

READINGS IN EPIDEMIOLOGIC MODELING

Epidemiology 719

Fall Semester, 2008

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Time and Place:

Wednesday 12:00-12:50 PM in HC 0001 (Blue Cross Blue Shield Auditorium)

**Note: No class on October 15th (Fall Break)
No class on November 26 (Thanksgiving)**

Co-Requisite:

All students enrolled in Epid 719 should be currently enrolled in Epid 718

This seminar is a 1-credit hour course designed to facilitate an active discussion of theoretical or conceptual readings related to epidemiologic modeling. There are no teaching assistants or co-instructors. There is no final examination at the end of the term. Because of the seminar format, preparation (reading the assigned articles) and class participation (participating in the discussion) are particularly important.

Required Texts:

None. But you may wish to refer to ME3 2008 as a general reference.

Readings:

Readings are assigned each week. Adobe Acrobat files of the assigned readings will be available for downloading from the course website. Additional readings are also listed for the interested and intrepid student, most of which are available electronically as well.

Required readings are shown in **bold**, and recommended auxiliary readings are shown in *italics*.

Schedule of Topics and Readings:

Session 1: Wednesday August 20, 2008 12:00-12:50 PM
Topic: Statistical reasoning and modeling in epidemiology

Assigned Readings:

Greenland S. Randomization, statistics, and causal inference. *Epidemiology*. 1990 Nov;1(6):421-9.

Zeger SL. Statistical reasoning in epidemiology. Am J Epidemiol. 1991; 134(10): 1062-6.

Greenland S. Re: "Statistical reasoning in epidemiology". Am J Epidemiol. 1992; 135(10): 1186-7.

Greenland S. Summarization, smoothing, and inference in epidemiologic analysis. 1991 Ipsen Lecture, Hindsø, Denmark. *Scand J Soc Med*. 1993;21(4):227-32.

Vandenbroucke JP. Should we abandon statistical modeling altogether? Am J Epidemiol. 1987; 126(1):10-3.

Session 2: Wednesday August 27, 2008 12:00-12:50 PM
Topic: Defining Causal Effects

Assigned Readings:

Maldonado G, Greenland S. Estimating causal effects. *Int J Epidemiol*. 2002; 31(2): 422-38. [commentaries and responses are not required]

Hernan MA. A definition of causal effect for epidemiological research. *J Epidemiol Community Health*. 2004; 58(4): 265-71. [appendix is not required]

Pearl J. Statistics and Causal Inference: A Review [with discussion]. Test Journal 2003; 12(2): 281-345.

*Little RJ, Rubin DB. Causal effects in clinical and epidemiological studies via potential outcomes: concepts and analytical approaches. *Annu Rev Public Health*. 2000;21:121-45.*

*Greenland S, Brumback B. An overview of relations among causal modelling methods. *Int J Epidemiol*. 2002 Oct;31(5):1030-7.*

Session 3: Wednesday September 3, 2008 12:00-12:50 PM
Topic: Data, design, and background knowledge in etiologic inference.

Assigned Readings:

Robins JM. Data, design, and background knowledge in etiologic inference. *Epidemiology* 2001; 12(3): 313-20.

*Hernan MA, Hernandez-Diaz S, Werler MM, Mitchell AA. Causal knowledge as a prerequisite for confounding evaluation: an application to birth defects epidemiology. *Am J Epidemiol* 2002; 155(2): 176-84.*

*Howards PP, Schisterman EF, Heagerty PJ. Potential Confounding by Exposure History and Prior Outcomes: An Example From Perinatal Epidemiology. *Epidemiology*. 2007; 18(5): 544-551.*

Session 4: Wednesday September 10, 2008 12:00-12:50 PM
Topic: Confounding and Collapsibility

Assigned Readings:

Newman SC. Commonalities in the classical, collapsibility and counterfactual concepts of confounding. *J Clin Epidemiol*. 2004;57(4):325-9.

Greenland S. Interpretation and choice of effect measures in epidemiologic analyses. *Am J Epidemiol*. 1987 May;125(5):761-8.

*Greenland S, Morgenstern H. Confounding in health research. *Annu Rev Public Health*. 2001;22:189-212.*

*Greenland S, Robins JM, Pearl J. Confounding and collapsibility in causal inference. *Statistical Science* 1999; 14 (1): 29-46.*

Session 5: Wednesday September 17, 2008 12:00-12:50 PM
Topic: Interaction and Synergism

Assigned Readings:

Thompson WD. Effect modification and the limits of biological inference from epidemiologic data. *J Clin Epidemiol*. 1991;44(3):221-32.

