

Instructor:

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Course Description

As a second course in the Epidemiologic Methods sequence, this course builds on the basic concepts and methods of epidemiology taught in SPPH 502 -Epidemiologic Methods I. This course provides details on threats to internal validity, including confounding, information bias and selection bias, precision, and effect modification. The course also provides the opportunity for in-depth discussions on various epidemiologic designs. Finally, this course will also delve into the issue of causation in epidemiology.

Course Philosophy

Similar to any other epidemiology methods course, we will be using various examples from the literature that deal with a variety of diseases/exposures and health characteristics in our discussions, however, the course is about *principles and methods*. Examples are used to illustrate an underlying concept, rather than to learn about any particular disease/exposure or health characteristic.

Many students find basic principles and tools of epidemiology to be fairly straightforward. The main challenge lies in the application of those concepts and tools, in recognizing the problems *in situ* and then skillfully addressing them. During this course, we will try to apply concepts to real life problems from published studies in order to link theory and practice.

Course Objectives

The overall goal of this course is to provide students with the basic understanding required to conduct and critique epidemiological studies.

Upon completion of this course students will be able to:

- Apply widely accepted criteria for causal inference

School of Population and Public Health (SPPH)

SPPH 503 DL – Epidemiological Methods II September to December 2017

- Recognize and analyze the most important threats to validity: confounding, selection, and information bias
- Evaluate effect modification
- Design epidemiologic studies to evaluate whether a certain exposure is causally associated with a certain health outcome
- Describe the strengths and weaknesses of alternative epidemiologic study designs for determining whether a given factor is a determinant of disease risk
- Critically review and appraise scientific literature

Course Format

This course includes a mixture of online self-directed learning, pre-class readings, online and face-to-face lectures and discussions, presentations, written assignment and problem sets and a final exam.

Course Texts and Readings

Readings for this course will consist of textbook chapters and journal articles.

Recommended Text:

Szklo M, Nieto FJ. Epidemiology: Beyond the Basics (3rd edition). Sudbury, MA: Jones and Bartlett, 2012.

Other supplemental texts:

Rothman KJ, Greenland S, Lash TL. Modern Epidemiology 3rd Ed. Philadelphia: Lippincott Williams & Wilkins, 2008.

Kleinbaum DG, Kupper LL, Morgenstern H. Epidemiologic Research: Principles and Quantitative Methods. John Wiley & Sons, Inc. 1983.

Prerequisite Courses

The following courses or their equivalents are prerequisites for taking SPPH 503:

- SPPH 502 (Introduction to Epidemiology)
- SPPH 400 (Statistics for Health Research)

Course Evaluation

1. Group presentation on critique of a published paper	10%
2. End of term assignment: letter to the editor critiquing a published paper	10%
3. Online discussion	10%
4. Assignments	35%
5. Final exam	35%

SPPH 503 DL – Epidemiological Methods II
September to December 2017

Office Hours and Teaching Assistant

Office Hours are available through Blackboard Collaborate on a pre-arranged schedule. The office hours schedule will be reviewed at the first face-to-face session and may change after that depending on student needs and TA availability.

Students are also invited to contact the TA by email as needed with questions and concerns. Meetings with the TA can be arranged for outside of office hours and will be conducted through Blackboard Collaborate, or meeting in person, whichever is appropriate.

Module 1: Causation in Epidemiology

1a: Causation and Causal Models

online/self-directed learning

Readings

Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd Ed. 2008.
Chapter 2 Causation and Causal Inference: Causality; pp 5-18.

Koopman JS, Lynch JW. Individual causal models and population system models in epidemiology. Am J Public Health 1999 Aug;89(8):1170-1174.
PMCID: [PMC1508689](#). doi: [10.2105/ajph.89.8.1170](#)

Rose G. Sick individuals and sick populations. Int J Epidemiol. 1985 Mar;14(1):32-8. [Also reprinted as: Int J Epidemiol. 2001 Jun;30(3):427-32.]
PMID: [3872850](#). doi: [10.1093/ije/14.1.32](#) [Original]
PMID: [11416056](#). doi:[10.1093/ije/30.3.427](#) [Reprint]

Parascandola M, Weed DL. Causation in epidemiology. J Epidemiol Community Health. 2001 Dec;55(12):905-12.
PMCID: [PMC1731812](#). doi: [10.1136/jech.55.12.905](#).

Assignment/Activity

- Online discussion on causal inference and causal models. [**part of 10%**]
(When: **Sept. 08- 30, 2017**)

1b: From Causation to Inferring Causality

self-directed learning

Readings

Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd Ed. 2008.
Chapter 2 Causation and Causal Inference: Causal inference in Epidemiology; pp 25-31.

Hill AB. The Environment and Disease: Association or Causation? Proc R Soc Med. 1965 May; 58(5): 295–300.
PMCID: [PMC1898525](#).

