	To Be Announced (TBA)
5	Monday, September 22	12-2:00 PM	To Be Announced (TBA)
6			
7	Monday, October 6	12-2:00 PM	To Be Announced (TBA)
8	Monday, October 13	12-2:00 PM	To Be Announced (TBA)
9	Monday, October 20	12-2:00 PM	To Be Announced (TBA)
10	Monday, October 27	12-2:00 PM	To Be Announced (TBA)
9			
12	Monday, November 10	12-2:00 PM	To Be Announced (TBA)
13	Monday, November 17	12-2:00 PM	To Be Announced (TBA)
14	Monday, November 14	12-2:00 PM	To Be Announced (TBA)
15			

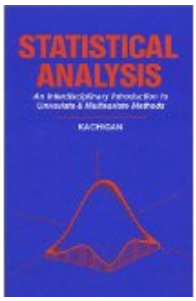
This schedule may be subject to minor adjustment as the semester progresses, and the computing labs may not always meet in the same location. Schedule conflicts with other IPPAM classes will be avoided in any event.

Considerable statistical consulting assistance is also available from the ITS consultants at (213) 740-5555 or send email to stats@usc.edu. These folks are a valuable resource. Treat them kindly. See also http://itservices.usc.edu/stats/sas/ and http://itservices.usc.edu/stats/sas/elearning/ .

Teaching Assistant

We don't have one, nor do we really need one for a course this size. It is just us. The Course Assistants are responsible for the statistical computing lab. Questions about how to proceed with respect to the lecture material and home works should be directed to me. Questions about how to proceed with respect to the computing lab and lab assignments should be directed to Michael and Luna, both of whom are very qualified. Michael has completed his doctorate in the Price School. Luna is a Master of Public Policy student, and a graduate of Fudan University in China. They will be collaborating to determine your lab grades.

Required Texts For the Statistics Lecture

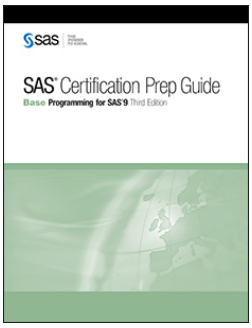


Kachigan, Sam Kash, *Statistical Analysis: An Interdisciplinary Approach to Univariate and Multivariate Methods*, Radius Press, 1986. This is available in USC Gift and Convenience Store (formerly the USC Book Store).

Supplemental Readings and Lecture Notes for PPD 570: Applied Statistics for Planning, Policy, and Management, Fall, 20014. This is available on the course website.

Assigned readings are important and will contribute significantly to your understanding of the lecture material. Fortunately, both the required text and the lecture notes are reasonably clear. The first-best strategy is to skim the assigned material before class, attend lecture and listen carefully, and then read the text assignments with discrimination.

Recommended Texts For the Computing Lab



Additional reading material you need for the computing lab will be provided by Michael and Luna. Some will come from SAS, *SAS Certification Prep Guide: Base Programming for SAS 9 (Third Edition)* SAS Institute Inc., 2011. https://support.sas.com/pubscat/bookdetails.jsp?pc=63049). Don't purchase this book. It is expensive. We will distribute what you need.

Tentative Course Outline

Topics Assigned Readings	Week of	
I. Fundamental Concepts	Aug 26	**K** pp 1-28
II. Data Reduction		
A. Frequency Distributions		**K** pp 29-42
B. Central Tendency	Sept 2 **HW 0 due**	**K** pp 43-53
III. Probability		
A. Basic Probability		
…Sample spaces and set logic		
…Simple discrete probability distributions		**K** pp 73-87
…Expected value of a random variable	Sept 9	**K** pp 97-98
…Conditional probability		**K** pp 87-97
B. Advanced Probability Topics		
…Bayes formula and decision trees	Sept 16	**K** pp 476-488
…Permutations and combinations	**HW 1 due**	**K** pp 462-468
IV. Inference		
A. Variation	Sept 23	**K** pp 54-72
B. Sampling Distributions:		**K** pp 102-131
…Samples		
…Normal distribution		
…Statistics as random variables		
…Central limit theorem	Sept 30, **HW 2 due**	
…Proportions as means: Binomial distribution		
…Hypergeometric distribution		**K** pp 471-473
…Poisson distribution		**K** pp 473-476
C. Parameter Estimation:	Oct 7	**K** pp 134-159
…Point and interval estimates		
…t-statistics		
D. Hypothesis Testing:		**K** pp 160-185, 189
…Types of hypothesis sets		
…Tests of a mean		
…Type I and Type II errors		

MIDTERM EXAMINATION	Oct 14	**In Class**
V. Association (Fundamentals of Multivariate Analysis)		
A. Simple and Serial Correlation Analysis	Oct 21	**K** pp 195-226, 233-234 **B** pp 125-149 (lecture notes)
B. Nonparametric Statistics		**K** pp 452-461
C. Analysis of Category Data	Oct 28 (BOO!) **HW 3 due**	**K** pp 342-354
D. Simple Regression Analysis: …Basic linear model and assumptions …Significance tests and confidence bands …Proportion of variance explained		**K** pp 238-259
E. Multiple Regression Analysis	Nov 4	**K** pp 259-271 **H** pp 61-72 (lecture notes)
F. Multiple and Partial Correlation Analysis (Qualitative): Relationship to Multiple Regression		**K** pp 226-232
G. Analysis of Variance (ANOVA) …One-Way ANOVA and Multiple Regression …Factorial Designs	Nov 11 **HW 4 due**	**K** pp 272-282 **K** pp 282-297
H. Multiple Regression Using Matrices …Matrix Arithmetic	Nov 18	**R** pp 1-10 (lecture notes);
…Matrix Generalization of the General Linear Model	Nov 25 **HW 5 due**	**W&W** pp 331-340 (lecture notes)
I. Review/Spare Date	Dec 2	
FINAL EXAMINATION		Distributed: Dec 2 **Due: Dec 11, 2014**

This schedule is optimistic, but it has been met before. Hopefully, you will find these techniques useful in many ways. In any event, this schedule is not a contract, and will probably be subject to minor revisions subject to our joint capacity for progress.

The Key to Success in This Class:

Don't fall behind. If you do fall behind, catch up. If you can't catch up, formulate a Plan B. Ask for guidance, and you will receive it. Do not, however, ignore the situation and hope for the best. You will be disappointed if you do, and you are investing too much time and tuition not to give yourself every opportunity to succeed.

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