M19-512 **Intermediate Biostatistics for Clinical Research (Year 2016)**

Instructor:

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Course Description: This intermediate course in biostatistics is designed for medical students, clinicians and health researchers, and is a continuation of the introductory course (M19-511). The topics include basic statistical concepts and methods for various types of clinical data (continuous, categorical, count, and time-to-event outcome data). Through lectures, SAS labs, and homework assignments, students will learn the concepts and methods for those types of clinical outcome data, and will develop certain computing skills using SAS software.

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

Prerequisite: M19-510 and M19-511, or consent by instructor
Format: Lecture and followed by SAS lab.
Text: The course material is based on the class notes, which are largely selected from following books and documents

1. Der, G., Everitt, B.S., Applied Medical Statistics using SAS, CRC Press, 2013. **(D&E)**
2. DiMaggio, C., SAS for Epidemiologists: Applications and Methods, Springer, New York, 2013. **(DiMa)**
3. Kleinbaum, D.G., Klein, M., Logistic Regression: A Self-Learning Text, 3rd edition, Springer, New York, 2010. **(K&K)**
4. Rosner, B., Fundamentals of Biostatistics, 7th edition, Brooks/Cole, Boston, 2011. **(Rosner)**

   The first three books are E-books from Becker library. All books are available in the library course reserve.

5. SAS help documents in SAS software system.

Readings: All readings are recommended. For SAS document reading, you only need to get some ideas about what is there.

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: There will be seven homework assignments. Homework assignments will be handed out on Wednesdays for the following classes, and will be due one week after the class (see the schedule for details). 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.

Problems should be submitted in the order in which they are assigned. All graphs and tables should be properly labeled and only relevant SAS output should be turned in. The completed homework should be organized in one MS word or PDF file.

Exam: There will be in-class final examination on the last day of the class. The exam is open books and open notes.

Grading: The course grade will be based 40% on the final exam, 50% on homework, and 10% on class participation.

A: 94-100
A-: 90-93
B+: 88-89
B: 84-87
B-: 80-83
C+: 78-79
C: 74-77
C-: 70-73
F: < 70

M19-512 Schedule-Year 2016
(Mondays & Wednesdays 9am – noon)

Date	Topics	Recommended readings*	HW due date
10/17	ANOVA	D&E: chap 6.1-6.3 DiMa: chap 11 SAS: Proc GLM	
10/19	Correlation and simple regression	DiMa: chap 12, 13.1-13.3 D&E: chap 7.2-7.3 SAS: Proc CORR	
10/24	Multiple linear regression	DiMa: chap 13.4-13.5, 14.6. D&E: chap 8.1-8.4 SAS: Proc GLM, REG	
10/26	Diagnostics for linear regression model	DiMa: chap 41.1-14.5 D&E chap 8.5 SAS: Proc GLM, REG	HW one
10/31	Binomial distribution, maximum likelihood estimation, and simple logistic regression	Rosner: chap 4.8. K&K: chap 4 SAS: Proc logistic	
11/2	Multiple logistic regression-I	Rosner: chap 13.8. K&K: chap 3. SAS: Proc logistic	HW two
11/7	Multiple logistic regression-II	K&K: chap 6, 7 SAS: Proc logistic	
11/9	Assessing binary logistic regression models	D&E: chap 9.4 K&K: chap 9, 10 SAS: Proc logistic	HW three
11/14	Logistic regression for case-control and matched designs	DiMa: chap 9.1, 9.2, 9.7 D&E: chap 9.5 SAS: Proc logistic	
11/16	Logistic regression for nominal and ordinal outcomes	K&K: chap 12, 13 SAS: Proc logistic	HW four
11/21	Poisson distribution, Poisson regression, over-dispersion	Rosner: chap 4.10 D&E: chap 10.3.1, 10.5 SAS: Proc Genmod	
11/23	Introduction to survival analysis, KM method	D&E: chap 15.1-15.3 SAS: Proc lifetest	HW five
11/28	Cox's PHM	D&E: chap 16.2.1, 16.2.2 SAS: Proc phreg	
11/30	Assessing Cox's PHM	D&E: chap 16.2.3, 16.2.4 SAS: Proc phreg	HW six
12/5	Time dependent covariates	D&E: chap 16.3 SAS: Proc phreg	
12/7	Review for final exam		HW seven
12/12	Final exam		