Biostatistics 551
Introduction to Biostatistics for Population Health
Fall 2014

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Teaching assistant: To be announced.

Course website: https://learnuw.wisc.edu

Class meetings: 2:30-3:45 pm Tuesdays and Thursdays in E5-492 CSC

Office hours: SW: 9:30-11:30 am Thursday or by appointment


Lab Section: 2:30-3:20 pm Wednesdays in E5-492 CSC
Attendance and participation in the laboratory sessions is required. In a typical lab session, students will be assigned to small groups to work through a lab exercise. If you are unable to attend a lab session, please notify the instructor in advance to make alternative arrangements.

Assignments: There will be six homework assignments due at the start of the lab session on Wednesdays. The importance of the homework assignments cannot be overemphasized. Much of your learning will take place while working the homework problems. It is required that you show your work in order to receive credit. Only essential computer output should be turned in, and it must be accompanied by a written explanation of what the output shows. Late homework received before the homework solutions are released will be accepted, but will receive (at most) half credit.

Exams: There will be an in-class midterm exam and final exam. The exams will cover lecture materials and homework material.

Grading: The course grade will be based on homework (48%), attendance and participation in the lab sessions (12%) and the two exams (20% each).
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. Explain and evaluate the assumptions required for one-sample hypothesis tests and confidence intervals
10. Understand the relationship between confidence intervals and hypothesis tests
11. 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)
12. Explain and evaluate the assumption required for the paired and independent samples t-tests
13. Construct and interpret two-sample hypothesis tests for binomial proportions
14. Construct and interpret confidence intervals for the risk difference, relative risk and odds ratio in two-sample binomial problems
15. Estimate and perform inference for simple linear regression models
16. 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 10-11 of the Rosner textbook. The order of topics is given below. The section(s) in the text corresponding to each topic are listed and should be read prior to lecture.

Descriptive statistics
  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
  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 Section 5.7
  Normal approximation to the Poisson Section 5.8

One-sample inference
  Populations and samples Section 6.2
  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
  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
  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

Simple linear regression and correlation
  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

If time permitting:
  Power analysis and sample size calculations Sections 7.5-7.6, 8.10-8.11