



EMORY

ROLLINS  
SCHOOL OF  
PUBLIC  
HEALTH

**DEPARTMENT: Environmental Health**

**COURSE NUMBER: EH548      SECTION NUMBER: 000**

**CREDIT HOURS: 3      SEMESTER: Spring 2019**

**COURSE TITLE: Research Methods for Studies of Water & Health**

**CLASS HOURS AND LOCATION: Mondays, 9-11:50AM  
GCR P41 &  
CNR 6<sup>th</sup> floor teaching lab**

**INSTRUCTOR NAME: Amy Kirby**

**INSTRUCTOR CONTACT INFORMATION**

EMAIL: [aekirby@emory.edu](mailto:aekirby@emory.edu)

PHONE: 404-718-3161

SCHOOL ADDRESS OR MAILBOX LOCATION: By appointment

**OFFICE HOURS: By appointment**

**Teaching Assistant: Julia Sobolik**

EMAIL: [Julia.sobolik@emory.edu](mailto:Julia.sobolik@emory.edu)

OFFICE HOURS: Fridays, 10-11AM or by appointment

LOCATION: CNR 2<sup>nd</sup> Floor, Environmental Health Department Break Room

**COURSE DESCRIPTION**

This hands-on, elective course covers methods needed to carry out field studies focused on water and health. Through lecture and laboratory exercises, students will learn critical skills in measuring water quality exposure assessment and waterborne disease health outcomes that will enable them to conduct their own field studies and analyze the resulting data. The focus will be on issues of microbiological contamination in developing countries, but chemical contamination and domestic cases will also be covered.

## COMPETENCIES

### MPH/MSPH FOUNDATIONAL COMPETENCIES:

- Select quantitative and qualitative data collection methods appropriate for a given public health context
- Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate
- Interpret results of data analysis for public health research, policy or practice
- Communicate audience-appropriate public health content, both in writing and through oral presentation

### CONCENTRATION COMPETENCIES:

- Describe major environmental risks to human health ranging from the local to global scale
- Assess the sources and movement of contaminants through the environment
- Characterize the magnitude, frequency, and duration of environmental exposures
- Apply the principles of toxicology to assess health effects of environmental exposures
- Apply the principles of epidemiology to assess health effects of environmental exposures
- Communicate the key methods, findings, and public health implications of research on a poster and verbally to an audience of public health professionals
- Appraise the environmental, behavioral, and social factors that contribute to the emergence, re-emergence, and persistence of infectious diseases
- Assess the major forces that influence the health of populations around the world

## COURSE LEARNING OBJECTIVES

- Understand key issues in designing studies of water and health
- Learn theory behind and how to carry out microbiological assessment of water quality
- Learn theory behind and how to carry out physiochemical assessment of water quality
- Learn how to carry out field evaluation of water treatment technologies
- Learn how to carry out observational studies & observational techniques
- Learn how to design surveys specific to studies of water & health
- Learn how to carry out qualitative interviews

## EVALUATION

EHSO training	1 pt
ODK aggregate set-up	2 pts
Skill Practice Assignments (Boxplot & Serial Dilutions)	2 Assignments x 2 pts each = 4 pts
Reading quizzes (7 total, lowest score dropped)	6 quizzes x 2 pts each = 12 pts
Lab Homework	3 Homework x 6 pts each = 18 pts
Project Scoping Assignment	3 pts
Class Project Research Questions	5 pts
Water Quality Results Complete/Uploaded	5 pts
Draft of project tools (Surveys & Structured Observations)	10 pts
Final Project	Written Report = 15 pts Presentation = 15 pts
Class participation	10 pts
Total	100 pts

Late assignments will be penalized by **10%** of the assignment's value per day past the due date. When stated, some assignments will not be accepted late and no credit will be given for these late submissions.

### Letter Grade Cutpoints:

A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C	70-79
F	≤ 69

## COURSE STRUCTURE

### Group Project (55% of grade)

The group project is the centerpiece of this course. The best way to learn how to do research is to actually do research. This project will give you the opportunity to conceptualize, design, conduct, and present a novel water quality research project. The project will be completed in groups of 3-4 students. The project will be completed in stages:

1. Project scoping (3 pts, individual)
2. Develop research question (5 pts, individual)
3. Draft survey and structured observation forms (10 pts, group)(ODK setup 2 pts)
4. Collect data (5 pts, group)
5. Analyze data (group)

## 6. Present results (oral and written, 15 pts each, group)

An in-depth description of the project will be presented on Feb. 4<sup>th</sup>. A detailed guide is posted in the course Canvas site. Labs and lectures will provide instruction in the methods used in WASH research. There will be time in class to discuss your project with the instructor and TA, and they are available for further discussion by email or during office hours.

