



Department of Population Health Sciences

Epidemiologic Methods 4 (PHS 805)

Fall Semester, 2015

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Course Description: Epidemiologic Methods 4 (PHS 805) is directed to PhD and MSc students. This course expands on the knowledge and abilities developed in PHS797 and PHS798. The main emphasis of PHS 805 is on the understanding and use of viewpoints and design/analytical tools to render possible the estimation of causal effects in epidemiologic studies. PHS 805 provides students with an opportunity to learn about the rationale and use of study designs/analytic tools that built upon but are substantially different from the most common approaches used in epidemiologic research (experimental studies, case-control studies, and cohort studies). Student evaluation will be based on the development, presentation, and discussion of an individual course project involving the use of principles and tools discussed in the course.

Course Objectives: By the end the course the student will be able to:

- a) Demonstrate a good understanding of the main features of the counterfactual model as a base for causal inferences in epidemiological research.
- b) Identify assumptions needed for causal inference and assess whether they are sufficient to allow the estimation of causal effects from available data.
- c) Understand and use design and analytic strategies that help in the estimation of causal effects.

Credits: 3

Grading: Student evaluation will be based on the development, presentation, and discussion of an individual course project. The project must make substantial use of the principles and design/analytic strategies learned in the course. Grades will be assigned as 90.0-100, A; 85.0-89.9, AB; 80.0-84.4, B; 75.0-79.9, BC; 70.0-74.9, C; etc.

Policies:

- Course readings should be completed prior to the start of the corresponding lecture.
- Students are encouraged to discuss course contents with each other.
- Students should expect to be individually asked to participate in the class discussions
- Hand outs and homework assignments will be delivered through learn@uw.

Online access: Desire to learn (D2L) at: <https://learnuw.wisc.edu/>

Course schedule: Tuesday & Thursday 1:00 to 2:15 p.m., WARF 758

Course Topics and Readings:

About 12 topics will be covered in 15 weeks. Some topics may require more than two class periods to complete, but this additional time is built into the schedule.

Date	Topic	Instructor
- Sept 3-8	Causality: The Counterfactual framework Readings: - Höfler M. The Bradford Hill considerations on causality: a counterfactual perspective. <i>Emerging Themes in Epidemiology</i> 2005, 2:11 - Maldonado G, Greenland S. Estimating causal effects. <i>Int J Epidemiol</i> 2002, 31:422-429 - Hernán, MA, Robins, JM. Estimating causal effects from epidemiological data. <i>Journal of Epidemiology and Community Health</i> 2006, 60:578-586	L Bautista
- Sept 10-15	Causality: Causal diagrams Readings: - Hernán MA, Hernández-Díaz S, Robins JM. "A Structural Approach to Selection Bias." <i>Epidemiology</i> 2004, 15(2):174-84 - Elwert F. "Graphical Causal Models." Pp. 245-273 in S. Morgan (ed.), <i>Handbook of Causal Analysis for Social Research</i> . New York: Sage Publications. 2013.	Peter Steiner
- Sept 17-22	Mendelian randomization Readings: - Davey SG, Ebrahim S. 'Mendelian randomization': can genetic epidemiology contribute to understanding environmental determinants of disease? <i>Int J Epidemiol</i> 2003;32:1-22. - Davey SG, Ebrahim S. Mendelian randomization: prospects, potentials, and limitations. <i>Int.J Epidemiol</i> 2004;33:30-42. - Hernán MA, Robins JM. Instruments for Causal Inference: An Epidemiologist's Dream? <i>Epidemiology</i> 2006;17:360-72.	P Peppard
- Sep 24-29	Ecologic studies Readings: - Morgenstern H. Ecologic studies in epidemiology: concepts, principles, and methods. <i>Ann Rev Public Health</i> 1995, 16:61-81. - Guthrie KA, Sheppard L. Overcoming biases and misconceptions in ecological studies. <i>J R Statist Soc</i> 2001, 164:141-154 - Blakely TA, Woodward AJ. Ecological effects in multilevel studies. <i>J Epidemiol Community Health</i> 2000, 54:367-374	P Peppard

