

Course Title:	Advanced Epidemiologic Research Methods with Application
Course Number:	EPID 0753
Course Prerequisite(s):	EPID 0657; BIST 0535; BIST 0657; BIST 0551
Course Location:	Piscataway, NJ
Course Date & Time:	Tuesdays from 12:30 – 2:30 pm
Course Instructor:	Instruction team: Judith Graber PhD (course coordinator), Henry Raymond DrPH, Jason Roy PhD
Office Hours:	By Appointment Only
Course Assistant:	None
Course Website:	Canvas.rutgers.edu
Required Course Text:	Readings will be required and recommend for each lecture and module. Readings are posted on the course Canvas page.

Additional/Supplemental Readings/Resources:

Course Description: This is an advanced course in epidemiologic methods designed to help students develop and in-depth understanding of theories, concepts, and principles underlying epidemiologic study designs and analyses. The emphasis is on deepening, expanding, integrating and applying epidemiologic concepts to analytic problems so that students understand the relationship between epidemiologic methods and their application with real-life examples.

The course covers advanced topics with the underlying theme of the theoretical basis of epidemiologic study designs and data analysis. Organizationally, the course consists of core modules, rotating module(s), and a student-led module. The core modules (always included) are: theory-based data analysis, design and analytic considerations for analytical epidemiologic studies, and, causal inference. Topics for the rotating module will vary but may include topics such as small area sampling; hierarchal models or geographic regression. The student-led lead includes an in-depth presentation by each student on an assigned topic and is described further in the assessment section below

Competencies Addressed: The competencies addressed in this course for the PhD in *Epidemiology* include:

Formulate specific hypotheses and determine an appropriate study design and analysis plan using quantitative data analysis techniques

1. Analyze and interpret epidemiologic data appropriately, including data from large national and state level datasets
2. Communicate and present study findings to professional audiences

Course Objectives: By the completion of this course, students will be able to:

1. Recognize and describe complex methodologic problems in epidemiology, such as those due to selection and information biases; confounding bias; time-varying confounding bias; missing data; heterogeneity of effects, and generalizability
2. State implications for etiologic inferences for such complex methodologic problems in epidemiology and evaluate the sensitivity of such inferences to violations of assumption or conditions such as lack of bias
3. Apply appropriate analytic tool(s) to diagnose and account for complex methodologic problems
4. Present results of analytical approaches to complex methodologic problems in a technical written and verbal format

Course Requirements and Grading:

- Module assessments
 - Each course module is to be evaluated with an analysis assignment due one week after the module is completed. The emphasis in these assignments is on application of concepts through data analysis and interpretation of findings using methods taught during the module. At least 3 unique data sets will be used.
 - For the RCT lecture students will prepare a short presentation on an assigned topic
- Presentation
 - Each student will be assigned a topic and will prepare a 45 minutes PowerPoint presentation, about the topic

Assessments

1. Theory based analysis assignments –
See class Canvas page, Assignments section
2. Short in-class presentation: RTC design feature exercise
Each student will review a small topic and summarize it for the class. Topics will be chosen the first day of class. Possible topics are listed below, alternate topics can be proposed to Dr. Rhoads
 - What is the value of a Run in [where subjects are asked to cooperate with key aspects of the intervention, (like taking their tablets) before randomization and then randomized only if they cooperated well.]
 - What variables are usually selected for stratification?
 - What is the relations between stratified randomization and blocking the random sequence?
 - What is a factorial design and what are its advantages?
 - How does masked assignment and masked assessment relate to "double blind"?
 - Effect of cross overs on study findings - how many cross overs does it take to be a problem?
 - What is a non-inferiority trial?

3. Cohort and nested case-control study analysis
See class Canvas page, Assignments section
4. Online 30 assignments
See class Course schedule, below
5. Causal inference assignment
See class Canvas page, Assignments section
6. Population size estimation
See class Course schedule, below
7. Individual in-class presentation
See class Course schedule, below

Assessment	% of grade	SPH Grading	
1. Theory based analysis assignments	15	94 – 100	A
2. Short in-class presentation: RTC design feature exercise	10	90 – <94	A-
3. Cohort and nested case-control study analysis	20	87 – <90	B+
4. Causal inference assignment	20	84 – <87	B
5. Population size estimation	10	80 – <84	B-
6. Individual in-class presentation	25	77 – <80	C+
		70 – <77	C
		<70	F

Link between assessments and the course competencies.

Competency	Course Objectives(s)	Modules	Assessment(s)
1. Formulate specific hypotheses, study design and analysis plan	1, 2	1, 3, 4, 5	1, 3, 4, 5, 6
2. Data analyze and interpretation	2, 3	1-5	1, 3, 4, 5, 6
3. Communicate and present findings	1, 4	2, 7	2, 7

Course Schedule:

DATE	TOPIC	ONLINE 30	DUE DATES	INSTRUCTOR(S)
21-Jan	Course introduction, review syllabus, and expectations			Graber/Roy/ Raymond
Module 1: Theory-based data analysis (Raymond)				
21-Jan	Philosophy of science and theory-based analysis concepts			Raymond
28-Jan	Theoretical basis for heterogeneity		Submit topic choice for final presentation (4/21 and 4/28) to Prof. Graber	Raymond/ Manderski
4-Feb	Analytic strategies in multiple regression			Raymond
Module 2&3: Considerations and applications for analytic study designs (Graber)/ Machine learning (roy)				
11-Feb	Design and analysis considerations for cohort studies	Prepare for class discussion of Costello et. al, 2019 using posted questions		Graber
18-Feb	Intervention trials		In class team presentations	Rhoades
25-Feb	Machine learning in epidemiology			Roy
3-Mar	Design and analysis considerations for case-control studies; Validity in Epi studies	Prepare for class discussion of Cardis et. al, 2018- using posted questions	Submit presentation outline to topic Prof. Graber	Graber

