

## COURSE SYLLABUS

**Title:** NLX 466: Epidemiology and Population Health Research  
**Term:** Spring 2009 (Fridays – 1-3:50pm)  
**Location:** Helen Wood Hall 1W502  
**Credit Hours:** 3  
**Instructor:** James McMahon, Ph.D.  
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**Office Hours:** By appointment with instructor  
**Pre-Requisites:** Introductory course in statistics

### Course Description:

This course represents the research component of the Leadership in Health Care Systems Master's Program and will prepare students with advanced research competencies. The course presents (a) the theoretical, methodological, and statistical concepts used in the development and evaluation of population-based health research, programs and services; and (b) the foundations of epidemiology and population-based practice. Emphasis is placed on application of epidemiological methods and strategies in the conduct and evaluation of population-based health research and outcomes. This course provides in-depth coverage of epidemiological principles and methods including natural history of disease, dynamics of disease etiology and transmission, measures of population morbidity and mortality, diagnostics and screening tests, risk exposure, population health disparities, structural and community-based interventions, health services evaluation, cost-effectiveness, and epidemiology and public policy

### Course Objectives:

At the completion of this course the student will be able to:

1. Identify linkages between epidemiologic research, theory, and population-based practice.
2. Use epidemiological terminology fluently in discussing community research and practice.
3. Describe population-based concepts of disease including their occurrence, transmission, and control within populations (rather than individuals).
4. Systematically collect health data to evaluate the health status of individuals and groups.
5. Identify a range of sampling and data collection strategies along with the strengths and weaknesses of each.
6. Compare and contrast methodologies used in community research.
7. Determine whether the research methodology used in an epidemiological study is appropriate for its stated purpose(s) or research question(s).
8. Discuss strategies to assure scientific rigor in epidemiologic studies.
9. Critically evaluate the design and conduct of observational and interventional studies.
10. Use epidemiologic thinking and methods in the evaluation of health care and development of public policy.

### Teaching Methods:

1. Lectures with PowerPoint presentations,
2. Current Research Critique (CRC). Bi-weekly exercise in which the class, with guidance from the instructor, critically evaluates a newly published primary research article (related to a population health topic) for methodological strengths and weaknesses and interprets the results. Topics and articles are selected to reinforce concepts introduced in the lectures and readings.
3. Films. 2.5 hours of documentary films will be shown in class
4. Problem based learning (PBL). Four PBL cases (health disparities in breast cancer, malaria screening in Africa, randomized trials of cholesterol lower drugs, and autism spectrum

disorder) will allow students, in small group settings, to apply acquired knowledge and principles of epidemiology to address and resolve population health problems with the use of health statistics and critical interpretation of primary research.

5. Guest lecture/demonstration
6. Student “health report” slide presentation given to the class describing the population health status, trends, and programs of one U.S. state (each student will be assigned a different state).

**Course Requirements and Evaluation Measures:**

1. Weekly readings, class attendance, preparedness, and participation.
2. Mid-term on-line open book exam (20% of grade)
3. Final on-line open book cumulative exam (35% of grade)
4. Preparation of slide presentation on state public health report (25% of grade).
5. Problem based learning (PBL) participation (20% of grade)

**Required Reading:**

Gordis, Leon (2009) Epidemiology, WB Saunders Company (Fourth Edition).

**Week 1: January 16**

(A) Lecture: Principles of Epidemiology

- 1) Course overview
- 2) Basic principles of epidemiology
- 3) Natural history of disease
- 4) Dynamics of disease transmission
- 5) Distribution of disease

(B) Reading

Gordis: Chapters 1 & 2

(C) Film

Documentary: “Unnatural Causes” (California Newsreel, 2008, <http://www.unnaturalcauses.org/>) One-hour film on health disparities within and between nations and structural factors influencing the distribution of disease.

**Week 2: January 23**

(A) Lecture: Measuring the Occurrence of Disease I

- 1) Measures of morbidity
- 2) Rates and proportions
- 3) Incidence and prevalence
- 4) Attack rates
- 5) Relative risk
- 4) Surveillance

(B) Reading

Gordis: Chapter 3

(C) Current Research Critique (CRC1)

HIV Incidence in Rural South Africa: Surveillance

<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0003640>

(D) PBL Case 1, Session 1

“Black, White and Pink: Racial/Ethnic Disparities in Breast Cancer in the U.S”

**Week 3: January 30**

- (A) Lecture: Measuring the Occurrence of Disease II
  - 1) Measures of mortality
  - 2) Mortality rate and case-fatality rate
  - 3) Proportionate mortality
  - 4) Leading causes of death
  - 5) Years of Potential Life Lost (YPLL)
  - 6) Direct and indirect adjustment
  - 7) Hazard ratio
- (B) Reading
  - Gordis: Chapter 4
- (C) PBL Case 1, Session 2
  - “Black, White and Pink: Racial/Ethnic Disparities in Breast Cancer in the U.S”

**Week 4: February 6**

- (A) Lecture: Measuring the Occurrence of Disease II
  - 1) Risk estimates
  - 2) Point estimates
  - 3) Odds ratios
  - 4) Confidence intervals
- (B) Current Research Critique (CRC2)
  - Leukaemia in young children living in the vicinity of German nuclear power plants.  
Kaatsch et al. *Int. J. Cancer*: 1220, 721–726 (2008)
- (C) PBL Case 1, Debriefing and results session
  - “Black, White and Pink: Racial/Ethnic Disparities in Breast Cancer in the U.S”
- (D) Guest Lecture:
  - Mary Beth Klofas:
    - 1) Population health statistics: resources and search strategies
    - 2) Primary research literature search

