

EPI/ENVH 573

Methods and Issues in Using Biological Measurements in Epidemiologic Research

Autumn 2021

T-359 Health Sciences Center
Tuesdays and Thursdays, 8:30 – 9:50¹

Instructor: Stephen M. Schwartz, Ph.D. (Professor, Department of Epidemiology)

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Course website: <https://canvas.uw.edu/>

Office Hours: By appointment at the FHCRC or UW

Prerequisites: EPI 511 or EPI 512, or by permission of instructor. Students who are permitted to enroll in the course without the prerequisite coursework are still responsible for competency in the material covered in those courses.

Purpose of Course: Human studies of disease etiology and prognosis often require the measurement of one or more characteristics of biological material. The purpose of this course is to provide students with an introduction to the methods and issues arising in the design, conduct, and analysis of these studies. Specifically, by the end of this course, a student should be able to:

- identify strengths and limitations of using biological measures in human studies of disease etiology, and the characteristics of biomarkers that should be established prior to incorporating them into epidemiologic studies;
- identify the goals of, and strategies in conducting, discovery and characterization studies of biomarkers;
- identify potential sources and impact of biomarker measurement error, in particular the role of differential and nondifferential misclassification of binary and continuous biomarkers;
- identify strengths and limitations of various traditional epidemiologic study designs, and implementation strategies, for the purposes of incorporating biomarker measurements;
- critique scientific reports from human populations that involve biologic measures in the study of disease etiology, prognosis, and early detection.

¹ Except on December 14th, when class will meet from 10:30 am – 12:20 pm

Council on Education for Public Health (CEPH) Competencies:

This course provides the “Characterize the measurement properties of biomarkers” competency for the Department of Epidemiology’s MS – Clinical Translational Research (CTR) track.

Format:

There are 20 sessions. Eighteen sessions will consist of lectures on methodologic issues, applications of methodologic issues to particular diseases, discussion of homework assignments, discussion of research papers, discussion of real or hypothetical case studies, or a combination of these. All readings can be downloaded and printed from the course website. Two sessions are reserved for student presentations of final papers.

Evaluation:

EPI/ENVH 573 is a 3 credit, graded course. The grade will be based on three assignments (contributing 20% each), discussions (10%), and a final paper and presentation (30%). The assignments and paper are described generally below.

Assignments: Assignments will be distributed throughout the quarter (see attached course schedule), and will involve written exposition of ideas, interpretation of data and/or calculations, etc. Some may involve data analyses (including multivariate methods) for which access to a statistical package (e.g., SAS, SPSS, STATA, R) will be necessary. STATA is preferred. We will discuss each assignment in class on the date indicated in the syllabus (unless otherwise changed).

Paper: Each student will write a brief paper summarizing the use of a biomarker (or family of related biomarkers) in studies of human disease. More information on this assignment will be provided in a separate handout. During the final two class sessions, each student will deliver a brief (9-12 minutes depending on the number of students) presentation summarizing their paper.

All assignments and papers must be prepared electronically using MS-Word or compatible software and uploaded to the UW Canvas Learning Management System (<https://canvas.uw.edu/>) by the due date and time.

Points for late assignments in the absence of a reasonable excuse (e.g., illness) will be 5-10% lower than for assignments submitted on time. Assignments will not be accepted after discussion of the answers in class, or after 8:30 am on the 7th day after the due date regardless of when the discussion occurs.

There is no final examination. However, we will meet during the official UW final examination scheduled time (Tuesday, December 14th, from 10:30 am – 12:20 pm) for the final set of student presentations.

First Peoples Land Acknowledgment

The University of Washington acknowledges the Coast Salish people of this land, the stolen land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations.

COVID-Related Expectations

Per [UW policy](#), this class will be conducted in person. Therefore, unless you meet the criteria for an accommodation from Disability Resources for Students (DRS) or a special arrangement approved by the [SPH Office of the Dean](#) that allows you to take the course remotely you should only register for this class if you can attend in-person.

- Please contact [UW Disability Resources for Students](#) (DRS) directly if you feel you may be eligible for an accommodation based on your status as an immunocompromised individual or based on other diagnosed physical or mental health conditions that might prevent you from being able to take classes in-person.
- If you are a student enrolled in a program in SPH, and you are either living with an individual who is immunocompromised, OR you are unable to obtain a visa to travel to the US, you may be eligible for a “special arrangement” that will allow you to take this course remotely. Requests for special arrangements to take the class remotely should have been submitted to and approved by the Students and Academic Services team in the Office of the Dean before the beginning of the quarter. If you have questions about this type of arrangement, please reach out to Student and Academic Services by email at sphas@uw.edu.

All UW students are expected to complete their vaccine attestation before arriving on campus and to follow the campus-wide face-covering policy at all times. You are expected to follow state, local, and UW COVID-19 policies and recommendations. If you feel ill or exhibit possible COVID symptoms, you should not come to class. If you need to temporarily quarantine or isolate per CDC guidance and/or campus policy, you are responsible for notifying your instructors as soon as possible by email. If you receive a positive COVID-19 test result, you must report to campus Environmental Health & Safety (EH&S) by emailing covidehc@uw.edu or calling 206-626-3344.

