

PRINCETON UNIVERSITY

WWS 598/ POP 508

EPIDEMIOLOGY

SPRING 2003-2004

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Professor Noreen Goldman
243 Wallace Hall
ngoldman@princeton.edu
(609) 258-5724

Preceptor: Dr. Chris Seplaki
263 Wallace Hall
Seplaki@princeton.edu
(609) 258-1394

This is a first-semester course in epidemiology for students in public policy and demography. Areas of focus include measurement of health status, disease occurrence, survival, and the association between risk factors and health outcomes; techniques for design, analysis and interpretation of epidemiologic research studies; and sources of bias and confounding. Other topics include foundations of modern epidemiology, the nature of causal inference, social inequalities in health, and ethical issues in epidemiological research. The course will examine the bridging of "individual-centered" epidemiology and "macro-epidemiology" to recognize social, economic and cultural context, assess impacts on populations, and provide important inputs for public health and health policy.

Course Outline: List of Topics

Note that a given topic may span anywhere from less than one to two class periods.

Part 1: Measurement and Dynamics of Disease and Mortality

1. Introduction and overview
2. Disease transmission & measurement of disease occurrence
3. Measurement of mortality and survival

Part 2: Association, Causation and Study Design

4. What is causation?
5. Randomized clinical trials
6. Cohort studies
7. Case control and cross-sectional studies
8. Measuring risk: odds ratio, relative risk
9. Bias, confounding and interactions
10. Multivariate models: linear and logistic regressions

Part 3: Epidemiological Research and Health Policy

11. Outbreaks of disease: a case study of SARS (guest lecture)
12. Interpreting and synthesizing the epidemiological literature
13. The gap between scientific knowledge and health policy: a case study of malaria (guest lecture)
14. Screening programs
15. Individual vs. population health
16. Population health: Defining the issues and outcomes
17. Determinants of population health (social epidemiology)
18. Ethical issues in epidemiological research (guest lecture)
19. The future of epidemiology

The textbook for the course is the following:

Gordis, Leon. 2000. *Epidemiology*, 2nd edition. WB Saunders Company

We will also read:

Russell, Louise B. 1994. *Educated Guesses. Making Policy about Medical Screening Tests*. University of California Press

The U-store has copies of both books.

The following list includes books in which we will read selected chapters as well as books that can be used for alternative explanations to Gordis or supplemental material. Stokes library should have copies of most of these.

Bhopal, Raj. 2002. *Concepts of Epidemiology. An Integrated Introduction to the Ideas, Theories, Principles and Methods of Epidemiology*. Oxford University Press.

Buck, Carol, Alvaro Llopis, Enrique Najera and Milton Terris (eds.). 1988. *The Challenge of Epidemiology: Issues and Selected Readings*. Pan American Health Organization. Scientific Publication No. 505.

Evans, Robert G., Morris L. Barer and Theodore R. Marmor (eds.) 1994. *Why are Some People Healthy and Others Not? The Determinants of Health of Populations*. Aldine de Gruyter.

Friis, Robert H. and Thomas A. Sellers. 2004. *Epidemiology for Public Health Practice*, 3rd Edition. Aspen Publishers, Inc.

Gehlbach, Stephen H. 2002. *Interpreting the Medical Literature*, 4th edition. Macmillan Publishing Company.

Greenberg, Raymond S., Stephen R. Daniels, W. Dana Flanders, John William Eley and John R. Boring III. 2001. *Medical Epidemiology*, 3rd edition. McGraw-Hill.

Kelsey, Jennifer L., Alice S. Whittemore, Alfred S. Evans, and Douglas Thompson. 1996. *Methods in Observational Epidemiology*. Oxford University Press

Koepsell, Thomas D. and Noel S. Weiss. 2003. *Epidemiologic Methods: Studying the Occurrence of Illness*. Oxford University Press.

Last, John M. 2001. *A Dictionary of Epidemiology*, 4th edition. Oxford University Press.

Marmot, Michael and Richard G. Wilkinson (eds.). 2000. *Social Determinants of Health*. Oxford University Press.

Rose, Geoffrey. 1992. *The Strategy of Preventive Medicine*. Oxford University Press.

Rothman, Kenneth J. and Sander Greenland. 1998. *Modern Epidemiology*, 2nd edition.

