

## M19-512 Intermediate Biostatistics for Clinical Research (Year 2017)

### **Instructor:**

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### **Teaching Assistant:** TBA

### **Office Hours:** By Appointment

**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, 3<sup>rd</sup> edition, Springer, New York, 2010. **(K&K)**
4. Rosner, B., Fundamentals of Biostatistics, 7<sup>th</sup> 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

**Other information for the class:**

Accommodations based upon sexual assault:

The University is committed to offering reasonable academic accommodations to students who are victims of sexual assault. Depending on the specific nature of the allegation, such measures may include but are not limited to: implementation of a no-contact order, course/classroom assignment changes, and other academic support services and accommodations. If you need to request such accommodations, please direct your request to Kim Webb ([kim\\_webb@wustl.edu](mailto:kim_webb@wustl.edu)), Director of the Relationship and Sexual Violence Prevention Center. Ms. Webb is a confidential resource; however, requests for accommodations will be shared with the appropriate University administration and faculty. The University will maintain as confidential any accommodations or

protective measures provided to an individual student so long as it does not impair the ability to provide such measures.

#### Bias Reporting:

The University has a process through which students, faculty, staff and community members who have experienced or witnessed incidents of bias, prejudice or discrimination against a student can report their experiences to the University's Bias Report and Support System (BRSS) team. See: [diversityinclusion.wustl.edu/brss/](https://diversityinclusion.wustl.edu/brss/)

#### Mental Health:

Mental Health Services' professional staff members work with students to resolve personal and interpersonal difficulties, many of which can affect the academic experience. These include conflicts with or worry about friends or family, concerns about eating or drinking patterns, and feelings of anxiety and depression. See: [shs.wustl.edu/MentalHealth](https://shs.wustl.edu/MentalHealth)

**M19-512 Schedule-Year 2017**  
 ( Mondays & Wednesdays 9am – noon )

Date	Topics	Recommended readings*	HW due date
10/23	Course overview and simple linear regression	DiMa: chap 13.1-13.3 D&E: chap 7.3 SAS: Proc GLM, REG	
10/25	Multiple linear regression	DiMa: chap 13.4-13.5, 14.6 D&E: chap 8.1-8.4 SAS: Proc GLM, REG	
10/30	Diagnostics for linear regression model	DiMa: chap 41.1-14.5 D&E chap 8.5 SAS: Proc GLM, REG	
11/1	Binomial distribution, maximum likelihood estimation, and simple logistic regression	Rosner: chap 4.8. K&K: chap 4 SAS: Proc logistic	HW-1
11/6	Multiple logistic regression	Rosner: chap 13.8. K&K: chap 3. SAS: Proc logistic	
11/8	Assessing binary logistic regression models	D&E: chap 9.4 K&K: chap 9, 10 SAS: Proc logistic	HW-2
11/13	Logistic regression for case-control and matched designs	DiMa: chap 9.1, 9.2, 9.7 D&E: chap 9.5 SAS: Proc logistic	
11/15	Logistic regression for nominal outcome	K&K: chap 12 SAS: Proc logistic	HW-3
11/20	Logistic regression for ordinal outcome	K&K: chap 13 SAS: Proc logistic	
11/22	Poisson distribution, Poisson regression, over-dispersion	Rosner: chap 4.10 D&E: chap 10.3.1, 10.5 SAS: Proc Genmod	
11/27	Zero-inflated Poisson model		HW 4
11/29	Introduction to survival analysis, KM method	D&E: chap 15.1-15.3 SAS: Proc lifetest	
14/4	Cox's PHM	D&E: chap 16.2.1, 16.2.2 SAS: Proc phreg	HW 5
12/6	Assessing Cox's PHM	D&E: chap 16.2.3, 16.2.4 SAS: Proc phreg	
12/11	Time dependent covariates	D&E: chap 16.3 SAS: Proc phreg	HW 6
12/13	Review for final exam		
12/18	Final exam		