

EPI/ENVH 573

Methods and Issues in Using Biological Measurements in Epidemiologic Research

Autumn 2019

Health Sciences Center Room T530
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 10th, when class will meet from 10:30 am – 12:20 pm

Format:

There are 20 sessions. Seventeen sessions will consist of lectures on methodologic issues, applications of methodologic issues to particular diseases or exposures, 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. Three sessions are reserved for student presentations of final papers.

Evaluation:

EPI/ENVH573 is a 3 credit, graded course. The grade will be based on class attendance and participation in discussions (10%), three assignments (contributing 20% each), 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 basic statistical package (e.g., SAS, SPSS, STATA) 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 present a brief (9-12 minutes depending on the number of students) presentation summarizing his or her paper.

All assignments and papers must be prepared electronically using MS-Word or compatible software (not PDF) 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 10th, from 10:30 am – 12:20 pm) for the final set of student presentations.

Multi-cultural inclusion commitment:

The UW School of Public Health (SPH) seeks to ensure all students are fully included in each course. We strive to create an environment that reflects community and mutual caring. We encourage students with concerns about classroom climate to talk to your instructor, your advisor, a member of the departmental or SPH Diversity Committee and/or the program director. DCinfo@uw.edu is a resource for students with classroom climate concerns.

Texts on Reserve

- 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.
- Hamdan M, Righetti PG. Proteomics today: protein assessment and biomarkers using mass spectrometry, 2D electrophoresis, and microarray technology. John Wiley & Sons, Hoboken, 2005.
- Khoury MJ, Little J, Burke W. Human Genome Epidemiology. Oxford University Press, 2004.
- Pepe MS. The statistical evaluation of medical tests for classification and prediction. Oxford University Press, Oxford, 2003.
- Rebbeck TR, Ambrosone CB, Shields PG. Molecular Epidemiology: Applications in Cancer and Other Human Diseases. Informa Healthcare, New York, 2008
- Wild C, Vineis P, Garte S. Molecular Epidemiology of Chronic Diseases. John Wiley and Sons Ltd, West Sussex, 2008.
- Strachan T, Read AP. Human Molecular Genetics. 5th Edition. Garland Science, London, 2004.
- Rifai N, Horvath AR, Wittwer CT. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics. 8th Edition. WB Saunders Co. Philadelphia, 2018.
- 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.

Academic Integrity

Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). University of Washington (UW) Students 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. You are expected to know and follow the university's policies on cheating and plagiarism (<https://www.washington.edu/cssc/for-students/student-code-of-conduct/>), and the SPH Academic Integrity Policy (<http://sph.washington.edu/students/academicintegrity/>). Any suspected cases of academic misconduct will be handled according to UW regulations and Department of Epidemiology policies.

Accommodations

If you would like to request academic accommodations due to a disability, please contact Disabled Student Services (<https://hr.uw.edu/dso/>). 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 so that he can discuss the accommodations you might need for the class.

Additionally, reasonable accommodations for religious reasons will be made in accordance with UW policy (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>). As with accommodations due to disability, please contact the instructor within the first week of the course to discuss your needs.

Intentions

We acknowledge the Coast Salish people of this land, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations.

Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of University education. In SPH, students are expected:

1. To respect individual differences, which may include, but are not limited to, age, cultural background, disability, ethnicity, family status, gender, immigration status, national origin, race, religion, sex, sexual orientation, socioeconomic status and veteran status.
2. To engage respectfully in the discussion of diverse worldviews and ideologies embedded in course readings, presentations and artifacts, including those course materials that are at odds with personal beliefs and values.
3. To encourage students with concerns about classroom climate to talk to their instructor, adviser, a member of the departmental or SPH EDI Committee, the Assistant Dean for EDI, or the program's director.

EPI 573/ENVH 573
Class Schedule

<u>Session</u>	<u>Topic</u>	<u>Leader</u>
Thur 9/26	Introduction to Course Introduction to Biomarkers in Epidemiologic Research	Schwartz
Tues 10/1	Article Discussion	Schwartz
Thur 10/3	No Class (Steve away)	
Tues 10/8	Validity and Reliability Studies for Biological Markers – Part 1 Begin Assignment #1	Schwartz
Thur 10/10	Validity and Reliability Studies for Biological Markers – Part 2 Biomarker Discovery and Characterization – Part 1	Schwartz
Tues 10/15	Biomarker Discovery and Characterization – Part 2 Assignment #1 Due and Reviewed	Schwartz
Thur 10/17	Tissues, Assays, and Laboratory Variation	Schwartz
Tues 10/22	Study Design and Implementation – Part 1 Begin Assignment #2	Schwartz
Thur 10/24	Study Design and Implementation – Part 2	Schwartz
Tues 10/29	Statistical Analysis of Biomarker Data Assignment #2 Due Begin Assignment #3	Schwartz
Thur 10/31	Application: Cancer	Whiteaker
Tues 11/5	Application: Human Papillomavirus	Winer
Thur 11/7	Application: Vaginal Microbiome	Balkus
Tues 11/12	Application: Air Pollution Assignment #3 Due	Simpson
Thur 11/14	Assignment #2 Review	Schwartz
Tues 11/19	Application: Gut Microbiome	Hullar
Thur 11/21	Application: Nutrition	Neuhouser
Tues 11/26	Assignment #3 Review	Schwartz
Thur 11/28	No Class (Thanksgiving Holiday)	
Tues 12/3	Student Presentations	All
Thur 12/5	Student Presentations	All
Tues 12/10	Student Presentations	All

* This session will take place from 10:30 am – 12:20 pm. Final papers will be due on 12/13/2019 at 5 pm.