**Week 5: February 13**

- (A) Lecture: Validity and Reliability of Screening and Diagnostic Tests
  - 1) Sensitivity and specificity
  - 2) Cut-off point for continuous tests
  - 3) Multiple screening tests and net sensitivity and specificity
  - 4) Positive and negative predictive value
  - 5) Reliability and kappa
  - 6) Survival rate and life tables
- (B) Reading
  - Gordis: Chapter 5
- (C) PBL Case 2, Session 1
  - “Malarious Planet: Screening and Treatment in sub-Saharan Africa”

### Week 6: February 20

- (A) Lecture: Randomized Clinical Trial Designs
  - 1) Trial phases (I, II, III, IV)
  - 2) Allocation
  - 3) Target population definition
  - 4) Sampling frame and plan
  - 5) Comparison group selection
  - 6) Stratified randomization
  - 7) Data collection and assessment
  - 8) Drop-outs and non-compliance
  - 9) Effect size and sample size
  - 10) Type I and II error
  - 11) Consort statement
- (B) Reading
  - Gordis: Chapters 7, 8
- (C) Current Research Critique (CRC3)
  - Effects of intravenous nitrate administration on mortality rates of acute myocardial infarction patients.
  - Whitney and Ball, *Critical Care*, 6(3):222-225, 2002
- (D) PBL Case 2, Debriefing and results session
  - “Malarious Planet: Screening and Treatment in sub-Saharan Africa”
- PBL Case 3, Session 1
  - “Only Vytorin’: The Randomized Trial Billion Dollar Holdup”

### Week 7: February 27

- (A) Lecture: Observational Designs: Cohort and Case-Control Studies
  - 1) Cross-sectional studies
  - 2) Cohort studies
  - 3) Case-control studies
  - 4) Matching
  - 5) Confounding
  - 6) Sources of bias
  - 7) Cross-over studies
  - 8) Meta-analyses
- (B) Reading
  - Gordis: Chapters 9, 10
- (C) Current Research Critique (CRC4)
  - Vitamin D and Dementia. Llewellyn et al. *J Geriatr Psychiatry Neurol.*, 2009
  - <http://jgp.sagepub.com/cgi/rapidpdf/0891988708327888v2>
- (D) PBL Case 3, Session 2
  - “Only Vytorin’: The Randomized Trial Billion Dollar Holdup”

**Week 8: March 6**

- (A) Lecture: Estimating Risk: Review
  - 1) Hazard ratio
  - 2) Relative risk
  - 3) Odds ratio
  - 4) Attributable risk
  - 5) Population attributable fraction
- (B) Reading
  - Gordis: Chapters 11, 12, 13
  - Equator: Research reporting guidelines. <http://www.equator-network.org/>
- (C) Current Research Critique (CRC5)
  - Occupational exposure and the risk of COPD
  - Blanc et al. *Thorax*, 64:6-12, 2009
  - <http://thorax.bmj.com/cgi/reprint/64/1/6>
- (D) PBL Case 3, Debriefing and results session
  - “Only Vytarin’: The Randomized Trial Billion Dollar Holdup”
- (E) Film
  - Documentary: “Bad Sugar” (California Newsreel, 2008, <http://www.unnaturalcauses.org/>) 30-minute film on the genetic, environmental, historical and structural forces responsible for obesity and diabetes among native American populations.

**Week 9: March 20**

- (A) Lecture: Deriving Inferences from Epidemiological Studies
  - 1) Ecological studies and ecological fallacy
  - 2) Evidence for causal relationships
  - 3) U.S. Preventative Services Task Force
  - 4) Approaches to etiology
- (B) Reading
  - Gordis: Chapter 14
- (C) Current Research Critique (CRC6)
  - Obesity, Smoking and Mortality
  - Neovius M. et al. Combined effects of overweight and smoking in late adolescence on subsequent mortality: nationwide cohort study *British Medical Journal*, 338:b496, 2009
  - [http://www.bmj.com/cgi/reprint/338/feb24\\_2/b496](http://www.bmj.com/cgi/reprint/338/feb24_2/b496)
- (D) PBL Case 4, Session 1
  - “Autism: Silent Faces, Strange World”

**Week 10: March 27**

- (A) Lecture: More on Causal Inference and Course Synthesis
  - 1) Selection and information bias
  - 2) More on confounding
  - 3) Interaction effects
  - 4) Genetic /environment interaction
  - 5) Big picture synthesis
- (B) Reading
  - Gordis: Chapters 15, 16
- (C) PBL Case 4, Session 2
  - “Autism: Silent Faces, Strange World”

**Week 11: April 3**

- (A) Lecture: Using Epidemiology to Evaluate Health Services
  - 1) Efficacy, effectiveness, and efficiency
  - 2) Program evaluation and outcomes research
  - 3) Cost effectiveness
  - 4) Primary prevention
  - 5) Risk assessment
  - 6) Public policy
  - 7) Ethics in epidemiology
- (B) Reading
  - Gordis: Chapter 17, 19
- (C) PBL Case 4, Debriefing and results session
  - “Autism: Silent Faces, Strange World”
- (E) Film
  - Documentary: “Sick Around America” (PBS Documentary, 2009, <http://www.pbs.org/wgbh/pages/frontline/sickaroundamerica> ) 1 hours film on the disparities and distribution of disease stemming from health insurance coverage inequalities in the U.S.

**Weeks 12 & 13: April 10 & 17**

- (A) Student PowerPoint slide presentations

**Week 14: April 24**

- (A) Lecture: Conclusion
  - 1) Review of concepts
  - 2) Course themes
  - 3) PBL cases
  - 4) Student slide presentations; regional differences, common themes
  - 5) Final words