Lippincott Williams & Wilkins.

Rothman, Kenneth J. 2002. *Epidemiology: An Introduction*. Oxford University Press.

Rothstein, William G. 2003. *Public Health and the Risk Factor: A History of an Uneven Medical Revolution*. University of Rochester Press.

Spasoff, Robert A. 1999. *Epidemiologic Methods for Health Policy*. Oxford University Press.

Young, T. Kue. 1998. *Population Health: Concepts and Methods*. Oxford University Press.

In the reading list, these texts are referenced by the name of the first author.

Two short online textbooks are:

Coggon, D., G. Rose and D.J.P Barker. 1997. *Epidemiology for the Uninitiated*, 4th edition. BMJ. <http://bmj.bmjournals.com/epidem/epid.html>

Pearce, Neal. 2003. *A Short Introduction to Epidemiology* (131 pp.)
<http://publichealth.massey.ac.nz/publications/introepi.pdf>

Some useful websites:

PubMed (National Library of Medicine) (<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi>)

The Cochrane Collaboration (<http://www.cochrane.org/index1.htm>)

Centers for Disease Control and Prevention (<http://www.cdc.gov>)

National Institutes of Health (<http://www.nih.gov>)

National Center for Health Statistics (<http://www.cdc.gov/nchs>)

Epidemiology Supercourse (<http://www.pitt.edu/~super1/>)

Office of Public Health and Science (<http://www.surgeongeneral.gov/ophs/>)

World Health Organization (<http://www.who.int/en/>)

Program in Policy Decision-Making (<http://www.researchtopolicy.ca/>)

The Epidemiology Monitor (<http://www.epimonitor.net/>)

American Public Health Association (<http://www.apha.org/>)

Pan American Health Organization (<http://www.paho.org/>)

The Virtual Library (Epidemiology), University of California, San Francisco
(<http://www.epibiostat.ucsf.edu/epidem/epidem.html>)

Seminars:

You should attend some of the seminars at the Center for Health and Well-Being. See the schedule at <http://www.wws.princeton.edu/~chw/lecturesf.html>

You may also want to attend select seminars at the Institute for Health, Health Care Policy and Aging Research at Rutgers University. See the schedule at <http://www.ihhpar.rutgers.edu/events/>

Topic 1: Introduction and overview

- Gordis, Chapter 1
- John Snow, “On the Mode of Communication of Cholera.” Excerpted from *Snow on Cholera*, 1949. In Buck volume, pp. 42-45.
- John Snow, “The Cholera Near Golden Square.” Excerpted from *Snow on Cholera*, 1949. In Buck volume, pp. 415-418.
- Ignaz Semmelweis, “The Etiology, Concept, and Prophylaxis of Childbed Fever.” In Buck volume, pp. 46-59.
- “Epidemiology Faces Its Limits,” 1995. *Science* 269: 164-169.

Optional

- Friis, Chapter 1 (“The History and Scope of Epidemiology”)
- for more on John Snow, see <http://www.ph.ucla.edu/epi/snow.html#WATER%20COMPANIES>

Topic 2: Disease transmission, measurement of disease occurrence & sources of data

- Gordis, Chapters 2 and Chapter 3 (up to pg. 51)
- Friis, Chapter 5 (“Sources of Data for Use in Epidemiology”) **OR** Koepsell, Chapter 6 (“Sources of Data on Disease Occurrence”)

Topic 3: Measurement of mortality and survival

- Gordis, Remainder of Chapter 3 and Chapter 5
- J.A. Palmore and R.W.Gardner, 1983. *Measuring Mortality, Fertility and Natural Increase: A Self-Teaching Guide to Elementary Measures*. Chapter 2 (“Mortality”), pp. 9-26.
- D.G. Altman and J.M. Bland. 1998. “Time to Event (Survival) Data.” *British Medical Journal* 317: 468-469.
- J.M. Bland and D.G. Altman. 1998. “Survival Probabilities (the Kaplan-Meier Method).” *British Medical Journal* 317: 1572.
- R. Pearl. 1938. Tobacco Smoking and Longevity. *Science* 87: pp. 216-217.

