



EMORY

ROLLINS  
SCHOOL OF  
PUBLIC  
HEALTH

DEPARTMENT: BIOS  
COURSE NUMBER: 736 SECTION NUMBER: 001  
CREDIT HOURS: 2 SEMESTER: Fall, 2020  
COURSE TITLE: Statistical Analysis with Missing and Mismeasured Data  
CLASS HOURS AND LOCATION: TBD

**INSTRUCTOR NAME:** Eugene Huang and Bob Lyles

**INSTRUCTOR CONTACT INFORMATION**

EMAIL: [yhuang5@emory.edu](mailto:yhuang5@emory.edu), [rlyles@sph.emory.edu](mailto:rlyles@sph.emory.edu)

PHONE: 404-727-2951, 404-727-1310

SCHOOL ADDRESS OR MAILBOX LOCATION: Room 340 and 360, GCR bldg

OFFICE HOURS: By appt.

**Teaching Assistant(s):** None.

**COURSE DESCRIPTION**

This course introduces concepts and statistical methodology relevant to situations where exposure (or sometimes outcome) data are subject to measurement error or misclassification. The latter portion of the course also introduces concepts relevant to missing data, with some specific examples.

**COURSE LEARNING OBJECTIVES:**

Students should seek to obtain an understanding of terminology and concepts related to measurement error and missing data problems, as well as the potential adverse effects of measurement error, misclassification, and missingness that is not completely at random. He or she will also become familiar with various methodological approaches for dealing with such problems in practice, with particular emphasis on structural and functional measurement error. Much of the focus should be upon valid parameter estimation and statistical inferential procedures, with attention to study design considerations when necessary.

## EVALUATION

Unless otherwise noted, evaluation will be based upon roughly 5 or 6 homework assignments together with a brief in-class presentation at the end of the semester. Attendance and in-class attentiveness may also be considerations in the evaluation process.

## COURSE STRUCTURE

The course will be organized into weekly lectures. Students are expected to ask and answer questions in classes. At the end of the semester, each student will give an in-class presentation of her/his choice in consultation with the course instructors.

## COURSE POLICIES

Students are expected to attend every class unless they have extenuating circumstances. Active class participation and in-time assignment submission are also expected.

*Text:* There is no required textbook for the class. At times it may be recommended for students to read certain papers and/or sections in the following two reference books (which will be placed on reserve):

*Reference books:*

Carroll RJ, Ruppert D, Stefanski LA, and Crainceanu CM. *Measurement Error in Nonlinear Models, 2<sup>nd</sup> Edition*. Chapman and Hall (2006). **\*\* NOTE:** A copy of this book should be on reserve in the file cabinet around the corner from Mary Abosi's desk **\*\***

Little RJA and Rubin DB. *Statistical Analysis with Missing Data, 2<sup>nd</sup> Edition*. Wiley (2002).

**\*\* NOTE:** This book may be available in the main library, or could be borrowed from one of the instructors **\*\***

*Homework:* Assignments will be communicated periodically in class or via email, and are to be turned in at the start of class on the due date. Students are permitted to discuss homework assignments with others, but each student must turn in his/her own written work.

*In-class Presentation:* Each student taking the class for credit will be asked to choose a topic related to measurement error, misclassification, or missing data and give a 15-20 minute talk about it during the last class of the semester. Topics are flexible but should not directly repeat material discussed in class, and should be approved by one or both instructors. For example, some students may wish to present on a methodological paper that was not covered in class, while others may wish to report on a project of their

own in which they apply some of the methods learned. Auditing students are also welcome, but not required, to present.

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

## **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](mailto: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](http://www.sph.emory.edu/cms/current_students/enrollment_services/honor_code.html))

## **COURSE CALENDAR AND OUTLINE**

### *TENTATIVE CLASS SCHEDULE*

9/1 (Lyles) Intro. to measurement error concepts and terminology, with basic illustrations; A taxonomy of some proposed methods for measurement error correction.

9/8 (Lyles) Misclassification in tabular analyses; Validation studies; Parameter estimation and efficient inference

9/15 (Lyles) Structural measurement error problems: Correction approaches with emphasis on likelihood and quasi-likelihood methods; Inferential considerations

9/22 (Lyles) Further topics in structural measurement error settings: Outcome misclassification in logistic regression; Random effects models and measurement error; Validation study cost considerations (time permitting)

9/29 (Huang) Intro to functional measurement error; Regression calibration approach

10/6 (Huang) Simulation extrapolation (SIMEX)

10/13 Fall Break

10/20 (Huang) Missing data methods to address covariate measurement error

10/27 (Huang) The conditional score approach

11/3 (Huang) The corrected score approach: Parametric methods

11/10 (Huang) The corrected score approach: Nonparametric methods

11/17 (Lyles) Intro to missing data concepts and terminology with basic illustrations; General methodologic approaches

11/24 (Lyles) Some missing data problems involving tabular data; EM example; Sensitivity analysis; Reassessment

12/1 (Lyles) Other missing data topics: Informative drop-out; Detection limit problems

12/8 **In-class student presentations (Last Name begins with ???)**

12/15 **Finish in-class student presentations (Last Name begins with ???)**