DEPARTMENT: EH

COURSE NUMBER: 530 **SECTION NUMBER: 4497**

CREDIT HOURS: 2 **SEMESTER: Spring 2021**

COURSE TITLE: Environmental and Occupational Epidemiology

CLASS HOURS AND LOCATION: Fridays 3:15 – 5:05 PM; Online

PREREQUISITES: EPI 530 and BIOS 500, or consent of instructor

INSTRUCTOR: Matthew Gribble (He/Him/His)

INSTRUCTOR CONTACT INFORMATION:

EMAIL: matt.gribble@emory.edu

PHONE: 404-712-8908

SCHOOL ADDRESS OR MAILBOX LOCATION: CNR 2023

***OFFICE HOURS*:** by appointment (to accommodate varying online student time-zones)

TEACHING ASSISTANT:

Zhenjiang Li (He/Him/His): zhenjiang.li@emory.edu

TA OFFICE HOURS: Thursday, 12–1 PM

COURSE DESCRIPTION

Environmental and Occupational Epidemiology is a course for students in the Environmental Health Department who have successfully completed EPI 530 and BIOS 500. Students will gain experience reading, evaluating, and interpreting epidemiologic studies on the impact of both workplace and environmental exposures, and thinking through practical considerations. The course aims to strengthen each student's ability to read epidemiological literature critically. This aim will be realized through in-depth exploration of major study designs including cross-sectional studies, cohort studies, and case-control studies, and through the weekly readings and case studies. The focus of the class is on conceptual issues common in environmental and occupational epidemiology research, the application of epidemiological concepts to environmental health topics, and on the interpretation of findings. Successful completion of the course will also contribute to a richer appreciation of how the environment affects public health.

MPH CONCENTRATION COMPETENCY:

- Apply the principles of epidemiology to assess health effects of environmental exposures (competency for Environmental Health, Global Environmental Health)

How competency is assessed:

1. Homework assignments.
2. Midterm and final exam.
3. Term paper (part of the final).
4. Weekly quizzes (these are more to reinforce the concepts weekly than to demonstrate application, but may have questions requiring application).

COURSE LEARNING OBJECTIVES:

- Independently and confidently read published epidemiologic studies.
- Correctly apply common terminology to describe epidemiologic study designs and sources of bias.
- Interpret different measures of association and the results of multivariable statistical models.
- Understand the assumptions needed for various epidemiological study designs to be valid.
- Express criticism in a thoughtful, constructive, and respectful manner.

EXPECTATION

This class has EPI 530 and BIOS 500 as prerequisites. Therefore, it is expected you are entering this class already understanding key concepts in epidemiology such as confounding, interaction, mediation, selection bias, etc. and key concepts from biostatistics such as P values, linear regression, sampling from a population, etc.. We will review key concepts in this class, but if you are unclear on any material covered in EPI 530 or BIOS 500, please review your notes and if necessary schedule an office hour appointment early into this semester to make sure you are adequately prepared to do well in this course. This course moves quickly, based on assumption of prerequiste knowledge, so make sure you are prepared with full mastery of the prerequiste classes.

EVALUATION

Evaluation is based on weekly quizzes (10%), two exams (40%), on a final term paper critiquing an epidemiological report (25%), and on a few case study homework assignments (25% total for all the written case studies together). Class attendance is strongly recommended, but you do not need to ask me for permission if you need to miss class (including every week – you may take this course asynchronously if necessary). This class moves quickly, so it is essential that you complete all assigned readings (what is listed on a date is homework that night, fair game for that week's quiz due before the next class). You will be evaluated on the mastery of material after each

week through a weekly quiz so please read carefully enough to mentally process and retain the broad concepts of the lectures and what you have read in all assigned readings; some readings have additional work. You are encouraged to read more for fun.