Optional

- Koepsell, pp. 247-252.
- Kelsey, Chapter 6, pp. 130-134 (Kaplan-Meier method of estimating survival).
- J.A. Palmore and R.W.Gardner, 1983. *Measuring Mortality, Fertility and Natural Increase: A Self-Teaching Guide to Elementary Measures*. Chapter 2 (“Mortality”), pp. 33-45 (the life table).

Topic 4: What is causation?

- Gordis, Chapter 13
- A. B. Hill. 1965. “The Environment and Disease: Association or Causation?” *Occupational Medicine*: 295-300.
- R. Doll and A.B. Hill. 1964. “Mortality in Relation to Smoking: Ten Year’s Observations of British Doctors.” *British Medical Journal* 1: 1399-1410. Skim.
- Rothstein, Chapter 13 (“Cigarette Smoking and Statistical Correlations”),

pp. 238-259.

Optional

- Bhopal, Chapter 5 (“Cause and effect”)
- A.S. Evans. 1978. “Causation and Disease: A Chronological Journey,” *American Journal of Epidemiology* 108: 249-258.
- R.A. Fisher. 1958. “Lung Cancer and Cigarettes?” *Nature* 182: p. 108.
- U.S. Department of Health, Education, and Welfare. 1964. *Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health Service*. Public Health Service Publication No. 1003. Skim Chapters 1-4 and Chapter 9.
- J. Goldberger, G.A. Wheeler and E. Sydenstricker. 1920. “A Study of the Relation of Family Income and Other Economic Factors to Pellagra Incidence in Seven Cotton-Mill Villages of South Carolina in 1916.” *Public Health Reports* 35: 2673-2714. In Buck Volume, pp. 584-609.

Topic 5: Randomized clinical trials (& other interventions)

- Gordis, Chapters 6 and 7
- A. M. Gotto. 1997. “The Multiple Risk Factor Intervention Trial (MRFIT): A Return of a Landmark Trial.” *Journal of the American Medical Association* 277: 595-597.
- R. Kirschstein. 1993. “Largest US Clinical Trial Ever Gets Under Way.” *Journal of the American Medical Association* 270: 1521.
- E. C. Halperin. 2001. “Should Academic Medical Centers Conduct Clinical Trials of the Efficacy of Intercessory Prayer?” *Academic Medicine* 76: 791-797.

Optional

- Koepsell, Chapter 13 (“Randomized Trials”)
- A. Khan, H.A. Warner, and W.A. Brown. 2000. “Symptom Reduction and Suicide Risk in Patients Treated with Placebo in Antidepressant Clinical Trials.” *Archives of General Psychiatry* 57: 311-317.
- A. T. Bang, R.A. Bang et al. 1999. “Effect of Home-based Neonatal Care and Management of Sepsis on Neonatal Mortality: Field Trial in Rural India.” *The Lancet* 354: 1955-1961.
- P. Meier. 1977. “The Biggest Public Health Experiment Ever: the 1954 Field Trial of the Salk Poliomyelitis Vaccine.” In *Statistics: a Guide to the Study of the Biological and Health Sciences*. J.M. Tanur et al. (eds.). Holden-Day, pp. 88-100.

Topic 6: Cohort studies

- Gordis, Chapter 8
- T.R. Dawber, W.B. Kannel and L.P. Lyell. 1963. “An Approach to Longitudinal Studies in the Community: The Framingham Study.” *Annals of New York Academy of Science*: 539-556.
- D.A. Grimes and K.F. Schulz. 2002. “Cohort Studies: Marching Towards Outcomes.” *The Lancet* 359: 341-345.
- Pearce, Chapter 5 (“Measurement of Exposure and Health Status”). Skim.

Optional

- Koepsell, Chapter 14 (“Cohort Studies”)
- S. Cohen, D.A. Tyrrell, and A.P. Smith. 1991. “Psychological Stress and Susceptibility to the Common Cold.” *The New England Journal of Medicine*, 325: 606-612.
- J. E. Manson et al. 1990. “A Propsective Study of Obesity and Risk of Coronary Heart Disease in Women.” *The New England Journal of Medicine*. 322: 882-889.

Topic 7: Case-control and cross-sectional studies

- Gordis, Chapter 9
- K.F. Schulz and D.A. Grimes. 2002. “Case-control Studies: Research in Reverse.” *The Lancet* 359: 431-434.

