

# Stat 538-001 Fall 2005 Syllabus

## Biostatistical Methods I for Public Health and Medical Sciences Introduction to Statistics: Statistical Summaries and Inference

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- Class:** Tuesday 9:30 - 11:30 FPCT 340 (lecture)  
Thurs 9:30 - 11:00 School of Med. Bldg. 2 – Electronic Classroom (lab)
- Office Hours:** Schrader: Tues 2:00-4:00, Thur 2-3; or appt. in Hum 435  
Erhardt: Tues and Thurs 12:00-13:30 in Hum 328
- Text:** *Statistics for the Life Sciences (3<sup>rd</sup> Edition)*,  
by Samuels and Witmer: Prentice Hall, 2003  
ISBN 0-13-041316-X (should be at the North Campus bookstore).
- Software:** MINITAB 14  
This is installed in the Electronic Classroom (Med 2), on the special MPH computers in the library, and on main campus at CIRT and in ESC Pod South. See the course web page for a link to a cheap rental of the software for your use at home. Documentation installs with the software.
- Course Notes:** Most of the course notes will be available in PDF format (readable by Adobe Acrobat) on the course web page located at [http://www.stat.unm.edu/~schrader/Biostat\\_I.html](http://www.stat.unm.edu/~schrader/Biostat_I.html). Our schedule is ambitious; material may be excised as necessary.
- Homework:** Assigned approximately every week. Due at next lecture, unless otherwise stated. Late homework normally will not be accepted.
- Grading:** Homework (90%), Computer lab/class participation (10%)
- Prerequisite:** Math 121 (College Algebra) or permission of instructor

## Objectives

1. Understand basic statistical and probability concepts.
2. Be able to interpret and prepare graphical and numerical summaries of data.
3. Understand the basics of statistical inference with respect to estimation and hypothesis testing.
4. Be able to determine appropriate statistical methods to use and implement them in simple analyses involving inferences for the population mean from one sample, population means from two samples, simple discrete data analysis, and simple linear regression models.
5. Be able to use computer software to conduct simple statistical analyses.
6. Understand basic research designs used in Public Health.
7. Determine appropriate use of data and statistical methods.
8. Finding sources of relevant data and information, and how to access these sources.

## Course Description

This course covers basic statistical methods used in the medical sciences. Types of data will be discussed. Methods of summarizing data through graphical displays and numerical summaries (measures of central tendency, percentiles, and variability) will be studied. Probability concepts will be covered to form the basis of statistical inference. Confidence intervals and hypothesis testing will be studied. Methods for statistical inference will focus on population means for one-sample, paired samples and two independent samples. Both normal-theory and nonparametric approaches will be studied. Methods of summarizing and analyzing discrete data will include proportions and tests of association and independence for two-way tables. The course will conclude with an introduction to regression methods (simple linear, multiple linear, logistic, and survival analysis). Emphasis will be placed on conducting statistical analyses on the computer.

## Course Outline

1. Introduction (Aug. 23)  
Reading: Samuels and Witmer (hereafter SW), Chapter 1
  - (a) Examples of the use of statistics
  - (b) Lab - Introduction to computing
2. Descriptive Statistics: Numerical  
Reading: SW, Chapter 2, Sections 1-7
  - (a) Types of variables
  - (b) Frequency distributions
  - (c) Numerical summaries of location: mean, median, mode, geometric mean, percentiles