*Koopman JS, Weed DL. Epigenesis Theory - A mathematical-model relating causal concepts of pathogenesis in individuals to disease patterns in populations. *Am J Epidemiol* 1990; 132 (2): 366-390.*

Weinberg CR. *Can DAGs Clarify Effect Modification?* *Epidemiology*. 2007 Sep;18(5):569-72.

Vanderweele TJ, Robins JM. *Four Types of Effect Modification: A Classification Based on Directed Acyclic Graphs*. *Epidemiology*. 2007 Sep;18(5):561-568.

Vanderweele TJ, Robins JM. *The identification of synergism in the sufficient-component-cause framework*. *Epidemiology*. 2007 May;18(3):329-39.

Session 6: Wednesday September 24, 2008 12:00-12:50 PM
Topic: p-values and statistical inference

Assigned Readings:

Editorial. The value of P. *Epidemiology*. 2001 May;12(3):286.

Weinberg CR. It's time to rehabilitate the P-value. *Epidemiology* 2001; 12(3):288-90.

Goodman SN. Of P-values and Bayes: a modest proposal. *Epidemiology* 2001; 12(3):295-7.

Poole C. Low P-values or narrow confidence intervals: which are more durable? *Epidemiology*. 2001;12(3):291-4.

*Goodman SN. P-values, hypothesis tests, and likelihood - implications for epidemiology of a neglected historical debate. *Am J Epidemiol* 1993; 137(5): 485-496.*

Session 7: Wednesday October 1, 2008 12:00-12:50 PM
Topic: Measurement Error [David Richardson]

Assigned Readings:

Armstrong BG. Effect of measurement error on epidemiological studies of environmental and occupational exposures. *Occup Environ Med*. 1998 Oct;55(10):651-6.

*Wacholder S. When measurement errors correlate with truth: surprising effects of nondifferential misclassification. *Epidemiology*. 1995 Mar;6(2):157-61.*

*Sturmer T, Thurigen D, Spiegelman D, Blettner M, Brenner H. The performance of methods for correcting measurement error in case-control studies. *Epidemiology* 2002; 13(5): 507-516.*

Greenland S, Gustafson P. Accounting for independent nondifferential misclassification does not increase certainty that an observed association is in the correct direction. Am J Epidemiol. 2006 Jul 1;164(1):63-8.

Session 8: Wednesday October 8, 2008 12:00-12:50 PM
Topic: Sensitivity Analysis [Brian Pence]

Fox MP, Lash TL, Greenland S. A method to automate probabilistic sensitivity analyses of misclassified binary variables. Int J Epidemiol. 2005 Dec;34(6):1370-6.

Fox MP, Lash TL, Hamer DH. A sensitivity analysis of a randomized controlled trial of zinc in treatment of falciparum malaria in children. Contemp Clin Trials. 2005 Jun;26(3):281-9.

Chu H, Wang Z, Cole SR, Greenland S. Sensitivity analysis of misclassification: a graphical and a Bayesian approach. Ann Epidemiol. 2006 Nov;16(11):834-41.

Flanders WD, Khoury MJ. Indirect assessment of confounding: graphic description and limits on effect of adjusting for covariates. Epidemiology. 1990; 1(3): 239-46.

Lash TL, Silliman RA. A sensitivity analysis to separate bias due to confounding from bias due to predicting misclassification by a variable that does both. Epidemiology 2000; 11(5): 544-9.

Lash TL, Fink AK. Semi-automated sensitivity analysis to assess systematic errors in observational data. Epidemiology. 2003; 14(4): 451-8.

Phillips CV. Quantifying and reporting uncertainty from systematic errors. Epidemiology. 2003; 14(4): 459-66.

Session 9: Wednesday October 22, 2008 12:00-12:50 PM
Topic: Causal Inference in Infectious Disease [Daniel Westreich]

Assigned Reading:

Halloran ME, Struchiner CJ. Causal inference in infectious diseases. Epidemiology. 1995; 6(2):142-51.

Halloran ME, Struchiner CJ. Study designs for dependent happenings. Epidemiology. 1991; 2(5): 331-8.

Hudgens MG, Halloran ME. Towards causal inference with interference. Journal of the American Statistical Association 2008, 103:832-842.

Session 10: Wednesday October 29, 2008 12:00-12:50 PM
Topic: Population Attributable Risk [Beverly Rockhill Levine]

Levine BJ. The other causality question: estimating attributable fractions for obesity as a cause of mortality. *International Journal of Obesity* 2008; 32: S4-S7.

Kleinbaum DG, Kupper LL, Morgenstern H. *Epidemiologic Research: Principles and Quantitative Methods* 1982, pp. 160-168.