Read one of the following:

- A. R. Moss et al. 1987. “Risk Factors for AIDS and HIV Seropositivity in Homosexual Men.” *American Journal of Epidemiology* 125: 1035-1047.
- C. G. Victora et al. 1989. “Infant Feeding and Deaths due to Diarrhea.” *American Journal of Epidemiology* 129: 1032-1041.
- B. MacMahon et al. 1981. “Coffee and Cancer of the Pancreas.” *The New England Journal of Medicine*.304: 630-633.
- A.L. Querishi et al. 1997. “Crack Cocaine Use and Stroke in Young Patients.” *Neurology* 48: 341-345.
- E.B. Harvey et al. 1985. “Prenatal X-ray Exposure and Childhood Cancer in Twins.” *The New England Journal of Medicine* 312: 541-545.
- L. M. Green et al. 1999. “Childhood Leukemia and Personal Monitoring of Residential Exposures to Electric and Magnetic Fields in Ontario, Canada.” *Cancer Causes and Control* 10: 233-243.

Optional

- Koepsell, Chapters 12 (“Ecological Studies”) and Chapter 15 (“Case-control Studies”)

Topic 8: Measuring risk: odds ratio and relative risk

- Gordis, Chapters 10, 11, and 12
- J. Martin Bland and D.G. Altman. 2000. “The Odds Ratio.” *British Medical Journal* 320: 1468.
- Gehlbach, Chapter 8 (“Analysis: Statistical Significance”)

Optional

- Koepsell, Chapter 9 (“Measures of Excess Risk”)

Topic 9: Bias, confounding and interactions

- Gordis, Chapter 14
- D.A. Grimes and K.F. Schultz. 2002. “Bias and Causal Associations in Observational Research.” *The Lancet* 359: 248-252.
- Rothman, Chapter 8 (“Controlling Confounding by Stratifying Data”).

Skim.

- I.J. Selikoff, E.C. Hammond, and J. Churg. 1968. "Asbestos Exposure, Smoking, and Neoplasia." *Journal of the American Statistical Association* 204: 104-110.

Optional

- Bhopal, Chapter 4 ("Role of error, bias, and confounding")
- E.L. Wynder, I.T. Higgins and R.E. Harris. 1990. "The Wish Bias." *Journal of Clinical Epidemiology* 43: 619-621.

Topic 10: Multivariate models: linear and logistic regression

- Agresti and Finlay, *Statistical Methods for the Social Sciences*, 3rd edition, Chapter 15 ("Logistic Regression: Modeling Categorical Responses," pp. 575-589).
- Koepsell, Chapter 11 ("Confounding and Its Control"), pp. 256-269.

Topic 11: Outbreaks of disease: a case study of SARS

- Koepsell, Chapter 11 ("Epidemic Investigation")
- Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report, May 23, 2003, Severe Acute Respiratory Syndrome – Taiwan, 2003, pp. 461-466.
<http://www.cdc.gov/mmwr/PDF/wk/mm5220.pdf>
- D. E. Low and A. McGeer. 2003. "SARS – One Year Later." *The New England Journal of Medicine* 349: 2381-2382.

Optional

- J.S.M. Peiris et al. 2003. "The Severe Acute Respiratory Syndrome." *The New England Journal of Medicine* 349: 2431-41.

Topic 12: Interpreting and synthesizing the epidemiological literature

- Greenberg, Chapter 13 ("Interpretation of Epidemiologic Literature")
- F. Mosteller and G.A. Colditz. 1996. "Understanding Research Synthesis (Meta-Analysis)." *Annual Reviews of Public Health* 17: 1-23. Skip over the statistical sections (pp. 9-14).
- D.E. Barnes and L.A. Bero. 1998. "Why Review Articles on the Health Effects of Passive Smoking Reach Different Conclusions." *Journal of the American Medical Association* 279: 1566-1570.
- Have a brief look at <http://www.cochrane.org/index1.htm>

Case Study: Two Prominent Investigations with Conflicting Results

- F. Grodstein et al. 2000. "A Prospective, Observational Study of Postmenopausal Hormone Therapy and Primary Prevention of Cardiovascular Disease." *Annals of Internal Medicine* 133: 933-941.
- Writing Group for the Women's Health Initiative Investigators. 2002. "Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal Women: Principal Results from the Women's Health Initiative Randomized Controlled Trial." *Journal of the American Medical Association* 288: 321-333.