### **Labs (19% of grade)**

Anyone conducting WASH research should be familiar with the basic lab methods used to assess water quality. In this course, you will gain experience with the most common analytic methods for measuring microbial contamination, chlorine levels, and turbidity. You will also evaluate common approaches to water purification. After completing the labs, you will understand how the tests are performed, how to interpret the results, and the strengths and limitations of each approach. The instructions for each lab are posted in the course Canvas site. You must read the instructions prior to lab to ensure that you understand the tasks you will be completing. Not only does that ensure that the lab is completed correctly, but it also helps you work safely in the lab. After each lab, you will complete the lab homework and upload it to Canvas prior to the next class.

### **Lectures (16% of grade)**

The lectures in this course are designed to provide an overview of the methods used in WASH research. The lectures in the first half of the course will focus on the most common methods and those you will be using in your group project. The second half of the course will cover newer methods in the field, as well as specific approaches to WASH research such as outbreak investigations and randomized controlled trials. Lecture readings are listed below. All required reading should be completed prior to class to facilitate classroom discussion. Seven reading quizzes will be given throughout the semester with the lowest grade dropped. Quizzes will be administered at 9AM on the specified dates with no makeups or late quizzes allowed.

### **Participation (10% of grade)**

Participation in class lectures and discussions is a vital part of the learning process and will help to reinforce the information from the readings. Students are expected to positively contribute to the lectures and discussions in class.

## **COURSE POLICIES**

Attendance at all class sessions is **MANDATORY**. Please contact instructor for any extenuating circumstances. Absences with a valid excuse must be pre-approved by course instructor. Students will lose 1 point of class participation for each unexcused absence (pro-rated for portions of class missed).

In order to reduce the amount of distractions in class, **use of laptops and tablets during lectures is highly discouraged** to facilitate discussion and classroom engagement. **Laptops are not allowed in the lab.**

Safe work practices are a critical component of laboratory work. Your safety and the safety of your fellow students and instructors requires preparation prior to starting any lab work and attention and diligence while conducting lab work. **You must complete the EHSO Laboratory Safety Training by Jan. 22 (see directions on Canvas).** Prior to each lab, you must read the lab handouts carefully to understand the protocols you will be using. Any day you are conducting lab work, either as part of a lab class or for your class project, **you must wear long pants and closed toe shoes. Long hair must be tied back.**

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

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

Date	Topic	Due to Canvas*	Due in Class
Jan. 14	Course, Lab Introduction		
Jan. 21	MLK Day- NO CLASS	EHSO training	
Jan. 28	Microbial Indicators		Quiz 1
Feb. 4	Project scoping, planning	Serial Dilution Practice	Quiz 2
Feb. 11	LAB: Microbial Indicators	Box Plot Practice	
Feb. 18	Interviews	Lab 1 Homework, Scoping Report	Scoping Presentation
Feb. 25	Structured Observations		Quiz 3
Mar. 4	Surveys	Research Questions	Quiz 4
Mar. 11	Spring Break- NO CLASS		
Mar. 18	Open Data Kit	Survey, Str. Obs. forms	ODK install
Mar. 25	LAB: Chlorine and Turbidity		
Apr. 1	Chemicals, Antibiotic Resistance	Lab 2 Homework	Quiz 5
Apr. 8	LAB: Purification Methods		
Apr. 15	Outbreaks, Microbial Source Tracking	Lab 3 Homework, WQ Data Upload	Quiz 6
Apr. 22	Metagenomics, RCTs		Quiz 7
Apr. 29	Project Presentations		Project Presentation
May 3	NO CLASS	Project Paper	

**\*Online submissions due at 11:59PM on the preceding Sunday unless otherwise specified**

Topics and dates are subject to change

## COURSE OUTLINE AND READINGS

### Jan. 14- Course and Lab Introduction

- Complete EHSO Research Lab Safety Training (directions on Canvas) by Jan. 22

### Jan. 21- NO CLASS

### Jan. 28- Microbial Indicators

- Required reading:
  - Ashbolt et al. Indicators of microbial water quality. 2001. pp 289-316
  - Gruber et al. 2014. Coliform bacteria as indicators of diarrheal risk in household drinking water: systematic review and meta-analysis. PLoS One 9:e107429
- Optional reading:
  - Bain et al. 2012. A summary catalogue of microbial drinking water tests for low and medium resource settings. Int. J. Env. Res. Pub. Health 9:1609-1625.
  - CDC Microbiological indicator testing in developing countries: A fact sheet for the field practitioner. Version 1, December 2010.

### Feb. 4- Project Scoping and Data Management

- Guest Lecturer- Miranda Delahoy
- Complete data management survey prior to class
- Required readings:
  - Robb et al. 2017. Assessment of fecal exposure pathways in low-income urban neighborhoods in Accra, Ghana: Rationale, design, methods, and key findings of the SaniPath study. Am. J. Trop. Med. Hyg. 97(4): 1020-1032
  - SHINE Trial Team. 2015. The Sanitation Hygiene Infant Nutrition Efficacy (SHINE) trial: Rationale, design, and methods. Clin. Inf. Dis. 61(S7): S685-702.
  - Mbuya et al. 2015. Design of an intervention to minimize ingestion of fecal microbes by young children in rural Zimbabwe. Clin. Inf. Dis. 61(S7): S703-9.

