THE OHIO STATE UNIVERSITY
COLLEGE OF PUBLIC HEALTH

PUBHEPI 8430 – Epidemiology 4
4 credits – Spring, 2026
Tuesday and Thursday from 2:20 to 3:40 pm in Cunz Hall 380B

Course Instructor

Eben Kenah
MS in biostatistics (2008) and ScD in epidemiology (2008), Harvard School of Public Health
Office: Cunz Hall 380F
Email: kenah.1@osu.edu (**please use Carmen messages for communication about class**)

Instructor's Office Hours

Wednesday 9-10 am and Friday 9:30-10:30 am in Cunz Hall 380F or Zoom (links on Carmen). If these times do not work, please make an appointment via Carmen message.

Faculty Feedback & Response Times

The following gives you an idea of my intended availability during the course:

- **Grading:** You can generally expect feedback within 7-10 days.
- **Carmen messages:** I will reply to Carmen messages within 1-2 school days.
- **Discussion board:** Either the TA or the instructor will check and reply to messages in the discussion boards at least once per school day.

Course Description

This course will review fundamental concepts of epidemiology from an advanced point of view and then introduce advanced epidemiologic methods. Fundamental concepts to be reviewed include probability, conditional probability, diagnostic testing, point and interval estimation, maximum likelihood and Bayesian inference, risks and rates, counts, times to events, epidemiologic study designs, and regression. This will give us a foundation to introduce more advanced topics including potential outcomes, causal graphs, standardization, weighting, matching, propensity scores, marginal structural models, time-varying confounding, and doubly robust estimation. If time permits, we will discuss attributable risk and causal sensitivity analysis. The goal is to help you understand a wide range of epidemiologic concepts and methods well enough to apply them to complex research questions in public health.

Prerequisites

PUBHEPI 7430 and PUBHBIO 6211 or permission of instructor

Course Learning Objectives

Upon completion of each module, the student will be able to:

1. Describe data analyses that are appropriate to the study design and data available from existing epidemiologic data sources
2. Critically appraise research articles that employ applicable analytic techniques
3. Determine and conduct analyses appropriate to the data and research question
4. Interpret the results of epidemiologic data analyses
5. Summarize the methods and results of their analyses in written, oral, and visual contexts

Competencies

PhD Specialization in Epidemiology

Upon graduation, a successful student with a PhD degree specialization in Epidemiology will be able to:

- (#2) Synthesize and critique existing literature in student's area of specialization to identify gaps in the evidence base and justify their importance for public health
- (#4) Formulate hypotheses, plan and conduct a research study using appropriate research methods and ethical approaches
- (#5) Analyze data and prepare an original manuscript, suitable for publication, summarizing the results and interpreting the findings from a research study
- (#6) Communicate in writing and orally a research study's purpose, methods, results, limitations, conclusions and public health relevance to both informed and lay audiences
- (#7) Identify and address potential sources of bias, including selection bias, measurement error and confounding, in both the design and analysis phases of epidemiological studies

Text/Readings:

Course readings will come from lecture notes and the biostatistics and epidemiology literature. Important sources include:

- *Analytical Epidemiology* by Eben Kenah, online at: https://ekenah.github.io/analyticalepi/
- *Modern Epidemiology*, 4th edition by Kenneth J. Rothman, Sander Greenland, and Timothy L. Lash (Philadelphia: Lippincott Williams & Wilkins, 2021). For the purposes of this class, the third edition will also work.
- *Causal Inference: What If?* by Miguel A. Hernán and James M. Robins (Boca Raton: Chapman & Hall/CRC, 2025), which is freely available at: https://miguelhernan.org/whatifbook/

All readings will be posted on Carmen. There is no textbook that must be purchased.

Carmen

There is a Carmen site for this course: https://carmen.osu.edu. All course materials are available via Carmen. Due dates, readings, etc., on Carmen are the most accurate and up to date.

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions (https://admin.resources.osu.edu/buckeyepass/adding-a-device)
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application (https://admin.resources.osu.edu/buckeyepass/installing-the-duo-mobile-application) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP) and IT support staff will work out a solution with you.

Class Format: How this course works

- **Mode of delivery:** The class will be delivered in person. Attendance at lectures is expected of all students. Should in-person classes be canceled, we will meet virtually via CarmenZoom during our regularly scheduled time. The instructor will share any updates via announcements on Carmen.
- **Credit hours and work expectations:** This is a **4-credit-hour course**. According to Ohio State policy (go.osu.edu/credithours), students should expect around 4 hours per week of time spent on direct instruction (e.g., lectures and class discussion) in addition to 8 hours of homework (e.g., reading and assignments) to receive an average grade. A typical week will include 4 hours per week of lectures and class discussion, 4 hours per week of reading, and 4 hours working on assignments.
- **Attendance and participation requirements:** Attendance is expected in all scheduled classes. If students have an extenuating circumstance (e.g. unforeseen medical issues, death in the family, etc.) that prevents their attending, they should notify the instructor before class.

Course Technology

Technology skills needed for this course

- **R** (https://cran.r-project.org) will be used for statistical analysis. If you are new to R, I recommend using RStudio (https://posit.co/download/rstudio-desktop/).
- Navigating Carmen (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)

Required equipment

- **Computer:** current Mac (Mac OSX) or PC (Windows 10+) with high-speed internet connection
- **Calculator:** Students should have access to a scientific calculator that can perform basic arithmetic, square roots, logarithms, and exponentiation.
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Optional equipment (for participation in optional live office hours and/or review sessions)

- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet mic or external microphone

Required software

- **Microsoft 365 Copilot (formerly Office 365)**
  All Ohio State students are now eligible for free Microsoft 365 Copilot (formerly Office 365). Full instructions can be found at go.osu.edu/office365help.

Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** http://it.osu.edu/help
- **Phone:** 614-688-4357(HELP)
- **Email:** servicedesk@osu.edu

Assignments/Assessments

Quizzes: 40%
There will be one online quiz for each lecture. Each quiz will cover topics from the corresponding lecture (and may require background knowledge from earlier lectures). **Quizzes are open note, but you must work on them independently.** You are allowed two attempts on each quiz, and your final score will be the maximum of the two scores. See Carmen for due dates.

Data analysis projects: 60%
There will be 12-14 data analysis projects, each covering material from the corresponding week of class. **You may work together on projects, but each person must write up their own report.** Each project will involve applying concepts and methods from the lectures to a data set and writing a report summarizing the research question, methods, results, and conclusions. The text, tables, and figures in the report should be in a format that would be suitable for submission to a scientific journal, and the code used to conduct the analysis should be attached to the report as an appendix. Projects will be submitted online. See Carmen for due dates.

Grading
The lowest two quiz scores and the lowest data analysis project score will be dropped. Late assignments will be docked one letter grade for each day past the deadline. **If you need an extension, please send a Carmen message to the instructor before the due date.**

Grading Scale

A	**94 to 100**	Outstanding work that reflects mastery of the material and the ability to apply it
A-	**90 to <94**	Excellent work that reflects mastery of the material
B+	**87 to <90**	Good work that reflects mastery of most of the material
B	**84 to <87**	Good work that reflects mastery of some of the material
B-	**80 to <84**	Good work that reflects mastery of a few aspects of the material
C+	**77 to <80**	Mediocre work that reflects familiarity with, but not mastery of, the material
C	**74 to <77**	Mediocre work that reflects familiarity with most of the material
C-	**70 to <74**	Mediocre work that reflects little familiarity with the material
D+	**67 to <70**	
D	**61 to <67**	
E	**Below 61**	

Class Policies
Uploading course materials to Quizlet, Chegg, etc., and sharing homework assignments or assignment keys with other students are forbidden.

Copyright Statement

Generative AI Policy

Given that the learning goals of this class are to think and write clearly about applications of ideas and methods from statistical and causal inference in epidemiology, the use of generative artificial intelligence (GenAI) tools such as Copilot or ChatGPT is not permitted in this course.

Office of Student Life: Disability Services

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Mental Health Services

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Religious Beliefs or Practices Accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each

semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Civil Rights Compliance Office. (Policy: Religious Holidays, Holy Days and Observances)

Academic Misconduct

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7 (B)). For additional information, see the Code of Student Conduct.

Intellectual Diversity

Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

Grievances and Solving Problems

A student who encounters a problem related to his/her educational program has a variety of avenues available to seek resolution. According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, you may take your case to the department chairperson. Specific procedures are outlined in Faculty Rule 3335-8-23, the CPH Graduate Student Handbook, and the CPH Undergraduate Student Handbook. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Civil Rights Compliance Office:

Online reporting form at http://civilrights.osu.edu/,
Call 614-247-5838 or TTY 614-688-8605,
Or Email civilrights@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Civil Rights Compliance Office to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

Course Outline

The outline below is subject to change based on the needs of the class. Carmen will always have the most current information.

Week	Date	Topics
Module 1: Defining and measuring disease occurrence		
1	1/13	1. Probability and disease occurrence
	1/15	2. Conditional probability, Bayes' rule, and diagnostic testing
2	1/20	3. Random variables and estimation of probabilities
	1/22	4. Maximum likelihood inference
3	1/27	5. Bayesian inference
	1/29	6. Longitudinal data and rates
4	2/3	7. Counts and times to events
	2/5	8. Kaplan-Meier and Nelson-Aalen estimators
Module 2: Epidemiologic study design and analysis		
5	2/10	9. Cohort studies
	2/12	10. Case-control studies
6	2/17	11. Generalized linear models (GLMs)
	2/19	12. Accelerated failure time models
7	2/24	13. Log-rank test and Cox regression
	2/26	14. Small-sample methods
Module 3: Principles of causal inference		
8	3/3	15. Observation, experiment, and causality in public health
	3/5	16. Potential outcomes and attributable risk
9	3/10	17. Confounding and directed acyclic graphs
	3/12	18. Selection bias and single-world intervention graphs
	3/17	*Spring Break*
	3/19	*Spring Break*
10	3/24	19. Standardization and causal effects
	3/26	20. Confounding, collapsibility, and effect modification
Module 4: Statistical methods for causal inference		
11	3/31	21. Stratified analysis
	4/2	22. Multivariable regression in epidemiology
12	4/7	23. Matching in cohort and case-control studies
	4/9	24. Propensity scores
13	4/14	25. Inverse probability of treatment weights
	4/16	26. Marginal structural models
14	4/21	27. Doubly-robust estimation
	4/23	28. Time-dependent confounding

Alignment of Competencies with Assessments

Competencies	Quizzes	Data Analysis Projects
(#2) Synthesize and critique existing literature in student's area of specialization to identify gaps in the evidence base and justify their importance for public health		X
(#4) Formulate hypotheses, plan and conduct a research study using appropriate research methods and ethical approaches	X	
(#5) Analyze data and prepare an original manuscript, suitable for publication, summarizing the results and interpreting the findings from a research study	X	X
(#6) Communicate in writing and orally a research study's purpose, methods, results, limitations, conclusions and public health relevance to both informed and lay audiences		X
(#7) Identify and address potential sources of bias, including selection bias, measurement error and confounding, in both the design and analysis phases of epidemiological studies	X	X