

Biostatistics 511 – Medical Biometry I
Autumn 2007

Lecture: MWF 9:30 - 10:20
HSB T439

Discussion Sections:

- W: 8:30 – 9:20, T478
- W: 12:30 – 1:20, T531
- Th: 9:30 – 10:20, T359
- F: 8:30 – 9:20, T473

Some of the discussion sections will be held in the Health Sciences computer lab C. Enter through the 3rd floor T-wing entrance to the Health Sciences Library. You should bring a PIN drive to these sessions to save files and data.

Instructor: Jim Hughes, Professor of Biostatistics
H655F, Health Sciences Building
616-2721
jphughes@u.washington.edu
office hours: see chart below, or by appt.

TA's:

- Dena Freeman
o dfreeman@u.washington.edu
- Joanna Scott
o elorra@u.washington.edu
- Betsy Teeple
o eteeple@u.washington.edu

Mailboxes for the TA's are in F-600. TA's will hold office hours in H657 in the Health Sciences Building or in the Health Sciences Library. See chart below.

The chart below shows the times of class meetings and instructor/TA office hours. Office hours marked with a star* will be held in the Health Sciences Library Computer Lab.

	Mon	Tues	Wed	Thurs	Fri
7:30					
8:30	DF*		Discuss	JH	Discuss
9:30	Lecture		Lecture	Discuss	Lecture
10:30				JH	JH
11:30					
12:30	BT*		Discuss		
1:30	BT*	DF*			JS*
2:30	JS*	DF*			
3:30	JS*	BT*			
4:30					

Course Description: The objective of this course is to provide students with an understanding of basic concepts and methods of statistical inference in the health sciences. The major topics covered are:

- Data Description and Exploratory Data Analysis
- Basic Issues in Study Design, including Sample Size Calculations
- Probability Concepts and Models
- Statistical Inference - Estimation
- Statistical Inference - Hypothesis Testing for one and two sample problems
 - Parametric approaches
 - Nonparametric approaches
- Categorical Data Analysis
- Introduction to Regression Analysis

Examples are drawn from the biomedical literature, and real data sets are analyzed by the students after a brief introduction to the use of a statistical computing package.

Learning Objectives: Upon completion of the course, students should be able to ...

- Select and interpret appropriate graphical displays and numerical summaries for both quantitative and categorical data
- Explain the difference between observational and experimental studies
- Identify and describe cohort sampling, case-control sampling and cross-sectional sampling
- Recognize and explain the concepts of confounding and effect modification
- Describe the assumptions underlying the Binomial, Poisson and Normal probability models
- Define sensitivity, specificity and predictive values in the context of a binary screening test for a disease
- Translate scientific questions into appropriate null and alternative hypotheses
- Describe the assumptions underlying z-tests, t-tests and chi-square tests and use these tests to statistically compare two samples
- Explain and interpret p-values and confidence intervals
- Describe the assumptions underlying simple linear regression and be able to fit and interpret a regression model.
- Make predictions with a simple linear regression model
- Select and apply appropriate statistical methods to analyze their own data (for scientific questions appropriate to the tools taught in the course) and develop an analysis plan
- Critique the use of statistical methods in the published biomedical literature
- Use Stata to read data, describe data, and perform the statistical analyses covered in the course.

Textbook: Moore DS and McCabe GP (2002) Introduction to the Practice of Statistics, 5th ed. Freeman. Additional materials are on reserve at the Health Sciences Library. See attached list.

Lectures: Lectures will be captured on a tablet PC and made available on the website. Be aware, however, that computers occasionally die in the middle of a lecture ...

Lecture Notes: Copies of the lecture notes may be purchased at the South Campus Center Bookstore. The notes are also posted on the website.

Handouts: Extra copies of course handouts can be found on the website.

Web site: We will post homework assignments and other course materials on a course web site. The address is <http://courses.washington.edu/b511>

Software: You will need access to a software package that can do descriptive statistics, graphics and basic hypothesis testing. This includes most common statistical packages. The standard software package for the class will be Stata, which is available on the machines in the Health Sciences Library computer lab. Examples presented in class and quiz sections will be analyzed using Stata and a Stata tutorial will be given during the first week of the quarter. It is not required that you use Stata if you are familiar with another package and, for Biostat 511, it probably doesn't matter too much. However, if you are planning on taking Biostat 512 and 513 it will be worth your while to learn to use Stata as those courses will require use of Stata. To acquire Stata for home use see <http://www.stata.com/order/new/edu/gradplan.html>

Grading:

Quizzes:	15%
Midterm I:	25%
Final:	30%
Homework:	30% (includes data analysis plan)

Data Analysis Plan: Each student will be required to submit a written analysis plan for a proposed analysis (your own or one I provide). Students who are working on theses or research projects are encouraged to use these for their analysis plan (as appropriate). Plans will be graded on a credit/no credit basis.

