BIOS 767: Longitudinal Data Analysis

Spring 2018

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Graders:
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Texts:

- Primary Resources
  - Fitzmaurice, Laird, and Ware, Applied-Applied Longitudinal Analysis, 2nd edition
  - Relevant papers as assigned
- Supplemental Resources
  - Diggle, Heagerty, Liang, and Zeger, Analysis of Longitudinal Data
  - Background material: Christensen's book (from bios 762) and the GLM book by McCullagh & Nelder.

Software:

- SAS and R (other software allowed but not supported)

Location and Time:
Class: 9:05-10:50 Monday and Wednesday, McGavran-Greenberg Hall

Prerequisites:
BIOS 762. Knowledge of basic matrix algebra, SAS/IML and R is assumed.

Learning Objectives:

- Gain strong understanding of the key concepts and ideas in longitudinal data analysis
- Hone skills in fitting and interpreting longitudinal data models for addressing scientific questions that arise in public health and medicine

- Gain competency in study design and power analysis of longitudinal data to complete skills needed to write statistical section of a grant proposal to collect and analyze longitudinal data

Copies of presentations used in class will be available online on Sakai. These notes cover some material not contained in the text, so the assigned readings are very important.
Course credits: I have drawn heavily on the work of professors and colleagues when creating the course, and in particular the work of professors Liang and Zeger at Johns Hopkins, Fitzmaurice, Laird, Ware, and Williams at Harvard; Edwards, Helms, Muller, Stewart and Herring at UNC.
Grades Homework assigments and class participation: 33%; Two midterm exams: 33 %; Final Exam: Monday, May 7, 2018, 33%.
The Graduate School uses the grades H (clear excellence), P (entirely satisfactory), L (low pass), and F (failure). Graduate students are expected to earn "P" grades, with remarkable performances rewarded with other grades from the scale as appropriate. Class participation may modify the association between the numeric average and assigned letter grade.
Honor Code:
Students in BIOS767 are expected to abide by the UNC Honor Code. All suspected Honor Code violations will be reported to the UNC Dean of Students, who will investigate the case. These investigations typically involve lengthy hearings of the Honor Court, and as outlined in the Instrument of Student Judicial Governance, "The usual sanction for a first academic violation is definite suspension for at least one academic semester and a grade penalty of an 'F' for the course, a portion of the course, or the assignment."
Course Content: Note: This course content is to some extent tentative. Further, topics may not be covered in the same order as given below.

- A quick revision of linear model basics
- A quick revision of generalized linear models
- What is different about longitudinal data
- Marginal models for longitudinal data - linear, generalized linear
- ANOVA - univariate, multivariate
- Random-effects models - linear, generalized linear (including BLUPs, Empirical Bayes, Bayes, etc.)
- Conditional models - linear, generalized linear

- Methods of estimation (MLE, CMLE, OLS, WLS, GEE, REML): This is not a separate topic, it cuts across the above topics
- Regression diagnostics
- The use of simulation in longitudinal data analysis
- Missing data models, weighted estimating equations, multiple imputation
- Sample size computation