- Pearce N. The ecological fallacy strikes back. *J Epidemiol Community Health* 2000; 54 :326–327
- Oct 01-06 **Case-crossover studies** **L Bautista**
 Readings: - Maclure M, Mittleman MA. Should we use a case-crossover design? *Annu Rev Public Health*. 2000;21:193-221
 - Maclure M. 'Why me?' versus 'why now?' --differences between operational hypotheses in case-control versus case-crossover studies. *Pharmacoepidem Drug Safe*. 2007;16:850-853.
- Oct 13 **Meta-analysis** **P Peppard**
 Readings: - Greenland S, O'Rourke K. Meta-Analysis. In: Rothman KJ, Greenland S, Lash T, editors. *Modern Epidemiology*. Philadelphia: Wolters Klower/Lippincott Williams / Wilkins, 2008: 652-682.
 - Blettner M, Schlattmann P. Meta-Analysis in Epidemiology. In Ahrens W, Pigeot I. *Handbook of epidemiology*. Springer, 2005: 829-857.
- Oct 15-20 **Multivariate matching methods** **M Palta**
 Readings: - Williamson E, Morley R, Lucas A, Carpenter J. Propensity scores: from naive enthusiasm to intuitive understanding. *Stat Methods Med Res* 2012;21:273-93
 - D'Agostino RB. Propensity score methods for bias reduction in the comparison of a treatment to a non-randomized control group. *Statist.Med*. 1998;17:2265-81
- Oct 22-27 **Sensitivity analysis in epidemiological studies** **L Bautista**
 Readings: - Greenland S. Multiple-bias modelling for analysis of observational data. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*. 2005;168(2): 267-306.
 - Ichino A, Mealli F, Nannicini T. From temporary help jobs to permanent employment: what can we learn from matching estimators and their sensitivity? *J Appl Econ*. 2008;23(3):305-327.
 - Lash TL, Fink AK. Semi-Automated Sensitivity Analysis to Assess Systematic Errors in Observational Data. *Epidemiology*. 2003;14(4).
- Oct 29-Nov 3 **Mediation analysis** **M Brauer**
 Readings: - Ditlevsen S, et al. The Mediation Proportion: A Structural Equation Approach for Estimating the Proportion of Exposure Effect on Outcome Explained by an Intermediate Variable. *Epidemiology* 2005, 16:114-120
 - Albert, JM. Mediation analysis via potential outcomes models. *Statist. Med*. 2008; 27:1282–1304

- Nov 5-10 Spatial Epidemiology R Gangnon**
 Readings: - Morgenstern, H. 2005. Ecologic Study. Encyclopedia of Biostatistics.
 - Bithell, J.F. 2005. Geographic Epidemiology. Encyclopedia of
 Biostatistics.
 - Elliott, P. and Best, N. 2005. Geographic Patterns of Disease.
 Encyclopedia of Biostatistics.
 - Elliot P. and Wartenberg D. Spatial Epidemiology: Current Approaches
 and Future Challenges. *Environ Health Perspect.* 2004; 112: 998-1006.
 - Rezaeian M., Dunn G., St Leger S. and Appelby L. Geographic
 Epidemiology, Spatial Analysis and Geographical Information Systems: A
 Multidisciplinary Glossary. *J Epidemiol Community Health.* 2007; 61: 98-102.
- Nov 12-17 Bayesian Methods on Epidemiology D Vannes**
 Readings: - Greenland S. Introduction to Bayesian Statistics. In:
 Rothman KJ, Greenland S, Lash T, editors. *Modern
 Epidemiology.* Philadelphia: Wolters Klower/Lippincott
 Williams / Wilkins, 2008: 328-344.
- Nov 19-24 Missing Data Analysis L Bautista**
 Readings: - Allison, Paul D. (2009) "Missing Data." Pp. 72-89 in The
 SAGE Handbook of Quantitative Methods in Psychology,
 edited by Roger E. Millsap and Alberto Maydeu-Olivares.
 Thousand Oaks, CA: Sage Publications Inc
 - Graham JW. Missing Data Analysis: Making It Work in
 the Real World. *Annu Rev Psychol.* 2008;60(1):549-576.
 - White IR, Royston P, Wood AM. Multiple imputation
 using chained equations: Issues and guidance for practice.
 Statist Med. 2011;30(4):377-399.
- Nov 25-28 Thanksgiving Recess**
- Dec 01-03 Individual project work**
- Dec 08-10 Project presentation and discussion**
- Dec 14-18 Project presentation and discussion**