Weekly Readings (reflected in Weekly Quizzes and Case Studies): Each week there are assigned readings. This course's reading load is designed to comply with national expectations for a 2-unit course (i.e., you are supposed to have an average of four hours of work outside of class each week) but this may vary. You may be responsible for understanding nuance in the textbook readings, so make sure you read the textbook readings especially closely (you are encouraged to take notes to help you master that assigned material). The "example" readings are intended to highlight real-world applications of the relevant epidemiological concepts highlighted each week. Broad brushstroke questions about the subject matter of those example readings are fair game for assessment, as we have selected important environmental and occupational health topics, but the level of detail you are expected to remember from each example is less exact than the detail you are expected to retain from the textbook readings (e.g., you probably do not need to take any notes for the example readings). You should make sure to review the full assigned textbook readings, and at least the abstracts, tables, and figures of the example readings as preparation for your Midterm and Final exams.

Weekly Quizzes (10% of overall course grade): To help ensure accountability in an entirely online class for the assigned readings and lectures, and to help you learn the course material gradually over the course of the semester, there will be short quizzes administered online via Canvas each week. These may be cumulative for concepts (e.g., confounding is fair game any week of the semester) but will emphasize the course content from the week preceding the quiz. For example, on April 2 the class theme is One Health Epidemiology; therefore, the weekly quiz to be completed prior to class on April 16 will pertain to the One Health Epidemiology lecture and/or reading. The quizzes will overall be weighted to a sum worth 10% of your overall course grade. Quizzes will be administered via the Canvas site. There are no quizzes Midterm and Final weeks. Each quiz is worth 1% of your overall course grade – there are ten quizzes total. These quizzes are "open book" – you may refer to your notes and any materials on the Canvas site including Course Reserves, but please do not Google.

Midterm and Final Exams (40% of overall course grade): There will be a midterm exam and a final exam, which will be multiple choice or True/False question format. **There is to be no discussion of exam questions among peers at any time including after the course has ended**. Each exam is worth 20% of the final grade. These will be administered online via the course Canvas site. There will be no weekly quizzes in Midterm and Final weeks. The Midterm and Final Exams will be cumulative (e.g., something in week 1 can be fair game for the Final Exam) but will include at least one question on content from the preceding week since the weekly quiz is being waived. In other words, be prepared for a question on environmental justice on the Midterm, and for a question on case-control designs on the Final. Two weeks are designated as review for the Midterm and Final, where student questions will be

answered. If no one has a question for 30 minutes during a review session day, class will end early. These exams are "open book" – you may refer to your notes and any materials posted to Canvas (including Course Reserves), but do not Google. Exams must be completed by 11:59 PM (just before midnight) of the Monday after assigned.
Written Critique of an Epidemiological Study (25% of overall course grade): You are required at some point this semester to independently read an epidemiological study and provide a critique of minimum 3 pages (1 inch margins, font size 12 Times New Roman, double-spaced, not including any references). This critique should critically evaluate the selected study with respect to rigor and consider the transparency and completeness of the manuscript reporting the research. This individual written critique of an epidemiological study is an opportunity for you to demonstrate mastery of the MPH Competency, because you will be critically appraising the extent to which a peer-reviewed epidemiology study adequately applied the principles of epidemiology to assess the health effect of an environmental exposure. To make sure that this assignment is not procrastinated until a stress-inducing late date, the score for this assignment is tied to interim deadlines as well as the final report. Thus, the 25% of overall grade related to the written critique has the following components:

- 5% of overall grade: selection of a suitable article for the written critique due 2/12
- 5% of overall grade: outline of the final written critique due 4/2
    - The outline should highlight the strengths and weaknesses, or other methodological themes, that you anticipate discussing in your final critique
- 15% of overall grade: final written critique due 4/30

Case Studies (25% of overall course grade): The case studies are an important part of assessing the MPH concentration competency, as students will apply epidemiological concepts such as confounding, information bias, effect modification, and selection bias to interpret findings from peer-reviewed epidemiological literature on environmental health concerns. Each case study shall be assigned a week in advance and is **due before the next class** (uploaded to Canvas). The goal of these case studies is to help you engage critically with the course concepts, and to help prepare you for the written critique of a peer-reviewed epidemiological study due at the end of the semester.

The case studies are intended to be challenging. A case study could take 3 or 4 hours to complete, and there are right and wrong answers. I do not expect that you will get every answer correct, but I do expect that you will make a sincere attempt to answer all the questions well. Students who turn in a thoughtfully completed case study will get full credit (even if some answers are wrong). Case studies that were hastily done or that contain many mistakes will not receive full credit. Students may work together on the case studies, but answers should be in each student's own words.