### Feb. 11- Microbial Indicators Lab (meet in teaching lab)

- Collect water sample no more than 24 hours prior to class
- Required readings:
  - Lab 1 Handout

### Feb. 18- Interviews, Scoping Presentations

- Guest Lecturer: Bethany Caruso
- Each student will present a 3 minute overview of their scoping results and proposed water sample

- Required readings:
  - Hennink, Hutter, and Bailey. 2011. Qualitative Research Methods. Ch. 6 In-Depth Interviews.
  - Janes et al. 2012. Emerging infectious diseases: The role of social sciences. Lancet 380: 1884-1886.
- Optional readings:
  - Caruso et al. 2017. Understanding and defining sanitation insecurity: women's gendered experiences of urination, defecation and menstruation in rural Odisha, India. BMJ Glob. Health.

### **Feb. 25- Structured Observations**

- Required readings:
  - Hennink, Hutter, and Bailey. 2011. Qualitative Research Methods. Ch. 8 Observation.
  - Ram et al. 2010. Is structured observation a valid technique to measure handwashing behavior? Use of acceleration sensors embedded in soap to assess reactivity to structured observation. Am. J. Trop. Med. Hyg. 83:1070-1076
  - Harvey. 2018. Observe before you leap: why observation provides critical insights for formative research and intervention design that you'll never get from focus groups, interviews, or KAP surveys. Glob. Health Sci. Per. 6(2):299- 316.

### **Mar. 4- Surveys, Project time**

- Required readings:
  - UNICEF & WHO. 2006. Core questions on drinking water and sanitation for household surveys
  - Rea and Parker. 2005. Designing and conducting survey research: A comprehensive guide
    - Ch. 1: An overview of the sample survey process
    - Ch. 2: Designing effective questionnaires: basic guidelines
    - Ch. 3: Developing survey questions
    - Ch. 9: Selecting a representative sample

### **Mar. 11- NO CLASS**

### **Mar. 18- Open Data Kit Survey Development**

- Bring laptop and Android device to class (each group needs access to one Android tablet or phone)

### **Mar. 25- Chlorine and Turbidity Lab** (meet in teaching lab)

- Required reading:
  - Lab 2 Handout

### **Apr. 1- Chemical Contaminants, Antibiotic Resistance**

- Guest Lecturer: Matt Gribble

- Required readings:
  - Aderibigbe et al. 2017. Seeking evidence of multidisciplinary in environmental geochemistry and health: an analysis of arsenic in drinking water research. *Env. Geochem. Health*.
  - Vieira et al. 2013. Perfluorooctanoic acid exposure and cancer outcomes in a contaminated community: a geographic analysis. *Env. Health Per.* 121:318-323.
  - Larsson et al. 2018. Critical knowledge gaps and research needs related to the environmental dimensions of antibiotic resistance. *Env. Int.* 117: 132-138.
  - Collingnon et al. 2018. Anthropological and socioeconomic factors contributing to global antimicrobial resistance: a univariate and multivariable analysis. *Lancet Planet Health.* 2:e398-405.
- Optional readings:
  - Discussion questions for Aderibigbe et al. and Vieira et al.
  - Rothrock et al. 2016. How should we be determining background and baseline antibiotic resistance levels in agroecosystem research? *J. Env. Qual.* 45:420-431.

**Apr. 8- Water Purification Lab** (meet in teaching lab)

- Required reading:
  - Lab 3 Handout

**Apr. 15- Outbreak Investigations, Microbial Source Tracking**

- Guest Lecturers: Jennifer Murphy, Mia Mattioli
- Group project microbial results must be uploaded by 11:59PM Apr. 14
- Required reading:
  - Boehm et al. 2013. Performance of forty-one microbial source tracking methods: a twenty-seven lab evaluation study. *Water Res.* 47:6812-6828.
  - Mattioli et al. 2017. Decay of sewage-sourced microbial source tracking markers and fecal indicator bacteria in marine waters. *Water Res.* 108:106-114.

**Apr. 22-Metagenomic Approaches, Intervention Studies**

- Guest Lecturer: Tom Clasen
- Required reading:
  - Thomas et al. 2013. Use of remotely reporting electronic sensors for assessing use of water filters and cookstoves in Rwanda. *Env. Sci. Tech.* 47:13602-13610
  - Boisson et al. 2013. Effect of household-based drinking water chlorination on diarrhea among children under five in Orissa, India: a double-blind randomized placebo-controlled trial. *PLoS Med.* 10:e1001497.

**Apr. 29- Final Presentations**

**May 3- Final papers due** (uploaded to Canvas by 5:00 PM)