DEPARTMENT: Biostatistics and Bioinformatics

COURSE NUMBER: BIOS 580   **SECTION NUMBER:** 1

CREDIT HOURS: 2.0   **SEMESTER:** Fall 2020

COURSE TITLE: Statistical Practice I

INSTRUCTOR NAME: Reneé H. Moore, Christina Mehta

INSTRUCTOR CONTACT INFORMATION

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COURSE DESCRIPTION

This course will prepare masters students to collaborate as biostatisticians for public health and biomedical projects with non-statisticians. Covered topics will include consulting versus collaboration, ethics, non-statistical aspects of collaboration (e.g. interpersonal communication), and negotiating expectations with clients. The students will work together in small groups to develop research questions based on an existing real life datasets and discussion with clinical collaborator, conduct power analyses, choose the appropriate statistical methodology to analyze the research questions, then answer at least one of the questions, and present the results in both oral and written format. In addition, individually each student will complete a series of milestones that results in oral and/or written proposal for individual capstone project to be completed in the Spring semester.

TEXTBOOK: None required.
SUGGESTED TEXTBOOKS:

Susan E. White: <u>Basic & Clinical Statistics</u>, 5th edition, 2019.

Gerald van Belle: <u>Statistical Rules of Thumb</u>, 2nd edition, Wiley, 2008.

STATISTICAL SOFTWARE: SAS (R use is acceptable but instructors will use SAS for demonstrations and provide code in SAS)

MPH/MSPH FOUNDATIONAL COMPETENCIES:

Evidence-based Approaches to Public Health
2. Select quantitative and qualitative data collection methods appropriate for a given public health context
3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate
4. Interpret results of data analysis for public health research, policy or practice

Communication
18. Select communication strategies for different audiences and sectors
19. Communicate audience-appropriate public health content, both in writing and through oral presentation

BIOSTATISICS CONCENTRATION COMPETENCIES:

B_{MPH}1: Identify statistical issues in contemporary public health problems.

B_{MPH}2: Design clinical and observational studies, including sample size estimation, in collaborative research teams.

B_{MPH}4: Apply regression modeling techniques for continuous, categorical, time-to-event, longitudinal and multilevel data.

B_{MPH}6: Communicate the results of statistical analyses to a broad audience.

B_{MSPH}2: Apply statistical software to implement custom techniques to address unique biomedical or public health problems.

COURSE LEARNING OBJECTIVES:

The primary learning objective is to develop skills necessary to be an effective biostatistics collaborator. Success requires an environment in which the biostatistician is an integral part of all phases of a research project (design, implementation and analysis). Strong communication skills [a mix of tact, persistence, compromise, willingness to listen, and friendly persuasion] are necessary to be successful in consulting and collaboration. Working with experienced biostatisticians and investigators is central to developing the skills necessary to be an effective consultant and collaborator. The course will facilitate students achieving these learning objectives via the following activities:

1. Lectures and corresponding homework assignments will ensure a broad understanding of the background knowledge necessary for successful biostatistical collaboration. Then, an in-class data analysis project will work through the all of the steps to provide biostatistical support for a research question starting from receipt of the data and a research question and concluding with a final report describing the results.

2. Small Group Collaboration Project: Students will work in small groups to identify an available dataset, develop specific research question(s) that can be answered with the identified dataset, design an appropriate statistical analysis plan to answer the research question, correctly conduct the planned statistical analysis, and present their results both orally (for non-statistical audiences) and in a written report (both for non-statistical and statistical audiences).

3. Individual Capstone Proposal Development: Over the course of the semester, students will develop their individual Capstone proposal to meet the BIOS Capstone graduation requirement. The development of the Capstone proposal will be incremental and measured by three assessments, each worth 10% of the final grade. For each section below, you will complete the Capstone Milestones document and submit via Canvas.
   a. *Individual report on meetings with BIOS faculty about Capstone topics.* Students will meet with faculty in the Department of Biostatistics and Bioinformatics to identify a Capstone project to be completed in the Spring semester for the BIOS Capstone graduation requirement. For each meeting, the report will list the name of the BIOS faculty member, date of the meeting, and topic of the potential project. Your meetings may occur via Zoom meeting with faculty or email correspondence. We encourage you to meet with at least two faculty members to make an informed decision that recognizes you have many options in diverse faculty and topics.
   b. *Individual report on meeting with BIOS Capstone Advisor and Clinical Collaborator.* Students will meet with their BIOS Capstone Advisor and Clinical Collaborator to discuss the Capstone project. The report should include names of the faculty member and clinical collaborator, date of the meeting and topic with specific aim/research question.
   c. *Individual Capstone Proposal.* The final proposal will include an outline of the following sections: analyzable specific aim(s), research/statistical analysis plan, and titles of shell tables and figures that can be utilized to visually display the results.

EVALUATION

- Class participation   10%
- Individual homework assignments   25%
- Small Group Collaboration Project   35%
  - Small group homework assignments (15%)
  - Oral presentation (10%)
  - Written report (10%)
- Capstone Proposal Development   30%
  - Individual report on meetings with BIOS faculty about Capstone topics (10%)
  - Individual report on meeting with BIOS Capstone Advisor and Clinical Collaborator (10%)
  - Individual Capstone Proposal (10%)

Class participation includes Canvas discussion boards and optional flipgrid videos. Up to two lowest discussion board post grades may be replaced by participation in flipgrid videos. Individual homework must be submitted to Canvas by the specified due date/time. The lowest individual homework grade will be dropped. Students may submit revised statistical programs for a re-grade up one weeks after the initial homework submission deadline. The small group collaboration project will have group homework assignments that build up to an oral presentation and written report. The oral presentation will be no more than 10 minutes and explain to non-statistical audiences your research question, analytic methods, results, limitations, and future directions. The written report will contain all of the elements of a scientific manuscript (introduction, methods, results, discussion, and conclusion). Capstone proposal development will require meeting with at least two BIOS faculty about potential Capstone topics, a follow-up meeting with the chosen BIOS faculty member and their clinical collaborator and an official Capstone proposal.

