

EPI/ENVH 573

Methods and Issues in Using Biological Measurements in Epidemiologic Research

Autumn 2015

Health Sciences Center Room T-474
Mondays and Wednesdays, 10:30 – 11:50¹

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

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

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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 knowing 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 8:30 – 10:20 am

Format:

There are 21 sessions. Twenty 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/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 10:30 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 (Monday, December 8th, from 8:30 – 10:20 am) as part of the student presentations.

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.
- Hulka BS, Wilcosky TC, Griffith JD. Biologic Markers in Epidemiology. Oxford University Press, New York, 1990.
- 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.
- Rebeck 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. 3rd Edition. Garland Science, London, 2004.
- Schulte PA, Perera FP. Molecular Epidemiology. Principles and Practice, Academic Press, Inc. New York, 1993.
- Tietz NW. Fundamentals of Clinical Chemistry. Third Edition. WB Saunders Co. Philadelphia, 1987.
- 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

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 University of Washington Student Conduct Code (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and the SPH Academic Integrity Policy. Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington Community Standards and Student Conduct website.

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 instructors so we can discuss the accommodations you might need for the class.

EPI 573/ENVH 573
Class Schedule

<u>Session</u>	<u>Topic</u>	<u>Leader</u>
Wed 9/30	Introduction to Course Introduction to Biomarkers in Epidemiologic Research	Schwartz
Mon 10/5	Article Discussion	Schwartz
Wed 10/7	Validity and Reliability Studies for Biological Markers Begin Assignment #1	Schwartz
Mon 10/12	Validity and Reliability Studies for Biological Markers (continued) Assignment #1 Due and Discussed	Schwartz
Wed 10/14	Biomarker Discovery and Characterization	Schwartz
Mon 10/19	Tissues, Assays, and Laboratory Variation	Schwartz
Wed 10/21	Study Design and Implementation Begin Assignment #2	Schwartz
Mon 10/26	Study Design and Implementation (continued)	Schwartz
Wed 10/28	Statistical Analysis of Biomarker Data Assignment #2 Due	Kerr
Mon 11/2	Application: Cancer Begin Assignment #3	Whiteaker
Wed 11/4	Application: Human Immunodeficiency Virus	Frenkel
Mon 11/9	Application: Human Papillomavirus	Winer
Wed 11/11	No Class – Veterans Day Holiday	
Mon 11/16	Application: microRNA Assignment #3 Due and Discussed	Pritchard
Wed 11/18	Application: Nutrition	Neuhouse
Mon 11/23	Application: Biomarkers of Air Pollution	Simpson
Wed 11/25	Application: Cardiovascular Disease	Corson
Mon 11/30	Application: Chronic Inflammation in Adipose Tissue	Kratz
Wed 12/2	Application: Phosphate Metabolism	Kestenbaum
Mon 12/7	Application: Gut Microbiome	Hullar
Wed 12/9	Student Presentations	All
Mon 12/14*	Student Presentations	All

* This session will take place from 8:30 – 10:20 am