

M19-511 Introductory Biostatistics for Clinical Research (3 credit)

Fall 2020 (08/24/2020 – 10/14/2020)

Mondays and Wednesdays: 9 am to Noon

Location: Virtual (Zoom)

INSTRUCTORS

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TAs:

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OFFICE HOURS

Via zoom, by appointment (send email to schedule)

PREREQUISITES

Introduction to SAS for Clinical Research: M19-510

COURSE DESCRIPTION & OBJECTIVES

This introductory course in biostatistics is designed for medical students, clinicians and health researchers. The course will introduce students to basic statistical concepts including hypothesis testing, probability distributions and relevant basic statistical methods. Through lectures, labs, and homework assignments, students will learn to apply statistical concepts in a medical context. This course includes introductions to the use of computers for statistical analysis, visualizing, summarizing and exploring data, probability theory, discrete and continuous probability distributions, populations and samples, sampling distributions and statistical inference, and hypothesis testing. Upon completion of the course, students will be able to summarize quantitative data and carry out and interpret simple data description and analyses using the SAS program. Prerequisite for the course is knowledge in SAS.

COMPETENCIES

1. Describe the roles biostatistics serves in biomedicine and public health.
2. Describe basic concepts of probability, random variation and commonly used statistical probability distributions.
3. Describe preferred methodological alternatives to commonly used statistical methods when assumptions are not met.

4. Distinguish among the different measurement scales and the implications for selection of statistical methods to be used based on these distinctions.
5. Apply descriptive techniques to summarize biomedical and public health data.
6. Apply common statistical methods for inference.
7. Apply descriptive and inferential methodologies according to the type of study design for answering a particular question.
8. Interpret results of statistical analyses found in biomedical and public health studies.

COURSE TEXTBOOKS:

Title	Edition	Author	Purchase
Fundamentals of Biostatistics	7/8	Bernard Rosner	Required
Biostatistics for Clinical and Public Health Research	1	Melody Goodman	Recommended

STATISTICAL SOFTWARE

The course provides a further introduction to SAS, a statistical software package. Several homework assignments require you to use SAS for one or more questions.

GRADING

Your grade will consist of four components: Homework, Midterm, Final, and class participation.

Components	Percentage
Homework Assignments	30%
Midterm	30%
Final	30%
Class Participation	10%
Total	100%

Grading scale:

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

Exams: There will be a midterm and final examination. You will have the complete class length (3 hours) to complete the examination. The exams are open notes and you will be allowed to use a scientific calculator. No graphing calculators, smartphones, smartwatches, laptops or other computers can be used during the examination.

Homework: Homework assignments can be found on the course website under course documents in the homework folder. 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. Homework assignments will be reviewed at

the beginning of class on the day they are due, and students will have an opportunity to correct their homework assignments during this period. Problems should be submitted in the order in which they were assigned. All graphs should be labeled with clear titles, axis labels and axis values. One of the course goals is to increase facility in communicating statistical information to others, so raw SAS output is not acceptable. Homework should include summaries of results illustrated by relevant SAS output.

Classroom environment: The more you participate in class discussion, the more you will gain from the course. It is understood that students bring varying kinds and levels of expertise to the class. In order for everyone to feel comfortable presenting work and voicing opinions or suggestions, a climate of tolerance and respect is essential.

ATTENDANCE AND PARTICIPATION

Class attendance is required. Statistics is a hands-on, collaborative practice, so much of the learning comes from input received from peers and course instructors. Homework and exams do not replace labs, in-class exercises and discussion. Absences from single classes for professional reasons (conferences, residency interviews) are acceptable. Extended absences will severely limit the return on your effort in this class.

POLICY ON LATE ASSIGNMENTS

Late assignments will result in a deduction of one grade point (A+ down to A) for each day late (including weekends) unless prior approval is obtained from the instructor or a compelling situation prevents prior approval (i.e. documented health issues or family emergencies).

LECTURE SCHEDULE

Date	Topic	Readings (chapter:pages)	HW Due
8/24	Introduction to course / Data Exploration / Overview of Probability	1:1-4, 2:5-33, 3:38-41	
8/26	Lab A: Using SAS for Data Exploration		
8/31	Probability, Prevalence, Incidence and Diagnostic Testing Probability Distributions: Discrete	3:42-60, 4:71-99	1
9/2	Probability Distributions: Continuous Estimation of Means, Proportions and Rates	5:108-137, 6:149-195	
9/7	Labor day		
9/9	Lab B: Probability and Estimation		2
9/14	One-sample Hypothesis Tests	7:204-258	
9/16	Lab C: One-sample Hypothesis Tests		3
9/21	Midterm Exam		
9/23	Two Sample Hypothesis Tests: Continuous	8:269-308, 9:327-345	
9/28	Two Sample Hypothesis Tests: Discrete	10:352-409	
9/30			4

	Lab D: Two-sample Hypothesis Tests		
10/5	Simple Linear Regression and Correlation	11:427-467	
10/7	Analysis of Variance (ANOVA)	12:516-548, 535-571	5
10/12	Review of Course and Questions		
10/14	Final Exam		

COURSE SYLLABUS SUBJECT TO CHANGE

Every effort will be made to follow the syllabus content and schedule. If circumstances dictate, there may be modifications made during the semester and every effort will be made to notify students in a timely manner.