COURSE STRUCTURE

During the weekly class meetings, there will be:
*presentations to facilitate the primary learning objective of developing skills necessary to be an effective biostatistics collaborator
*meetings with clinical investigators to learn about their research and their datasets which will be utilized for the small group collaboration projects
*career options in biostatistics; and opportunities to meet with group members and faculty for the small group project and capstone proposal development.

The weekly presentation of lecture materials will be delivered via Zoom recordings posted on Canvas; for convenience we also provide unedited captions. There will be homework assignments to reinforce the learning objectives. There also will be assignments throughout the course to facilitate the completion of the small group collaboration project and of the capstone proposal development.

(The foundational competencies that will be covered on the next page.)

MPH/MSPH Foundational Competencies assessed	Representative Assignment
Select quantitative and qualitative data collection methods appropriate for a given public health context	Homework Assignment will ask about study design including data collection methods for the datasets presented by investigators. Students will address if they would select a different collection method if the study were to be conducted again.
Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate	Small Group Collaboration Project will involve quantitative data analysis and utilizing statistical software such as SAS, R
Interpret results of data analysis for public health research, policy or practice	Small Group Collaboration Project will interpret results of data analysis of public health and medical data and translate the statistical results to public health research conclusion
Select communication strategies for different audiences and sectors	Homework and Small Group Collaboration Project will require students to select the appropriate communication strategy to present their results to both statisticians and non-statisticians (public health practitioners, clinicians)
Communicate audience-appropriate public health content, both in writing and through oral presentation	Homework and Small Group Collaboration Project will require students to provide oral and written communication both statisticians and non-statisticians (public health practitioners, clinicians)
BIOS Foundational Competencies assessed	**Representative Assignment**
Identify statistical issues in contemporary public health problems.	Capstone Proposal Development assignments will incorporate consideration of statistical issues
Design clinical and observational studies, including sample size estimation, in collaborative research teams.	Homework and Small Group Collaboration Project assignments will facilitate students interacting with public health and clinical investigators to design studies to address quantitative research questions and conduct sample size estimation for a future study
Apply regression modeling techniques for continuous, categorical, time-to-event, longitudinal and multilevel data.	Small Group Collaboration Project will require regression modelling
Communicate the results of statistical analyses to a broad audience.	Small Group Collaboration Project results will be communicated to statisticians and non-statisticians
Apply statistical software to implement custom techniques to address unique biomedical or public health problems.	Small Group Collaboration Project will utilize statistical software to address the unique biomedical or public health research questions for each dataset. Individual Capstone Proposal Development will address the statistical software that will be utilized to implement custom techniques to address unique biomedical or public health problems.

COURSE POLICIES

As the instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the Office for Equity and Inclusion, 404-727-9877.

RSPH POLICIES

Accessibility and Accommodations

As the instructor of this course I endeavor to provide an inclusive learning environment. I want every student to succeed. The Department of Accessibility Services (DAS) works with students who have disabilities to provide reasonable accommodations. It is your responsibility to request accommodations. In order to receive consideration for reasonable accommodations, you must register with the DAS at http://accessibility.emory.edu/students/ . Accommodations cannot be retroactively applied so you need to contact DAS as early as possible and contact me as early as possible in the semester to discuss the plan for implementation of your accommodations.

For additional information about accessibility and accommodations, please contact the Department of Accessibility Services at (404) 727-9877 or accessibility@emory.edu.

Students who registered with DAS 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.

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
Assignments are due by Saturday for the week indicated unless otherwise noted*
Course materials will be posted on Monday each week. (This is a tentative course calendar)

Week of	Topic
Lectures on Collaborative Biostatistics	
08/17	Introduction, Introduction to Collaborative Biostatistics
08/24	Study Design, Sampling, Sources of Error
	Individual HW1
08/31	Reviewing Scientific Literature and Grant Proposals
	Individual HW 2
09/07	Data Collection and Management
	Individual HW3
09/14	Best Practices in Data Cleaning, Data Review, Programming
	Individual HW4
09/21	Analytic Variables, Restructuring Data, Specific Aims, Analytic Plan
	Individual HW5
09/28	Specific Aims, Power Calculations
	Individual HW6
	CAPSTONE: Individual report on meetings with BIOS faculty about Capstone topics
10/05	Interpretation of results

In-Class Data Analysis Project and Outside-Class Small Group Collaborative Biostatistics Project

10/05	In-Class Data Analysis Project- Learn the data, Revise specific aims
	Small Group HW1: Small Group Contract
	Small Group HW2: Find and describe Small Group Dataset
10/12	In-Class Data Analysis Project- Describe the cohort
	Small Group HW3: Small Group Research Question/Specific Aim
10/19	In-Class Data Analysis Project- Answer the research question
	Small Group HW4: Table 1 (description of cohort)
10/26	In-Class Data Analysis Project- Statistical and collaborator write ups and interpretation of the results
	Small Group HW5: Multivariable tables, figures
	CAPSTONE: Individual report on meeting with BIOS Capstone Advisor (and Clinical Collaborator)
11/02	*Collaboration panel*
	Small Group HW6: Write up and interpret the results
	project
11/09	How to be a professional biostatistician
11/16	**Oral Small Group Presentation**
11/30*	**Final Written Small Group Report and Corresponding Statistical Programs Due**
12/04*	**CAPSTONE: Individual Capstone Proposal Due**
12/04*	**Small Group HW 7:** Evaluation of Contributions of Small Group Members to Final Report