Module 4: Causality and causal inference in observational studies (Roy)			
10-Mar	Framework – potential outcome and observed data	Module 3 assignment due before class	Roy
Gerhard	SPRING BREAK		
24-Mar	Approaches to causal modeling, Part 1 – propensity scores matching*		Gerhard
31-Mar	Approaches to causal modeling, Part 2 – Time dependent confounding		Roy
Model 5: Population Size Estimation (Raymond)			
7-Apr	Population Size Estimation I	Submit presentation resources	Raymond
14-Apr	Population Size Estimation II		Raymond
Module 6: Student presentations (ALL)			
21 Apr			
28 Apr			
5 May		Module 6 assignment due 6pm	

Learning Management System: Canvas will be used extensively throughout the semester for course syllabus, assignments, announcements, communication and/or other course-related activities. It is the student's responsibility to familiarize themselves with Canvas and check it regularly. If you have difficulties accessing Canvas, please inform the instructor and Canvas Support (help@canvas.rutgers.edu). Canvas is accessible at canvas.rutgers.edu.

School of Public Health Honor Code: The School of Public Health Honor Code is found in the School Catalog (sph.rutgers.edu/academics/catalog.html). Each student bears a fundamental responsibility for maintaining academic integrity and intellectual honesty in his or her graduate work. For example, all students are expected to observe the generally accepted principles of scholarly work, to submit their own rather than another's work, to refrain from falsifying data, and to refrain from receiving and/or giving aid on examinations or other assigned work requiring independent effort. In submitting written material, the writer takes full responsibility for the work as a whole and implies that, except as properly noted by use of quotation marks, footnotes, etc., both the ideas and the works used are his or her own. In addition to maintaining personal academic integrity, each student is expected to contribute to the academic integrity of the School community by not facilitating inappropriate use of her/his own work by others and by reporting acts of academic dishonesty by others to an appropriate school authority. It should be clearly understood that plagiarism, cheating, or other forms of academic dishonesty will not be tolerated and can lead to sanctions up to and including separation from the Rutgers School of Public Health.

Students with Disabilities: Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student must apply for Services by first completing a Registration Form with the Rutgers Office of Disability Services (ODS) at ods.rutgers.edu. The student will also be required to participate in an ODS intake interview and provide documentation. If reasonable accommodations are granted, ODS will provide you with a Letter of Accommodations which should be shared with your instructors as early in your courses as possible.

Commitment to Safe Learning Environment: The Rutgers School of Public Health is committed to helping create a safe learning environment for all students and for the School as a whole. Free expression in an academic community is essential to the mission of providing the highest caliber of education possible. The School encourages civil discourse, reasoned thought, sustained discussion, and constructive engagement. Provocative ideas respectfully presented are an expected result. An enlightened academic community, however, connects freedom with responsibility. The School encourages all students to disclose any situations where you may feel unsafe, discriminated against, or harassed. Harassment or discrimination of any kind will be not tolerated and violations may lead to disciplinary actions.

Reporting Discrimination or Harassment: If you experience any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking, know that help and support are available. You may report such incidents to the [RBHS Title IX Office](#) or to the School of Public Health's [Office of Student Affairs](#). Rutgers University has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more. If you experience any other form of discrimination or harassment, including racial, ethnic, religious, political, or academic, please report any such incidents to the School's [Office of Student Affairs](#). The School strongly encourages all students to report any incidents of discrimination or harassment to the School. Please be aware that all Rutgers employees (other than those designated as confidential resources such as advocates, counselors, clergy and healthcare providers as listed in Appendix A to [Policy 10.3.12](#)) are required to report information about such discrimination and harassment to the School and potentially the University. For example, if you tell a faculty or staff member about a situation of sexual harassment or sexual violence, or other related misconduct, the faculty or staff member must share that information with the [RBHS Title IX Coordinator](#). If you wish to speak to a confidential employee who does not have this reporting

responsibility, you can find a list of resources in Appendix A to University [Policy 10.3.12](#). For more information about your options at Rutgers, please visit [Rutgers Violence Prevention and Victim Assistance](#).

Graduate Student Computer Policy: Students are required to possess a personal laptop, no older than approximately two years, that must meet minimum requirements which may be found online at: sph.rutgers.edu/student-life/computer-support.html

Policy Concerning Use of Recording Devices and Other Electronic Communications Systems:

When personally owned communication/recording devices are used by students to record lectures and/or classroom lessons, such use must be authorized by the faculty member or instructor who must give either oral or written permission prior to the start of the semester and identify restrictions, if any, on the use of mobile communications or recording devices.

Policy Concerning Use of Turnitin: Students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com (directly or via learning management system, i.e. Canvas) for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. Students who do not agree should contact the course instructor immediately.

Withdrawal/Refund Schedule: Students who stop attending their course(s) without submitting a completed [Add/Drop Course](#) form will receive a failing grade. Furthermore, students dropping to zero credits for the semester are considered withdrawn and must submit a completed [Leave of Absence](#) form from the School of Public Health's Office of Student Affairs. The School of Public Health refunds tuition only. Administrative and technology fees are non-refundable. You may find the Withdrawal/Refund Schedule on the School of Public Health website at: sph.rutgers.edu/academics/academic-calendar.html