- Have a brief look at http://www.nhlbi.nih.gov/health/women/q_a.htm
- For a review of the literature on the benefit and harm of HRT, have a look at: H.D. Nelson et al. 2002. "Postmenopausal Hormone Replacement Therapy: Scientific Review." *Journal of the American Medical Association* 288: 872-881.

Optional

- D.G. Altman and J.M. Bland. 1995. "Absence of Evidence is not Evidence of Absence." *British Medical Journal* 311: 485.
- C. W. Heath. 1983. "Field Epidemiologic Studies of Populations Exposed to Waste Dumps." *Environmental Health Perspectives* 48: 3-7.
- P.J. Easterbrook, J.A. Berlin, R. Gopalan, D.R. Matthews. 1991. "Publication Bias in Clinical Research." *The Lancet* 337: 867-872.
- G. Koren and N. Klein. 1991. "Bias Against Negative Studies in Newspaper Reports of Medical Research." *Journal of the American Medical Association* 266: 1824-1826.

Meta-Analyses (Skim one of the following):

- W.T. Hoyt et al. 2000. "Religious Involvement and Mortality: A Meta-Analytic Review." *Health Psychology* 19: 211-222.
- J. Schwarz. 1994. "Air Pollution and Daily Mortality: A Review and Meta Analysis." *Environmental Research* 64: 36-52.
- S. Greenland. 1993. "A Meta-Analysis of Coffee, Myocardial Infarction, and Coronary Death." *Epidemiology* 4:366-374.
- J.W. Anderson et al. 1999. "Breast-feeding and Cognitive Development: a Meta-Analysis." *American Journal of Clinical Nutrition* 70: 525-35.

Topic 13: The gap between scientific knowledge and health policy: a case study of malaria

- J.A. Nájera. 1994. "The Control of Tropical Diseases and Socioeconomic Development (with special reference to malaria and its control)." *Parassitología* 36: 17-33.
- N. L. Stepan. 2003. "The Only Serious Terror in These Regions: Malaria Control in the Brazilian Amazon." Chapter in *Disease in the History of Modern Latin America*, D. Armus (ed.). Duke University Press.

Optional

- J.A. Nájera. 2000. "Epidemiology in the Strategies for Malaria Control." *Parassitología* 42: 9-24.
- R.M. Packard and P. Gadelha. 1994. "A Land Filled With Mosquitoes: Fred L. Soper, The Rockefeller Foundation, and the *Anopheles Gambiae* Invasion of Brazil." *Parassitología* 36: 197-213.
- P. Elliott et al., "Spatial Epidemiology: Methods and Applications," Chapter 1 in *Spatial Epidemiology: Methods and Applications*, P. Elliott et al. (eds.). Oxford University Press.

Topic 14: Screening: Diagnostic testing and policy implications

- Gordis, Chapters 4 and 17

- Russell, Louise B. 1994. *Educated Guesses. Making Policy about Medical Screening Tests*. University of California Press (95 pp.)
- S. Feldman, 2003. “How Often Should We Screen for Cervical Cancer?” *The New England Journal of Medicine* 349: 1495-1496.

Topic 15: Individual vs. population health

- G. Rose. 1985. “Sick Individuals and Sick Populations.” 1985. *International Journal of Epidemiology* 14: 32-38.
- M. G. Marmot and J. F. Mustard, “Coronary Heart Disease from a Population Perspective,” Chapter 7 in Evans et al (eds.)
- Gordis, Chapter 18 (this chapter is a mix of several issues)

Optional

- Rose, Chapter 6 (“Some Implications of Population Change”)
- A. McAlister et al. 1982. “Theory and Action for Health Promotion: Illustrations from the North Karelia Project.” *American Journal of Public Health* 72: 43-50.
- S. Leonard Syme. 2004. “Social Determinants of Health: The Community as an Empowered Partner.” Centers for Disease Control and Prevention. Preventing Chronic Disease, *Public Health Research, Practice, and Policy* 1: 1-5.

