School of Public Health
Sackler Faculty of Medicine
Tel Aviv University

Course Syllabus – Graduate School of Medicine

Advanced Biostatistical Methods

1. Course Details

Title: Advanced Biostatistical Methods

Number: 0158.1015

Format: Lectures and class exercises

Language of Instruction: Hebrew

Number of Academic Credits: 3

2. Course Teaching Staff

Principal Instructor: Prof. David Steinberg (dms@post.tau.ac.il)

3. Course Goal

The course will present and discuss several advanced methods for the analysis of biostatistical data. The primary topics will be the analysis of the following types of data: binary data, count data, hierarchical (nested) data and survival data.

4. Course Specific Topics

Modeling Binary Data

- The logistic regression model
- Odds ratios and logistic regression
- Odds ratios in case-control studies
- Adjusting odds ratios for covariates
- The Mantel-Haenszel test for stratified data
- Likelihood and its role in logistic regression
- The propensity score (if time permits)

Analysis of Count Data

- The Poisson distribution and Poisson process for count data
- Estimating standardized mortality and morbidity ratios
- The Poisson regression model

The Mixed Model

- Research designs that lead to hierarchical models
- Within subject and between subject effects
- The linear mixed model
- Two-stage approach to statistical modeling
- Estimating and interpreting mixed models
- Mixed models for binary outcomes
- Conditional vs marginal effects
- Estimating marginal effects via GEE

Survival Analysis

- Features of survival data: outcomes and censoring
- Basic notions in modeling survival data
- The Kaplan-Meier estimator of survival
- Testing for differences in survival: the log rank and related tests
- The Cox model for the effect of continuous covariates

5. Required Reading

Reference Books

- Jewell, N.P Statistics for Epidemiology
- Altman, D. Practical Statistics for Medical Research, Chapters 11-13
- Pagano, M. and Gauvreau, K. Principles of Biostatistics, Chapters 16, 19-21
- Rothman, K.J. and Greenland, S. Modern Epidemiology
- Hosmer, D.W. and Lemeshow, S. Applied Logistic Regression
- Hosmer, D.W. and Lemeshow, S. Applied Survival Analysis: Regression Modeling of Time to Event Data
- Parmar, M.K.B. and Machin, D. Survival Analysis: A Practical Approach

References on Standardizing Rates

- Mosteller, F. and Tukey, J.W. *Data Analysis and Regression,* Chapter 11
- Breslow, N.E. and Day, N.E. *Statistical Methods in Cancer Research, Volume II -- The Design and Analysis of Cohort Studies,* Chapter 2

6. Course Prerequisites

All students are expected to have

- Basic statistical knowledge (including regression and analysis of variance - It is possible to study these topics in parallel to this course)
- For School of Public Health Students: Course "Biostatistics B" (0158.1110)
- Statistics students who have taken "Statistical Theory" course should be able to get along with just one of the above areas (Regression/ ANOVA). "Statistical Theory" is not a prerequisite for this course.

7. Course Assignments and Grading Policy

Regular homework assignments will be given. You are required to submit at least 2/3 of the assignments to take the final exam. You may prepare and submit the homework in teams of 2 students.

Final grades are based on the following:

- Final exam - 100%