Food is not allowed in the classroom. Drinks may be sipped with lifting or removal of your facemask for a brief moment, and immediate re-masking after drinking.

Please check your email BEFORE 8 am on Tuesday and Thursday mornings. If I need to conduct class remotely because I or a guest speaker is unable to attend in person, I will send all registered students an email with a Zoom link for remote instruction. Thank you for your patience and support as we all transition together back to in-person learning!

Academic Integrity

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity. The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of the UW Student Conduct Code (WAC 478-120). You are expected to know and follow the university’s policies on cheating and plagiarism, and the SPH

Academic Integrity (cont.)

Academic Integrity Policy (<http://sph.washington.edu/students/academicintegrity/>). Any suspected cases of academic misconduct will be handled according to UW regulations. For more information, see the UW Community Standards and Student Conduct website (<http://www.washington.edu/cssc/student-conduct-overview/student-code-of-conduct/>).

I am Committed to Multi-cultural Inclusion

I seek to ensure all students are fully included in this course. To that end, I strive to create an environment that reflects community and mutual caring. If you have concerns about classroom climate, please talk to me, your advisor, a member of the departmental or SPH Diversity Committee and/or the program director. The SPH has a [formal concern policy](#) if you should choose to pursue that option. SPH contacts for formal concerns can be found [here](#).

Religious Accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at [Religious Accommodations Policy](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/) (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>). *Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request Form](#).*

Access and Accommodations

If you would like to request academic accommodations due to a disability, please contact [Disabled Student Services](#), 448 Schmitz, 543-8924 (V/TTD). If you have a letter from Disabled Student Services indicating you have a disability that requires academic accommodations, please present the letter to the instructor during the first full week of the academic term so that he can discuss the accommodations you might need for the class.

Physical Texts on HSL Course Reserves

- Hamdan M, Righetti PG. Proteomics today: protein assessment and biomarkers using mass spectrometry, 2D electrophoresis, and microarray technology. John Wiley & Sons, Hoboken, 2005.
- Pepe MS. The statistical evaluation of medical tests for classification and prediction. Oxford University Press, Oxford, 2003.
- Strachan T, Read AP. Human Molecular Genetics. 5th Edition. Garland Science, London, 2018.
- Tietz NW. Fundamentals of Clinical Chemistry. Fifth Edition. WB Saunders Co. Philadelphia, 2001.
- White E, Armstrong BK, Saracci R. Principles of Exposure Measurement in Epidemiology. Collecting, evaluating, and improving measures of disease risk factors. Oxford University Press, New York, 2008. (Note: E-text also available through the Canvas site)

E-Texts on Reserve Through HSL Course Reserves

Khoury MJ, Bedrosian S, Gwinn M, Higgins J, Ioannidis J, Little J. Human Genome Epidemiology. 2nd Edition. Oxford University Press, 2010.

E-Texts on Reserve Through Canvas

Wild C, Vineis P, Garte S. Molecular Epidemiology of Chronic Diseases. John Wiley and Sons Ltd, West Sussex, 2008.

Tonolio P, Boffetta P, Shuker DEG, Rothman N, Hulka B, Pearce N. Application of Biomarkers in Cancer Epidemiology. IARC Scientific Publications. No. 142, Lyon, 1997.

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Class Schedule

<u>Session</u>	<u>Topic</u>	<u>Leader</u>
Thur 9/30	Introduction to Course Introduction to Biomarkers in Epidemiologic Research	Schwartz
Tues 10/5	Article Discussion	Schwartz
Thur 10/7	Validity and Reliability Studies for Biological Markers – Part 1 Begin Assignment #1	Schwartz
Tues 10/12	Validity and Reliability Studies for Biological Markers – Part 2 Assignment #1 Due and Discussed	Schwartz
Thur 10/14	Biomarker Discovery and Characterization	Schwartz
Tues 10/19	Tissues, Assays, and Laboratory Variation	Schwartz
Thur 10/21	Study Design and Implementation – Part 1 Begin Assignment #2	Schwartz
Tues 10/26	Study Design and Implementation – Part 2	Schwartz
Thur 10/28	Statistical Analysis of Biomarker Data Assignment #2 Due Begin Assignment #3	Kerr
Tues 11/2	Application: Air Pollution	Simpson
Thur 11/4	Homework #2 Discussion	Schwartz
Tues 11/9	Application: Human Papillomavirus	Winer
Thur 11/11	No Class (Veterans Day Holiday)	
Tues 11/16	Application: Cancer Assignment #3 Due	Whiteaker
Thur 11/18	Application: Nutrition	Neuhouser
Tues 11/23	Homework #3 Discussion	Schwartz
Thur 11/25	No Class (Thanksgiving Holiday)	
Tues 11/30	TBD	TBD
Thur 12/2	Application: Vaginal Microbiome	Balkus
Tues 12/7	Application: Gut Microbiome	Hullar
Thur 12/9	Student Presentations	All
Tues 12/14*	Student Presentations	All

* This session will take place from 10:30 am – 12:20 pm. Final papers will be due on 12/16/2021 at 5 pm PDT.