REQUIRED COURSE TEXT

Statistical Methods in Environmental Epidemiology by Duncan C. Thomas (2009). Oxford University Press is required for this course. This book's assigned chapters do an excellent job covering the core concepts in this course, and the rest of the book beyond the readings assigned for this class will provide a useful foundation for your career in

environmental health beyond this classroom. **If you want a challenge beyond the assigned readings, you are very strongly encouraged to delve deeper into this textbook during the semester and to ask questions during office hours,** although the content of chapters not formally assigned as homework will not be assessed as part of your grade in the class. The other required readings for this course are specific peer-reviewed journal articles etc. as listed in the course calendar. All assigned peer-reviewed articles and assigned textbook chapters will be available through the library course reserves (link available via the class's Canvas website) but if you purchase your own copy of the Thomas textbook and do additional readings beyond what is assigned, you will get a fuller learning experience out of this class. You will also want to refer to your previous course notes from EPI 530 and from BIOS 500 throughout the semester.

RESPECTFUL AND INCLUSIVE CLASSROOM

Due to the online format of this course in Spring 2021, will be benefiting from a variety of guest speakers, some of whom are being particularly generous with their time and joining us during our class time despite significant time-zone differences. Although participation is not part of your course grade this semester, it is nonetheless expected that you will do your best to attend all the guest presentations so these speakers have a good audience, and I hope you engage with the speaker during the Question and Answer sessions. Guest speakers will generally begin presenting at 4 PM on the days where a guest speaker is noted. Your attendance is valued at all class sessions, but please make a particular effort to be present and attentive for our guests.

In addition to the primary lecture format of the class, throughout the course, we also plan for there to be dedicated time for open conversations around the core concepts and ideas of the class (e.g., how the concepts relate to contemporary events, study design challenges in studying selected topics, social and ethical dimensions, etc.). These might occasionally get into politically or emotionally charged material for some students. Therefore, to make sure everyone feels this classroom is a safe space, after the first session, students will be tasked with revising a Google Document of class "Ground Rules" for optimal class discussions. These Ground Rules will be reviewed in the second session and thenceforth used as a guide for subsequent class discussions. Our goal is for all students to be able to participate fully and have their learning supported both in and out of class. Thus, it is imperative that there be an atmosphere of trust and safety in the classroom. We will work to foster an environment in which each class member is able to hear and respect each other.

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 these with me and the Office for Diversity, Equity and Inclusion, 404-727-9867.

RSPH POLICIES

Accessibility and Accommodations

Accessibility Services works with students who have disabilities to provide reasonable accommodations. If you have a documented disability and have anticipated barriers related to the format or requirements of this course, or presume having a disability (e.g., mental health, attention, learning, vision, hearing, physical or systemic), and need accommodations for this semester, we encourage you to contact the Department of Accessibility Services (DAS) to learn more about the registration process and steps for requesting accommodations. DAS works with students who have disabilities to provide reasonable accommodations. In order to receive consideration for reasonable accommodations, you must register with the DAS at http://accessibility.emory.edu/students/Links to an external site.

If you are currently registered with DAS and have not received a copy of your accommodation notification letter within the first week of class, please notify DAS immediately. If you have accommodations in place, I encourage you to contact me during the first week of the semester to communicate your specific needs for the course as it relates to your approved accommodations. All discussions with DAS and faculty concerning the nature of your disability remain confidential.

It is your responsibility to request accommodations. Please note that accommodations are not retroactive and that disability accommodations are not provided until an accommodation letter has been processed. I encourage you to 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.

Diversity, Equity, and Inclusion Statement

The Rollins School of Public Health fosters a culture of inclusion and organizational equity by leveraging the many intersections of race, ethnicity, gender, religion, socioeconomic status, sexual orientation, gender expression, disability, diversity of thought, and other aspects of lived experience in our community. We intentionally recruit, support, and mentor faculty, staff, and students who are members of communities that are underrepresented in the public health and scientific workforce and reflect the multicultural and global communities that Emory serves. Building an academic community where all members are able to thrive enhances our scholarly mission to eliminate health disparities and improve health outcomes in disadvantaged and vulnerable populations.

