Biostatistics 551
Introduction to Biostatistics for Population Health
Fall 2008

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Class meetings: 1:00-2:15 pm Tuesdays and Thursdays in G5/113 CSC

Office hours: RG:
TA:

Texts (optional): *Fundamentals of Biostatistics (6th edition)* by Rosner.
Introductory Statistics with R by Dalgaard

Discussion Section: 2:30-3:30 pm Wednesdays in K6/120 CSC.
Attendance is strongly advised. Discussion section is held for the purposes of working through practice problems, answering general questions, and returning and discussing graded homework assignments. The first discussion will be held on September 12th.

Assignments: There will be weekly homework assignments. The importance of the homework assignments cannot be overemphasized. Much of your learning will take place while working the homework problems. Homework assignments should be well organized and reasonably neat. It is required that you show your work in order to receive credit. Homework assignments are due on Friday at 4:00 pm. With prior approval of the instructor, homework assignments may be turned in on Monday for full credit. Late homework turned in before the start of discussion section on Wednesday will receive (at most) half credit. Homework received after the start of discussion section will receive no credit.

Exams: There will be one in-class midterm exam and a take-home final exam. The exams will cover lecture materials, readings, and homework material. Exams will be open-book and open-notes. The midterm will take place on Thursday, October 23rd during the regular class time. The final exam will be handed out in class on Thursday, December 11th and due on Friday, December 19th at 4:00 pm.

Grading: The homework will count for 50% of the final grade; the midterm and the final exam will each count 25%.

Course Objectives for Biostatistics 551

By the end of the course, students will be able to:

1. Design and interpret graphical and tabular displays of public health data
2. Perform simple probability calculations based on the rules of probability
3. Use the binomial and Poisson distributions to calculate probabilities of events
4. Use the normal distribution to calculate probabilities of events
5. Explain and evaluate the assumptions required for the use of the binomial, Poisson and normal distributions
6. Explain the implications of the Central Limit Theorem in determining the sampling distribution of the mean
7. Explain the logic of statistical hypothesis testing and confidence intervals
8. Construct and interpret one-sample hypothesis tests and confidence intervals for
    a. the mean and variance of a normal distribution
    b. the proportion of a binomial distribution
    c. the rate of a Poisson distribution
    d. the mean of an arbitrary distribution using the Central Limit Theorem
9. Perform power and sample size calculations for one-sample hypothesis tests
10. Explain and evaluate the assumptions required for one-sample hypothesis tests and confidence intervals
11. Understand the relationship between confidence intervals and hypothesis tests
12. Construct and interpret two-sample hypothesis tests and confidence intervals for
    a. differences in means with paired data
    b. differences in means with independent samples (with and without the assumption of equal variances)
13. Explain and evaluate the assumption required for the paired and independent samples t-tests
14. Construct and interpret two-sample hypothesis tests for binomial proportions
15. Construct and interpret confidence intervals for the risk difference, relative risk and odds ratio in two-sample binomial problems
16. Perform power and sample size calculations for two-sample hypothesis tests
17. Estimate and perform inference for simple linear regression models
18. Explain and evaluate the assumptions required for simple linear regression

Syllabus for Biostatistics 551

We will cover most of the material in Chapters 1-8 and 10 of the Rosner textbook. Specific sections in the text and the order of topics are given below.

Descriptive statistics (about 2 lectures)	
Populations and samples	
Types of data	
Graphic methods	Section 2.8
Measures of location	Sections 2.2-2.3
Measures of spread	Sections 2.4-2.6
Probability and distributional models (about 9 lectures)	
Elementary probability	Sections 3.1-3.7
Elementary properties of random variables	Sections 4.1-4.6
Binomial distribution	Sections 4.8-4.9
Poisson distribution	Sections 4.10-4.13
Normal distribution	Sections 5.1-5.6
Central limit theorem	Section 6.5
Normal approximation to the binomial and Poisson	Sections 5.7-5.8
One-sample inference (about 7 lectures)	
Point estimation	Sections 6.5, 6.7-6.9
The logic of hypothesis testing	Sections 7.1-7.2
Inference for the mean of the normal distribution	Sections 7.3-7.4
Inference for the binomial distribution	Section 7.10
Inference for the Poisson distribution	Section 7.11
Power and sample size calculations	Sections 7.5-7.6
Confidence intervals for the mean and variance	Sections 6.5, 6.7
Hypothesis testing and confidence intervals	Section 7.7
Confidence intervals for binomial and Poisson	Sections 6.8-6.9
Two-sample inference (about 7 lectures)	
Design aspects	
Inference for paired samples	Sections 8.2-8.3
Inference for independent samples (equal variance)	Sections 8.4-8.5
Underlying assumptions	
Inference for independent samples (unequal variance)	Sections 8.6-8.7
Two-sample tests for binomial proportions	Sections 10.1-10.5
Measures of effect for binomial data	Section 13.3
Sample size calculations	Sections 8.10-8.11
Simple linear regression and correlation (if time allows)	
Fitting regression lines - method of least squares	Sections 11.1-11.3
Inference and prediction for regression	Sections 11.4-11.5
Correlation	Section 11.7-11.8