Homework will (typically) be handed out on Wednesday and is due on the following Wednesday at lecture. One point (out of 10) will be deducted for each day a homework assignment is handed in late. No assignments will be accepted after one week following the due date. Students are encouraged to work together or in small groups on the homework problems. A good strategy is for everyone in the group to work on the problems individually and then get together to discuss the more difficult ones. However, the final version you hand in should reflect your own interpretation and understanding. That is, support and assistance with developing answers is encouraged; copying answers is not. Also, have mercy on the TA's – if your handwriting is difficult to read, print or type your assignment.

Quizzes: There will be four brief web-based quizzes throughout the quarter (see class schedule). I'll give the details as we get closer to the first one, but the idea is that you will have the weekend to complete the quiz online. You will have to login with your UW NetID to complete the quiz. I expect each student to work on the quiz individually and without help from other people. You may use your books and notes.

Additional Readings

The following material has been placed on reserve at the Health Sciences Library.

- Fisher LD and Van Belle G (1993) *Biostatistics: A methodology for the Health Sciences*. Wiley, New York, 991pp

This book covers a wide variety of topics and is more biomedically oriented compared to Moore and McCabe. Previously used as a text for this course.

- Rosner B (1995) *Fundamentals of Biostatistics*, 4th ed. Duxbury Press.

More biomedically oriented than Moore and McCabe and has lots of problems but hard to read. Previously used as a text for this course

- Moore DS (1997) *Statistics: Concepts and Controversies*, 4th ed. WH Freeman and Co., New York, 526 pp.

Emphasizes concepts; very few formulas; selected as "favorite statistical text" (out of 34 reviewed) by a group of undergrads at South Carolina.

- Michael M, Boyce WT, Wilcox AJ (1984) *Biomedical bestiary: An epidemiologic guide to flaws and fallacies in the medical literature*. Little, Brown and Co., Boston, 161pp.

A short, easy to read, virtually equation free book that discusses, with examples, the many biases and "gotcha's" that can occur in biomedical research. Strongly recommended.

- Tanur J (1972) *Statistics: A guide to the Unknown*

A great book of case-studies written for non-statisticians

- Tufte E (1983) *The Visual Display of Quantitative Information*

Classic book on the practice and pitfalls of data display.

- Stata User's Guide and Reference manuals
- Handbook of Statistical Analyses Using Stat

Course Outline

<u>Date</u>	<u>Lecture Topic</u>	<u>Suggested Reading</u>	<u>Discuss.</u>
9/26	Introduction		HSCL
9/28	Descriptive Statistics – Distributions	MM chap1	
10/1	"		
10/3	Descriptive Statistics – Relationships	MM 2.1, 2.2, 9.1, 2.5	HSCL
10/5	"		
	<WebQ Quiz>		
10/8	Study Design	MM chap3	
10/10	"		Class
10/12	Probability	MM 4.1, 4.2, 4.5	
10/15	"		
10/17	Discrete distributions	MM 4.3, 4.4, 5.1; R4.10	Class
10/19	Continuous distributions	MM 1.3	
	<WebQ Quiz>		
10/22	"		
10/24	Sampling distributions	MM 5.2	Class
10/26	Confidence intervals	MM 6.1	
10/29	Hypothesis testing: Introduction	MM 6.2, 6.3	
10/31	"		Class
11/2	EXAM		
11/5	Hypothesis testing: One sample	MM 7.1	
11/7	Hypothesis testing: Two sample	MM 7.2	HSCL
11/9	Hypothesis testing: Proportions	MM chap 8	
11/12	HOLIDAY		
11/14	Sample size and power	MM 6.4	Class
11/16	Nonparametric tests	MM 15.1, 15.2	
	<WebQ Quiz>		
11/19	Contingency tables	MM 9.1, 9.2, 9.3	
11/21	"		None
11/23	HOLIDAY		
11/26	Contingency tables	R10.5, 10.6	
11/28	Correlation		Class
11/30	Simple linear regression	MM 2.3, 2.4	
	<WebQ Quiz>		
12/3	"	MM 10.1	
12/5	"	MM 10.2	Class
12/7	Review/ Catchup		

Final Exam: Wed 12/12/07 8:30 – 10:20 in T439