



EMORY

ROLLINS
SCHOOL OF
PUBLIC
HEALTH

DEPARTMENT: BIostatISTICS

COURSE NUMBER: 508 SECTION NUMBER: 00P

CREDIT HOURS: 4 SEMESTER: Fall, 2020

COURSE TITLE: Biostatistical Methods I

**CLASS HOURS AND LOCATION: Tuesday and Thursday
1:00-2:50pm**

INSTRUCTOR NAME: Ying Guo

INSTRUCTOR CONTACT INFORMATION

EMAIL: yguo2@emory.edu

PHONE: 404-712-8646

SCHOOL ADDRESS OR MAILBOX LOCATION: 1518 Clifton RD, Atlanta, GA,
30322

OFFICE HOURS: Thursday 3-4pm or by appointment

COURSE DESCRIPTION

This course is a required course for BIOS MSPH students. It is taken by the BIOS MSPH students and PhD students in the Fall semester of their first year in the program. The prerequisites include College-level courses in Linear algebra and Calculus and programming experience in either SAS or R (or concurrent enrollment in BIOS 531: SAS Programming.) This course provides a mathematically sophisticated introduction to the concepts and methods of biostatistical data analysis. It aims to provide the students the skills to collaborate with investigators and statistical colleagues in the analysis of data from biomedical and public health studies and to communicate the results of statistical analyses to a broad audience. The topics include descriptive statistics; probability; detailed development of the binomial, Poisson and normal distributions and simulation of random variables from these distributions; sampling distributions; point and confidence interval estimation; simulation studies; hypothesis testing; power analysis and sample size calculations; a variety of one- and two-sample parametric and non-parametric methods for analyzing continuous or discrete data and resampling statistics. The course will also equip students with computer skills for implementing these statistical methods using standard statistical software SAS or R.

MPH/MSPH FOUNDATIONAL COMPETENCIES:

Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate

CONCENTRATION COMPETENCIES:

- Estimate the sample size in the context of a given standard public health study design
- Collaborate with investigators and statistical colleagues in the analysis of data from biomedical and public health studies
- Communicate the results of statistical analyses to a broad audience
- Use statistical software for both data management and data analyses, including coding of custom techniques
- Demonstrate advanced analytic skills within a collaborative setting
- Demonstrate technical accuracy with advanced analytic methods

COURSE LEARNING OBJECTIVES:

EVALUATION

Homework:	30%
Mid-term Exam:	25%
Final Exam :	25%
Data Analysis Project:	20%

COURSE STRUCTURE

The course will provide two 2-hour lectures per week to go through the lecture notes and sample computational programs. The students demonstrate technical accuracy in their weekly homeworks and two in-class exams which are graded and returned to the students. The students demonstrate advanced analytical skills within a collaborative setting in their data analysis project. In the project, the students will be provided a dataset collected in a study by a clinical collaborator and the research questions the collaborator aims to investigate based on the data. The students work in groups to conduct statistical analysis on the data to address the research questions and then prepare a written report to summarize their findings. The report should be prepared according to the format of a journal article. Specifically, the report should be typewritten and no longer than 8 pages excluding tables and graphs. The tables and graphs are included after the text and should be properly labeled and referred to in the text. The report should include the following sections: Introduction, Methods, Results and Discussion. Detailed guidelines and instructions of the report will be offered in the project assignment and in the class. A few articles about scientific writing will also be provided.

In the following, we provide a table with more detailed information on the course structure.

MPH/MSPH Foundational Competency assessed	Representative Assignment
Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate	<ol style="list-style-type: none"> 1. Homework Assignments 2. Data analysis project
BIOS Concentration Competencies assessed	Representative Assignment
Collaborate with investigators and statistical colleagues in the analysis of data from biomedical and public health studies	1. Data Analysis Project
Communicate the results of statistical analyses to a broad audience	<ol style="list-style-type: none"> 1. Homework Assignments 2. Data Analysis Project
Demonstrate advanced analytic skills within a collaborative setting	1. Data Analysis Project
Use statistical software for both data management and data analyses, including coding of custom techniques	<ol style="list-style-type: none"> 1. Homework Assignments 2. Data Analysis Project
Demonstrate technical accuracy with advanced analytic methods	<ol style="list-style-type: none"> 1. Mid-term exam and final exam 2. Homework Assignments
Estimate the sample size in the context of a given standard public health study design	1. Homework Assignment

COURSE POLICIES

Homework: Homework will be assigned on a regular basis and will be due on the indicated date, usually one week after the date the homework is assigned. Late homework can only be accepted in emergencies.

Exams: Exams will be in-class and will be open-book and open-notes. Make-up exams can only be given for emergencies.