CANVAS

We will use Canvas to manage our class, access assignment instructions and post course-related questions. Canvas can be accessed at <https://hellocanvas.wustl.edu/>. Login with your WUSTLKey and Introductory biostatistics for clinical research should appear on the homepage. All updates and reminders will be posted on Canvas. Lecture notes and additional readings and assignment instructions will be posted on Canvas throughout the semester.

DROP DATES

You may drop for any reason during the course of the semester. However, you may only receive a partial or no tuition reimbursement depending upon how far into the semester you drop the course. See the [MPHS Student Handbook](#). Late withdrawals will appear on your transcript as a withdrawal.

MPHS Academic Policy Guidelines:

Guidelines regarding MPHS course registration and enrollment, grades, tuition obligation, and academic leave are consolidated in the [MPHS Student Handbook](#). Please review this document.

MPHS Guidelines for Academic and Non-Academic Transgressions:

By registering for this course you have agreed to the terms of the **MPHS Academic Integrity Policy**, outlined below and in more detail in the [MPHS Student Handbook](#). Please review this policy before submitting your first graded assignment.

Academic Integrity/Plagiarism Policy:

- Academic dishonesty is a serious offense that may lead to probation, suspension, or dismissal from the University. Academic dishonesty includes plagiarism (the use of someone else's ideas, statements, or approaches without proper citation). Academic dishonesty also includes copying information from another student, submitting work from a previous class for a new grade without prior approval from

your instructor, cheating on exams, etc. You are responsible for reviewing [WashU's academic integrity resources](#) to become aware of all the actions that constitute academic dishonesty.

- All instances of academic dishonesty will be reported to the Office of the Registrar for investigation and potential disciplinary action. In addition, the instructor will make an independent decision about the student's grade on any assignment in question. The MPHS process regarding academic dishonesty is described in the [MPHS Student Handbook](#)

DISABILITY RESOURCES

It is the goal of Washington University to assist students with disabilities in removing the barriers their disabilities may pose and provide support in facing the challenge of pursuing an education at Washington University.

Washington University recognizes and accepts its professional, legal and moral responsibility to avoid discrimination in the acceptance and education of qualified students with disabilities and to provide reasonable accommodations to such students consistent with the principles embodied in the law. These guidelines apply to students seeking admittance as well as to those who become disabled while they are enrolled.

Washington University makes every effort to insure that all qualified applicants and students can participate in and take full advantage of all programs and opportunities offered within the university. Washington University encourages and gives full consideration to all applicants for admission. Washington University does not discriminate in access to its programs and activities on the basis of age, sex, sexual orientation, race, disability, religion, color or national origin.

To learn more about services provided to students with disabilities, initiate the process of formal documentation and/or to arrange for accommodations, please review the [Disability Resources](#) for the Med School at the start of the course.

MENTAL HEALTH RESOURCES

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.

SEXUAL ASSAULT RESOURCES

You can also speak confidentially and learn about available resources by contacting [Dr. Gladys Smith, PhD](#), Sexual Violence Prevention Therapist and Licensed Psychologist at the Medical Campus, (314) 362-2404. Additionally, you can report incidents to the Office of Student Affairs or by contacting WUSM Protective Services 314-362-4357 or your local law enforcement agency.

BIAS RESOURCES

The University has a process through which students and staff who have experienced or witnessed bias, prejudice or discrimination against a student can report their experiences to the University's Bias Report and Support System (BRSS) team. For details see: diversityinclusion.wustl.edu/brss/.

Office of the Associate Vice Chancellor for Diversity, Equity and Inclusion (DEI)

The DEI Training Team designs, facilitates and leads diversity education programming for faculty, staff and students on a wide range of topics including: creating a climate of respect, the value of diversity and the role of biases in our day-to-day lives.

diversity.med.wustl.edu/training/

The Office of Diversity Programs promotes diversity among and prepares medical students to lead in a global society. A priority for the Office of Diversity Programs is to cultivate and foster a supportive campus climate for students of all backgrounds, cultures and identities.

mdiversity.wustl.edu/

The Diversity and Inclusion Student Council promotes an inclusive campus environment for all School of Medicine students.

sites.wustl.edu/disc/

The Office for International Students and Scholars embraces the university's mission of welcoming promising students from around the world.

wumma.wustl.edu/