Rockhill B, Weinberg CR, Newman B. Population attributable fraction estimation for established breast cancer risk factors: considering the issues of high prevalence and unmodifiability. *Am J Epidemiol.* 1998 May 1;147(9):826-33.

*Greenland S, Robins JM. Conceptual problems in the definition and interpretation of attributable fractions. *Am J Epidemiol.* 1988 Dec;128(6):1185-97.*

*Rockhill B, Newman B, Weinberg C. Use and misuse of population attributable fractions. *Am J Public Health.* 1998 Jan;88(1):15-9.*

Session 11: Wednesday November 5, 2008 12:00-12:50 PM
Topic: Effect Decomposition

Assigned Readings:

Cole SR, Hernan MA. Fallibility in estimating direct effects. *Int J Epidemiol.* 2002; 31(1):163-5.

Kaufman JS, MacLehose RF, Kaufman S. A further critique of the analytic strategy of adjusting for covariates to identify biologic mediation. *BMC Epidemiologic Perspectives & Innovations* 2004; 1:4 (8Oct2004) [<http://www.epi-perspectives.com/content/1/1/4>]

*Joffe MM, Colditz GA. Restriction as a method for reducing bias in the estimation of direct effects. *Stat Med.* 1998 Oct 15;17(19):2233-49.*

*Petersen ML, Sinisi SE, van der Laan MJ. Estimation of direct causal effects. *Epidemiology.* 2006 May;17(3):276-84.*

*Joffe MM, Byrne C, Colditz GA. Postmenopausal hormone use, screening, and breast cancer: characterization and control of a bias. *Epidemiology* 2001; 12(4): 429-38.*

Session 12: Wednesday November 12, 2008 12:00-12:50 PM
Topic: Propensity Scoring

Assigned Reading:

Oakes JM, Johnson PJ. Propensity score matching for social epidemiology. In: Methods in Social Epidemiology (Oakes JM, Kaufman JS, Eds), Chapter 15, 2006.

D'Agostino RB Jr. Propensity score methods for bias reduction in the comparison of a treatment to a non-randomized control group. Stat Med. 1998 Oct 15;17(19):2265-81.

Rubin DB. Estimating causal effects from large data sets using propensity scores. Ann Intern Med. 1997 Oct 15;127(8 Pt 2):757-63.

Joffe MM, Rosenbaum PR. Invited commentary: propensity scores. Am J Epidemiol. 1999 Aug 15;150(4):327-33.

Perkins SM, Tu W, Underhill MG, Zhou X-H, Murray MD. The use of propensity scores in pharmacoepidemiologic research. Pharmacoepidemiology and Drug Safety 2000; 9(2): 93-101.

Rosenbaum P, Rubin DB. The central role of the propensity score in observational studies for causal effects. Biometrika 1983; 70: 41-55.

Mansson R, Joffe MM, Sun W, Hennessy S. On the estimation and use of propensity scores in case-control and case-cohort studies. Am J Epidemiol. 2007;166(3):332-9.

Session 13: Wednesday November 19, 2008 12:00-12:50 PM
Topic: Marginal Structural Models

Assigned Reading:

Robins JM, Hernán MA, Brumback B. Marginal structural models and causal inference in epidemiology. Epidemiology. 2000 Sep;11(5):550-60.

Hernan MA, Robins JM. Estimating causal effects from epidemiological data. J Epidemiol Community Health. 2006; 60(7):578-86.

Petersen ML, Wang Y, van der Laan MJ, Bangsberg DR. Assessing the effectiveness of antiretroviral adherence interventions. Using marginal structural models to replicate the findings of randomized controlled trials. J Acquir Immune Defic Syndr. 2006 Dec 1;43 Suppl 1:S96-S103.

Newman SC. Causal analysis of case-control data. Epidemiol Perspect Innov. 2006 Jan 27;3:2.

Session 14: Wednesday December 3, 2008 12:00-12:50 PM
Topic: Selection Bias

Assigned Reading:

Hernan MA, Hernandez-Diaz S, Robins JM. A structural approach to selection bias. *Epidemiology* 2004;15(5): 615-25.

*Flanders WD, Klein M. Properties of 2 counterfactual effect definitions of a point exposure. *Epidemiology*. 2007 Jul;18(4):453-60.*

A Few Recommended Articles that Put All the Pieces Together for Post-Semester Reading:

*Maclure M, Schneeweiss S. Causation of bias: the episcopes. *Epidemiology*. 2001;12(1):114-22.*

*Greenland S. Epidemiologic measures and policy formulation: lessons from potential outcomes. *Emerg Themes Epidemiol*. 2005 May 27;2:5.*