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 [their] own property." (http://www.sph.emory.edu/cms/current_students/enrollment_services/honor_code.html)

COURSE CALENDAR

Date	**Topic**
1/29	***Class Theme: Epidemiology in Environmental Health*** Review Syllabus Lecture 1: Introduction to Environmental Epidemiology (and review of key concepts) ***Assignment*:** • Edit the Ground Rules Google Doc by 10 PM of Thursday 2/4 • Read Thomas Chapter 16 section *Probability of causation and compensation* (pages 337-344): sections "Causation at the population and individual levels", "Attributable risk and probability of causation", "Assigned shares for multiple causes", "Loss of life expectancy" • Weekly Quiz #1 (due before class 2/5)
2/5	***Class Theme: Epidemiology in Environmental Health*** Lecture 1 Continued: Introduction to Environmental Epidemiology Question and Answer Session / Open Discussion about the Key Course Concepts ***Assignment*:** • **Pick a paper from the list, or suggest an alternative paper, as the subject of your term paper critiquing an environmental epidemiology study (due 2/12)** • Read Künzli *et al*. (2006) "Health Effects of the 2003 Southern California wildfires on children". *American Journal of Respiratory and Critical Care Medicine* 174(11): 1221-1228. • Weekly Quiz #2 (due before class 2/12)
2/12	***Class Theme: What to Expect in an Epidemiological Research Report*** Lecture 2: Epidemiology in Practice TA Presentation: Walking through a paper (Künzli et al. 2006) ***Assignment*:** • Read STROBE Statement • Read Stein et al (2016) "Early Childhood Adversity Potentiates the Adverse Association Between Prenatal Organophosphate Pesticide Exposure and Child IQ: the CHAMACOS

	Cohort". *Neurotoxicology* 56: 180-187. • Apply STROBE checklist to Stein et al (2016) "Early Childhood Adversity Potentiates the Adverse Association Between Prenatal Organophosphate Pesticide Exposure and Child IQ: the CHAMACOS Cohort" • Weekly Quiz #3 (due before class on 2/19)
2/19	***Class Theme: Cross-Sectional Studies*** Discuss Stein et al. 2016 STROBE checklist homework Lecture 3: Cross-sectional studies ***Assignment*:** • Read Thomas Chapter 2 "Basic epidemiologic study designs" page 21 (Prevalence surveys) • Read Greens *et al*. (2014) "Determinants of bisphenol A and phthalate metabolites in urine of Flemish adolescents". *Environmental Research* 134: 110-117. • Greens *et al*. (2014) case study due (uploaded to Canvas before start of next class) • Weekly Quiz #4 (due before class on 2/26)
2/26	***Class Theme: Cross-Sectional Studies*** Discuss Greens et al. 2014 case study Lecture 4: Cross-Sectional Studies Review Time for Small Group Activity: Proposing a Cross-Sectional Study **Guest Lecture by Dr. Nigra from Columbia University** ***Assignment*:** • Read Schaider *et al*. (2019) "Environmental justice and drinking water quality: are there socioeconomic disparities in nitrate levels in U.S. drinking water?". *Environmental Health* 18(1): 3. • Weekly Quiz #5 (due before class on 3/5)
3/5	***Class Theme: Epidemiology and Environmental Justice*** Lecture 5: Environmental Exposure Disparities and Environmental Justice Time for Class Discussion on Environmental Justice Themes **Guest Lecture by Dr. Park from East Carolina University** ***Assignment*:** • Read Boyce, Zwickl, and Ash (2016). "Measuring environmental inequality". *Ecological Economics* 124: 114-123. • Read Salazar *et al*. (2019). "Race, Income, and Environmental Inequality in the U.S. States, 1990-2014". *Social Science Quarterly* 100(3): 592-603. • Weekly Quiz #6 (due before class on 3/12)
3/12	***Class Theme: Time-Series Designs*** Lecture 6: Time-Series Designs **Guest Lecture by Dr. Osborne from University of Queensland (Australia)** ***Assignment*:** • Read Bhaskaran *et al.* (2013). "Time-series regression studies in environmental