- (d) Numerical summaries of spread: standard deviation, variance, range, interquartile range
3. Descriptive Statistics: Graphical (Aug. 30)  
Reading: SW, Chapter 2, Sections 3 and 5
    - (a) Graphical displays of data: histograms, stem-and-leaf plots, box plots
  4. Probability - Basic Ideas, Discrete and Continuous Distributions (Sept. 6 and lab)  
Reading: SW, Chapter 2, Section 8; Chapter 3, Sections 1-6
    - (a) Populations and samples
    - (b) Definition of probability
    - (c) Rules for obtaining probabilities: Multiplication and addition rules
    - (d) Trees
    - (e) Binomial distribution
    - (f) Normal distribution
    - (g) Standard normal distribution
  5. Probability - Sampling Distributions and the Central Limit Theorem (Sept. 13 and lab)  
Reading: SW, Chapter 3, Section 7-8; Chapter 4, Sections 1- 4, Chapter 5, Sections 1-3
    - (a) Sampling distributions
    - (b) Central Limit Theorem
  6. Statistical Inference: Estimation in the One-Sample Situation (Sept. 20)  
Reading: SW, Chapter 6, Sections 1 - 7
    - (a) t-distribution
    - (b) Standard errors and sampling distributions
    - (c) Confidence intervals for the population mean
    - (d) Confidence intervals for a population proportion
  7. Statistical Inference: Hypothesis Testing in the One-Sample Situation (Sept. 27)  
Reading: Instructor's notes
    - (a) Hypothesis testing for the population mean: significance levels and p-values
    - (b) Relationship between confidence intervals and hypothesis testing
    - (c) Hypothesis tests for a population proportion
  8. Two Sample Problems (Oct. 4)  
Reading: SW Chapter 7, Sections 1 - 7, 9 and 11; Chapter 9, Sections 1 - 3
    - (a) Independent Samples: CI for difference in population means
    - (b) Independent Samples: Hypothesis tests

- (c) Tests and CI for dependent samples: paired data
9. One-Way Analysis of Variance (Oct. 11)  
Reading: SW, Chapter 11, Sections 1-4
- (a) ANOVA table and F-tests
  - (b) Multiple comparisons
10. Discrete Data (Oct. 18 & 25)  
Reading: SW, Chapter 10, Sections 1-10
- (a) Comparison of two proportions: large sample tests and confidence intervals
  - (b) Two-by-two contingency tables
  - (c) Fisher's exact test
  - (d) Relative risk and odds ratio
  - (e) Tests of association and independence in two-way tables
11. Simple Linear Regression (Nov. 1)  
Reading: SW, Chapter 12, Sections 1 - 7
- (a) Scatter plots
  - (b) Modelling: deterministic and stochastic
  - (c) Simple linear regression model: interpretation
  - (d) Inference concerning the coefficients
  - (e) Correlation coefficients: Pearson and Spearman
12. Multiple Regression (Nov. 8)  
Reading: Notes
- (a) Model
  - (b) Interpretation of regression parameters
  - (c) Diagnostics and model selection
13. Logistic Regression (Nov. 15 & Nov. 22)  
Reading: Notes
- (a) Model and data
  - (b) Interpretation of regression parameters and odds ratios
  - (c) Diagnostics
14. Survival Analysis (Nov. 29)  
Reading: Notes

- (a) Basic ideas: survival curves, censored data
- (b) Empirical and Kaplan-Meier estimate of survival
- (c) Proportional hazards regression model

**Students with Special Needs:** Qualified students with disabilities needing appropriate academic adjustments should contact the professor as soon as possible to ensure your needs are met in a timely manner.

Students must inform the professor of the disability early in the class so appropriate accommodations can be met. Handouts are available in alternative accessible formats upon request. If you are an MPH student, please use the School of Medicine Office of Student Learning to apply for the appropriate accommodations. Seek assistance from: Cheri Koinis, M.Ed., Mgr, Student Learning Support, UME/ACES, MSC 08 4710, UNM Health Sciences Center, 1 University of New Mexico, Albuquerque, NM 87131-0001, (505) 272-5042; FAX: 272-9012, ckoinis@salud.unm.edu.

If however, you have already sought accommodation from main campus student services, please present the appropriate documentation to your professor. For further information on disability issues from main campus, please contact: Theresa Ramos, Office of Equal Opportunity, University of New Mexico, 609 Buena Vista, NE, Albuquerque, New Mexico 87107, (505) 277-5251; Fax (505) 277-1356, tramos@unm.edu