Required Textbooks:

Fundamentals of Biostatistics, 7th or 8th Edition, by Bernard Rosner

RSPH POLICIES

Accessibility and Accommodations

Accessibility Services works with students who have disabilities to provide reasonable accommodations. In order to receive consideration for reasonable accommodations, you must contact the Office of Accessibility Services (OAS). It is the responsibility of the student to register with OAS. Please note that accommodations are not retroactive and that disability accommodations are not provided until an accommodation letter has been processed.

Students who registered with OAS and have a letter outlining their academic accommodations are strongly encouraged to coordinate a meeting time with me to discuss a protocol to implement the accommodations as needed throughout the semester. This meeting should occur as early in the semester as possible.

Contact Accessibility Services for more information at (404) 727-9877 or accessibility@emory.edu. Additional information is available at the OAS website at <http://equityandinclusion.emory.edu/access/students/index.html>

Honor Code

You are bound by Emory University's Student Honor and Conduct Code. RSPH requires that all material submitted by a student fulfilling his or her academic course of study must be the original work of the student. Violations of academic honor include any action by a student indicating dishonesty or a lack of integrity in academic ethics. *Academic dishonesty refers to cheating, plagiarizing, assisting other students without authorization, lying, tampering, or stealing in performing any academic work, and will not be tolerated under any circumstances.*

The RSPH Honor Code states: "Plagiarism is the act of presenting as one's own work the expression, words, or ideas of another person whether published or unpublished (including the work of another student). A writer's work should be regarded as his/her own property."

(http://www.sph.emory.edu/cms/current_students/enrollment_services/honor_code.html)

COURSE CALENDAR

COURSE OUTLINE

TOPICS	Readings	Assessments
Descriptive Statistics and Graphics	Lecture notes, sample computational	HW1

	programs and Textbook	
Probability Theory and Rules	Lecture notes, sample computational programs and Textbook	HW2
Probability Models: Binomial, Poisson and Normal distributions	Lecture notes, sample computational programs and Textbook	HW3
Estimation: mean and variance parameters for continuous distributions	Lecture notes, sample computational programs and Textbook	HW4
Estimation: parameters for discrete distributions	Lecture notes, sample computational programs and Textbook	HW5
Hypothesis testing: One-sample mean	Lecture notes, sample computational programs and Textbook	HW6
Hypothesis testing: One-sample proportion parameter	Lecture notes, sample computational programs and Textbook	HW7
Hypothesis testing: two-sample means (independent and paired samples)	Lecture notes, sample computational programs and Textbook	HW8
Hypothesis testing: nonparametric one-sample and two-sample tests	Lecture notes, sample computational programs and Textbook	HW9
Hypothesis testing: two-sample proportion parameters (Approximation test, Fisher's exact test and McNemar test)	Lecture notes, sample computational programs and Textbook	HW10
Resampling Statistics	Lecture notes, sample computational programs and Textbook	HW11

Appendix: Sample documentation of competencies and associated assessments

MPH/MSPH FOUNDATIONAL COMPETENCIES:

- Select quantitative and qualitative data collection methods appropriate for a given public health context.

BSHE CONCENTRATION COMPETENCIES:

- Select research methods to design appropriate studies in health promotion research.

- Select valid and reliable instruments to measure variables in public health research and evaluation.
- Synthesize a range of multidisciplinary scientific literature.

COURSE STRUCTURE:

Team Assignments (X% of final grade)

You will work in your team on an assignment designed to apply key research methods concepts and principles to real public health problems. Completion of assigned readings prior to class is key to maximizing your own learning as well as your contribution to the team. Each team will work collaboratively to complete and submit to Canvas a single written summary of the team’s response, reflection, decision or solution to the presented problem. Assignments are designed to be completed during class time, assuming that time is used efficiently.

Individual Research Proposal Paper (X% of final grade)

You will complete an individual final research proposal on a health behavior topic of your choosing over the course of the semester. This will consist of an **8 page research proposal** following the *American Journal of Public Health* formatting style including the following sections: Introduction, Methods, and Discussion. More detailed guidelines and instructions will be offered throughout the semester.

Different sections of your paper will be due throughout the semester to receive written feedback from the instructor or your peers.

- October 4 – Research question due (including brief synthesis and research gap)
- October 18 – Partial research proposal draft due (Lit review, research questions, and study design) for peer review
- December 6 – Complete research proposal draft due for review in class (not graded)
- December 11 – Final proposal paper due

MPH/MSPH Foundational Competency assessed	Representative Assignment
Select quantitative and qualitative data collection methods appropriate for a given public health context.	1. Research Proposal Paper
BSHE Concentration Competencies assessed	Representative Assignment
Select research methods to design appropriate studies in health promotion research.	1. Team Assignment on Observational Research 2. Research Proposal Paper
Select valid and reliable instruments to measure variables in public health research and evaluation.	1. Team Assignment on Measurement 2. Research Proposal Paper

Synthesize a range of multidisciplinary scientific literature.

1. Team Assignment on Literature Reviews
2. Research Proposal Paper