Biostatistics 612: Intermediate Statistical Analysis II

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Prerequisites: Biostatistics 611; permission of instructor

Target audience: Students in MSPH in Clinical Research, other physicians, nurses, and health professionals; PhD students in other SOPH Departments

Introduction: The course will offer intermediate-level instruction in the principles of biostatistics focusing on statistical modeling approaches to the analysis of continuous, categorical, and survival data.

Objectives: Students are taught to intermediate-level basic analysis methods focusing on regression modeling including the links between regression and analysis of variance (parameterization), multiple regression, indicator variables, use of contrasts, multiple comparison procedures and regression diagnostics. The second half of the course will generalize these modeling concepts to different types of outcome data including categorical outcomes (i.e., logistics and log-linear modeling) and survival outcomes (i.e., proportional hazards analysis). Students are taught to conduct the relevant analysis using current software such as SAS, SPSS, and JMP.

Format: Faculty will present material in didactic sessions; students will be responsible for exercises and critical readings, and analysis using computer systems.

Evaluation: Midterm and Final examinations; Review of publications; Homeworks

Credit hours: 3

Texts: W.W. Daniel: Biostatistics – A Foundation for Analysis in the Health Sciences. Wiley

Disability Student Services
Any student with a disability that may need accommodations in order to successfully complete all requirements for this course should visit the Office of Disability Support Services, located in Room 516 of the Hill University Center (205-934-4205). This office is responsible for registering students and ensuring the University’s compliance with Section 504 of the Rehabilitation Act. Once registered, this office will then inform faculty members of all courses in which the student is enrolled, of the student’s status, and the specific nature of any accommodations required. Any student requiring such accommodation should discuss this with the course master and assure that the appropriate correspondence is sent from the Office of Disability Support Services.
Syllabus and Proposed Timeline

Weeks 1 - 2
Simple linear regression
   Model description with assumptions
   Least square criterion and estimates
   Likelihood based inference
   Inference for model parameters
   Inference on mean response
   Prediction of single response
   Matrix formulation

Week 3-4
Residual Analysis – Diagnostics
   Normality and homoscedasticity
   Autocorrelation
   Outliers and influential observations

Homework #1

Weeks 5-8
Multiple linear regression
   Interaction
   Polynomial regression
   Indicator variables, coding, reparameterization
   ANOVA models
   Parallel regression lines, slope shifters (ANCOVA models)
   Model comparison, General F test

Homework #2

Week 9
Variable selection
   Stepwise regression
   R², adjusted R², MSE, Cₚ, Press statistic,

Week 10
Diagnostics in multiple regression
   Lack-of-fit test
   Residual analysis
   Collinearity
   Outliers and influence statistics
   Variance inflation factor

MIDTERM ASSIGNMENT

First review/critique of Published material due
Weeks 11-13
Logistic regression
  Logit model, odds ratio
  Model fitting
  Matched case-control study
  Cumulative logit models
  Diagnostics

Homework #4

Weeks 13-14
Introduction to Survival Analysis
  Kaplan-Meier (product limit) techniques
  Tests for differences between survival curves (log-rank test, Wilcoxon Test)

Week 15  Second review/critique of Published material due
FINAL ASSIGNMENT

Course Work and Evaluation
◆ Homework #1 (100 points)
◆ Homework #2 (100 points)
◆ MIDTERM EXAMINATION (200 points)
◆ First Review/Critique of Published Material (50 points)
◆ Homework #4 (100 points)
◆ Second Review/Critique of Published Material (50 points)
◆ FINAL EXAMINATION (200 points)

Grading
A = 90% of total points
B = 80% of total points
C = 65% of total points
F < 65% of total points