	epidemiology." *International Journal of Epidemiology* 42(4): 1187-1195. • There is no quiz this week to give you time to prepare for the midterm review session.
3/19	***Class Theme*: *MIDTERM EXAM REVIEW*** Review for midterm exam. ***Assignment*:** • **MIDTERM EXAM (Due Monday 3/22)**
3/26	***Class Theme: Cohort Studies*** Lecture 6: Cohort studies **Guest Lecture by Dr. Freeman from Emory University** ***Assignment:*** • Read Thomas Chapter 2 *Basic Epidemiological Study Designs Methods* pages 19-29, Thomas Chapter 3 *Basic Statistical Methods* page 41 "Survival Analysis", Thomas Chapter 4 *Multivariate Models* page 63 "Censored Survival Analysis" • Read Casey et al. (2016) "Unconventional natural gas development and birth outcomes in Pennsylvania, USA." • Casey *et al*. (2016) case study due at start of next class. • **Outline of your written critique of an epidemiological study due next week** • Weekly Quiz #7 (due before class on 4/2)
4/2	***Class Theme: One Health Epidemiology*** Discuss Casey *et al*. 2016 case study (Ground Rules apply). Lecture 7: One Health Epidemiology: Animals, Humans and the Environment **Guest Lecture by Dr. Gatti from l'Institut Luis Malardé (in Tahiti)** ***Assignment:*** • Read World Health Organization and Food and Agriculture Organization of the United Nations (2020) Report of the Expert Meeting on Ciguatera Fish Poisoning. Executive Summary (pages XIII - XVIII) and Chapter 6: Human Data (pages 65-82), although feel free to read more if interested in One Health or risk assessment. • Read Fair *et al*. (2017) "The environment as a driver of immune and endocrine responses in dolphins (*Tursiops truncatus*)". *PLoS One* 12(5): e0176202. • Weekly Quiz #8 (due before class on 4/9)
4/9	***Class Theme: Mediation*** **Guest Lecture by Dr. Rudolph from Columbia University** (theory and practice) Lecture 8: Examples of Mediation Analysis in Environmental Epidemiology ***Assignments:*** • Read Rudolph *et al*. (2018). "Causal mediation analysis with observational data: considerations and illustration examining mechanisms linking neighborhood poverty to adolescent substance use." *American Journal of Epidemiology* 188(3): 598-608. • Weekly Quiz #9 (due before class on 4/16)

4/16	***Class Theme*: *Effect Modification*** Lecture 8: Susceptibility in environmental epidemiology **Guest Lecture by Drs. Kim and Kawaguchi from the University of Southern California** ***Assignment*:** • Read Thomas Chapter 12 *Multiple risk factors and interactions* pages 258-278. • Read Lynch *et al*. (2011) "Varying coefficient function models to explore interactions between maternal nutritional status and prenatal methylmercury toxicity in the Seychelles Child Development Nutrition Study". *Environmental Research* 111(1): 75-80. • Lynch *et al*. (2011) case study due at start of next class. • Weekly Quiz #10 (due before class on 4/23)
4/23	***Class Theme: Case-Control Studies*** Discuss Lynch *et al.* 20111 case study (Ground Rules apply). Lecture 9: Case-control studies. **Guest Lecture by Dr. Koutros from the National Cancer Institute** ***Assignment:*** • Read Thomas Ch. 5 *Some special-purpose designs* pages 92-108. • Read McLean *et al*. (2014) "Occupational solvent exposure and risk of meningioma: results from the INTEROCC multicentre case-control study". *Occupational and Environmental Medicine* 71(4): 253-258. • **EPIDEMIOLOGICAL STUDY WRITTEN CRITIQUE DUE NEXT WEEK** • There is no quiz this week to give you more time to prepare for final review session.
4/30	***Class Theme: FINAL EXAM REVIEW*** Review for final exam. ***Assignment:*** • **FINAL EXAM (Due Monday 5/3/2020)** • **EPIDEMIOLOGICAL STUDY WRITTEN CRITIQUE DUE TODAY**