Cole P. Causality in epidemiology, public health and law. Environmental Law Reporter. 27 ELR 10282.
[PDF available from Instructor]

1c: Critical Appraisal (via Collaborate)

Sept 08- 30, 2017

Readings

Heller RF, Verma A, Gemmell I, Harrison R, Hart J, Edwards R. Critical appraisal for public health: a new checklist. Public Health. 2008;122(1):92-8.
PMID: [17765937](#). doi: [10.1016/j.puhe.2007.04.012](#) .

Assignments and Activities

- Group presentation on critique of a published paper by group of students assessing internal validity of a study and application of Hill's Criteria. [10%]
(Due: **Select paper by October 8, 2017; Presentation Nov 17, 2017**)
- Submission of a letter to the editor appraising an article. [10%]
(Due: **Article available by Nov 20, 2017; Submit letter Dec 3, 2017**)

Module 2: Study Designs

2a: Cohort Studies

Sept 08, 2017

Readings

Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd Ed. 2008.
Chapter 7 Cohort Studies; pp 100-110.

Samet JM, Muñoz A. Perspective: cohort studies. Epidemiol Rev. 1998;20(1):135-6.
PMID: [9762516](#).

Tager IB. Outcomes in cohort studies. Epidemiol Rev. 1998;20(1):15-28. [Review]
PMID: [9762506](#).

Hunt JR, White E. Retaining and tracking cohort study members. Epidemiol Rev.
1998;20(1):57-70. [Review]
PMID: [9762509](#).

White E, Hunt JR, Casso D. Exposure measurement in cohort studies: the challenges of prospective data collection. Epidemiol Rev. 1998;20(1):43-56. [Review]
PMID: [9762508](#).

Muñoz A, Gange SJ. Methodological issues for biomarkers and intermediate outcomes in cohort studies. Epidemiol Rev. 1998;20(1):29-42. [Review]
PMID: [9762507](#).

Assignments and Activities

- Exercise/Tutorial on Cohort Studies (via Collaborate) Sept 09-16, 2017
- Assignment # 1 on Cohort Studies [10%]
(Due: **Sep 24, 2017**)

SPPH 503 DL – Epidemiological Methods II
September to December 2017

2b: Case Control Studies

Oct 13, 2017

Readings

Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd Ed. 2008.

Chapter 8 Case-Control Studies; pp 171-182.

Chapter 11 Design Strategies to improve study accuracy. Matching; pp 111-127

Wacholder S, McLaughlin JK, Silverman DT, Mandel JS. Selection of controls in case-control studies. I. Principles. Am J Epidemiol. 1992;135(9):1019-28.

PMID: [1595688](#).

Wacholder S, Silverman DT, McLaughlin JK, Mandel JS. Selection of controls in case-control studies. II. Types of controls. Am J Epidemiol. 1992;135(9):1029-41.

PMID: [1595689](#).

Assignments and Activities

- Exercise/Tutorial on Case-Control Studies (via Collaborate) Oct 4-21, 2017
- Assignment # 2 on Case-Control Studies [10%]
(Due: Oct 29, 2017)

2d: Control Trials learning

self-directed

Readings

Green SB. Design of randomized trials. Epidemiol Rev. 2002;24(1):4-11. [Review]

PMID: [12119855](#). doi: [10.1093/epirev/24.1.4](#)

Atienza AA, King AC. Community-based health intervention trials: an overview of methodological issues. Epidemiol Rev. 2002;24(1):72-9. [Review]

PMID: [12119859](#). doi: [10.1093/epirev/24.1.72](#)

Schulz KF, Grimes DA. Allocation concealment in randomised trials: defending against deciphering. Lancet. 2002 Feb 16;359(9306):614-8. [Review]

PMID: [11867132](#). doi: [10.1016/S0140-6736\(02\)07750-4](#)

Schulz KF, Grimes DA. Generation of allocation sequences in randomised trials: chance, not choice. Lancet. 2002 Feb 9;359(9305):515-9. [Review]

PMID: [11853818](#). doi: [10.1016/S0140-6736\(02\)07683-3](#)

Buring JE. Special issues related to randomized trials of primary prevention. Epidemiol Rev. 2002;24(1):67-71. [Review]

PMID: [12119858](#). doi: [10.1093/epirev/24.1.67](#)

Wittes J. Sample size calculations for randomized controlled trials. Epidemiol Rev. 2002;24(1):39-53. [Review]

PMID: [12119854](#). doi: [10.1093/epirev/24.1.39](#)

Peduzzi P, Henderson W, Hartigan P, Lavori P. Analysis of randomized controlled trials. Epidemiol Rev. 2002;24(1):26-38. [Review]

PMID: [12119853](#). doi: [10.1093/epirev/24.1.26](#)

