M19-601: Multilevel and Longitudinal Data Analyses for Clinical and Public Health Research (Spring 2017)

Instructor:

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Office Hours: By Appointment

Course Description: This course is designed for medical students, clinicians, epidemiologists and other public health researchers, and is an extension to the intermediate biostatistics (M19-512). The topics include basic statistical concepts and methods for various types of biomedical and public health data (continuous, categorical, count, and time-to-event) in multilevel and longitudinal settings. Through lectures, SAS labs, homework assignments, and a small project, students will learn the concepts and methods for those types of data with application in clinical and public health research, and will further develop computing skills using SAS software.

Competencies: After completing the course, students should (1) understand the basic statistical concepts and methods for the various types of multilevel/longitudinal outcome data, (2) be able to address research questions using these concepts and methods, (3) be able to perform certain data analyses on these types of data with SAS software, and (4) be able to interpret the results in the context of clinical/public health research.

Prerequisite: M19-512 or equivalent (consent by the instructor)
Format: Lecture and followed by SAS lab.
Text: The course materials are based on the class notes, which are largely selected from various books, papers, and SAS documents. Reference (reading) materials are listed on the class notes.

Readings: All readings are recommended.

Class participation: Class attendance is required. You are expected to arrive on time. Involvement in class discussions is encouraged. Class attendance contributes 10 points to the course grade (a total of 100 points). One unexcused absence results in a loss of 5 points.

Homework and project: There will be four homework assignments and one final project.

Each homework assignment will be graded on a pass/fail basis. In order to receive credit for a homework assignment, students must complete every question. Unexcused late homework receives a fail grade on that assignment.

Students are encouraged to discuss with the instructor about the topics of their final project (defining research questions, describing statistical models to answer the research questions, performing data analyses, reporting and discussing the analysis results, and stating the conclusions). The final project is due on May 9th .

Grading: The course grade will be based 30% on the final project, 60% on homework, and 10% on class participation.

Section	Date	Contents
1	1/17	Introduction: multilevel/longitudinal data analyses and the related SAS procedures
		Part I: Continuous outcomes
2	1/24	Two-level models
3	1/31	Longitudinal models
4	2/7	Three-level models
5	2/14	Crossed random effects models / diagnostics of linear mixed effect models
		Part II: Discrete outcomes
6	2/21	Multilevel models for binary outcomes
7	2/28	Longitudinal models for binary outcomes
8	3/7	Multilevel /longitudinal models for ordinal outcomes
9	3/14	Multilevel/longitudinal models for nominal outcomes
10	3/21	Multilevel/longitudinal models for count outcomes
11	3/28	Multilevel/longitudinal models for counts with excessive zeros
		Part III: Time-to-event outcomes
12	4/4	Multilevel models for continuous-time data
13	4/11	Multilevel models for discrete-time data
14	4/18	Models for recurrent-event data
		Part IV: Other topics
15	4/25	Missing data in clinical and public health research
16	5/2	Missing data in longitudinal studies with focus on missing not at random(MNAR)