Topic 16: Population health: Defining the issues and outcomes

- R. G. Evans and G. L. Stoddart. 1990. “Producing Health, Consuming Health care.” *Social Science and Medicine* 31: 1347-1363.
- B. Poland et al. 1998. “Wealth, Equity, and Health Care: A Critique of a ‘Population Health’ Perspective on the Determinants of Health.” *Social Science and Medicine* 46: 785-798.
- N. Pearce. 1996. “Traditional Epidemiology, Modern Epidemiology, and Public Health.” *American Journal of Public Health* 86: 678-683.
- Institute of Medicine, Committee on Summary Measures of Population Health. 1998. *Summarizing Population Health: Directions for the Development and Application of Population Metrics*, pp. 1-24. <http://books.nap.edu/readingroom/books/sumpop/onedoc.pdf>
- U.S. Department of Health and Human Services. Healthy People 2010. 2nd edition. Vol. 1. <http://www.healthypeople.gov/document/tableofcontents.htm#uih> Skim, especially Chapter 2 (“A Systematic Approach to Health Improvement”).

Optional:

- K. J. Rothman et al., 1998. “Should the Mission of Epidemiology Include the Eradication of Poverty?” *The Lancet* 352: 810-812.
- D. A. Kindig. 1997. *Purchasing Population Health*. Chapter 4 (“Measuring Health Outcomes”), pp. 43-68. The University of Michigan Press.
- Evans, Chapter 8 (“The Determinants of a Population’s Health: What Can Be Done to Improve a Democratic Nation’s Health Status?”)
- R.G. Evans and G.L. Stoddart. 2003. “Consuming Research, Producing Policy?” *American Journal of Public Health* 93: 371-379.

Topic 17: Determinants of population health (social epidemiology)

- D.R. Williams and C. Collins. 1995. "U.S. Socioeconomic and Racial Differences in Health: Patterns and Explanations." *Annual Review of Sociology* 21: 349-386.
- M. Marmot, M. Bobak, and George Davey Smith. "Explanations for Social Inequalities in Health." Chapter 6 in B.C. Amick et al. (eds), *Society and Health*, pp. 172-210. Oxford University Press.
- S. E. Taylor, R.L. Repetti and T. Seeman. 1997. What is an Unhealthy Environment and How Does It Get Under the Skin? *Annual Review of Psychology* 48: 411-47.

Optional

- Evans, Chapters 1 and 3
- Marmot, skim through the book.
- R. Aldrich et al. 2003. "Using Socioeconomic Evidence in Clinical Practice Guidelines." *British Medical Journal* 327: 1283-1285.

Topic 18: Ethical issues in epidemiological research

- Gordis, Chapter 19
- Protecting Human Research Subjects: <http://training.arc.ucla.edu/> Take the training course and receive certification.
- Look at <http://www.princeton.edu/orpa/compliance/Acover.htm> as well as Questionnaires A and B at <http://www.princeton.edu/~orpa1/irp.htm>

Optional:

- S.R. Benatar. 2002. "Reflections and Recommendations on Research Ethics in Developing Countries." *Social Science and Medicine* 54(7): 1131-1141.
- M. Angell. 1997. "The Ethics of Clinical Research in the Third World." *The New England Journal of Medicine* 337: 847-849.
- E.J. Emanuel and F.G. Miller. 2001. "The Ethics of Placebo-Controlled Trials – A Middle Ground." *The New England Journal of Medicine*: 915-918.
- L. Gordis and E. Gold. 1980. "Privacy, Confidentiality and the Use of Medical Records in Research." *Science* 207: 153-156.
- G.J. Annas. 2003. "HIPAA Regulations – A New Era of Medical-Record Privacy? *The New England Journal of Medicine* 348: 1486-1490.

Topic 19: The future of epidemiology

- P. Alcabes. 2003. "Epidemiologists Need to Shatter the Myth of a Risk-Free Life." *The Chronicle of Higher Education*, May 23, 2003: B11-B12.
- G.A. Colditz. 1997. "Epidemiology – Future Directions." *International Journal of Epidemiology* 26: 693-697.
- P. Farmer. 1996. "Social Inequalities and Emerging Infectious Diseases." *Emerging Infectious Diseases* 2:259-269.

Optional

- M. Susser. 1998. "Does Risk Factor Epidemiology Put Epidemiology at Risk? Peering into the Future." *Journal of Epidemiology and Community Health* 52: 608-611.