SPPH 503 DL – Epidemiological Methods II
September to December 2017

- Knatterud GL. Management and conduct of randomized controlled trials. *Epidemiol Rev.* 2002;24(1):12-25. [Review]
PMID: [12119852](#). doi: [10.1093/epirev/24.1.12](#)
- Goetghebeur E, Loeys T. Beyond intention to treat. *Epidemiol Rev.* 2002;24(1):85-90. [Review]
PMID: [12119861](#). doi: [10.1093/epirev/24.1.85](#)
- Hlatky MA. Economic endpoints in clinical trials. *Epidemiol Rev.* 2002;24(1):80-4.
PMID: [12119860](#). doi: [10.1093/epirev/24.1.80](#)

Module 3: Issues Impacting Validity of Studies

3a: Confounding – Assessment and Control

Oct 13/Nov 17, 2017

Readings

- Szklo M, Nieto FJ. *Epidemiology: Beyond the Basics*, 3rd edition. 2012
Chapter 5 Identifying noncausal associations: Confounding; pp. 153.
- Rothman KJ, Greenland S, Lash TL. *Modern Epidemiology*, 3rd Ed. 2008.
Chapter 9 Validity in Epidemiologic Studies: Confounding; pp. 129-134.
Chapter 11 Design Strategies to Improve Study Accuracy: Design Options to Control Confounding; pp. 168-169.
- Schisterman EF, Cole SR, Platt RW. Overadjustment bias and unnecessary adjustment in epidemiologic studies. *Epidemiology.* 2009 Jul;20(4):488-95.
PMCID: [PMC2744485](#). doi: [10.1097/EDE.0b013e3181a819a1](#).
- Rutter M. Epidemiological methods to tackle causal questions. *Int J Epidemiol* 2009; 38(1):3-6. [Editorial]
PMID: [19052115](#). doi:[10.1093/ije/dyn253](#)
- Merchant AT, Pitiphat W. Directed acyclic graphs (DAGs): an aid to assess confounding in dental research. *Community Dent Oral Epidemiol.* 2002 Dec;30(6):399-404.
PMID: [12453109](#). doi: [10.1034/j.1600-0528.2002.00008.x](#)
- Cole SR, Platt RW, Schisterman EF, Chu H, Westreich D, Richardson D, Poole C. Illustrating bias due to conditioning on a collider. *Int J Epidemiol.* 2010 Apr;39(2):417-20. PMID: [19926667](#). doi: [10.1093/ije/dyp334](#).

Readings for Confounding by Indication

- Hak E, Verheij TJ, Grobbee DE, Nichol KL, Hoes AW. Confounding by indication in non-experimental evaluation of vaccine effectiveness: the example of prevention of influenza complications. *J Epidemiol Community Health.* 2002 Dec;56(12):951-5.
PMCID: [PMC1756997](#). doi: [10.1136/jech.56.12.951](#)
- Psaty BM, Koepsell TD, Lin D, Weiss NS, Siscovick DS, Rosendaal FR, Pahor M, Furberg CD. Assessment and control for confounding by indication in observational studies. *J Am Geriatr Soc.* 1999 Jun;47(6):749-54. PMID: [10366179](#).

3b: Selection Bias

November 17, 2017

Readings

Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd Ed. 2008.
Chapter 9 Validity in Epidemiologic Studies: Selection Bias & Information Bias; pp. 134-146.

Hernan MA, Hernandez-Dias S, Robins JM. A structural approach to selection bias.
Epidemiology 2004; 15(5):615-625.
PMID: [15308962](#). doi: [10.1097/01.ede.0000135174.63482.43](#)

Delgado-Rodríguez M, Llorca J. Bias. J Epidemiol Community Health. 2004 Aug;58(8):635-41. PMID: [PMC1732856](#). doi:[10.1136/jech.2003.008466](#)

Additional Readings on Bias

Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd Ed. 2008.
Chapter 19 Bias Analysis; pp. 345-380.

3c: Measurement Error

November 17, 2017

Readings

Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd Ed. 2008.
Chapter 9 Validity in Epidemiologic Studies: Selection Bias & Information Bias; pp. 134-146.

3d: Effect Modification

November 17, 2017

Readings

Szklo M, Nieto FJ. Epidemiology: Beyond the Basics, 3rd edition. 2012
Chapter 6 Interaction; pp. 185.

Rothman KJ, Greenland S, Lash TL. Modern Epidemiology, 3rd Ed. 2008.
Chapter 5 Concepts of Interaction; pp. 71-83.
Chapter 15 Introduction to Stratified Analysis; pp. 258-282.

de Mutsert R, Jager KJ, Zoccali C, Dekker FW. The effect of joint exposures: examining the presence of interaction. Kidney Int. 2009 Apr;75(7):677-81.
PMID: [19190674](#).

Assignment

- Exercise/Tutorial (via Collaborate) Nov 18-24, 2017
- Assignment # 3 on Internal Validity [15%]
(Due: **November 26, 2017**)

Final Exam

Released: Dec 01, 2017
Due: Dec 10, 2017 [35%]