Occupational and Environmental Epidemiology

PubH 6140 -- Spring Semester 2009

Thursdays, 9:05-11:00 a.m.

Moos 1-435

Credits: 2

Instructor: Timothy R. Church, PhD, MS

Professor

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Office Hours: arranged by appointment

Guest Lecturers:

Bruce H. Alexander, PhD, Associate Professor, Division of Environmental Health Sciences

Gurumurthy Ramachandran, PhD, Professor, Division of Environmental Health Sciences

Geary Olsen, DVM, PhD, Senior Epidemiologist, 3M Company

Jeff Mandel, M.D., MPH, Associate Professor, Division of Environmental Health Sciences

Nancy Nachreiner, M.S., PhD., Assistant Professor, Division of Environmental Health Sciences

Logan Spector, Ph.D., Assistant Professor, Pediatrics; Adjunct Assistant Professor, Epidemiology

Course Description
This course offers an overview of methods and topics in occupational and environmental epidemiology. The course will focus on the concepts of epidemiologic methods as they are applied in occupational and environmental epidemiology. The course will be a mixture of lectures, directed readings, and classroom exercises that will cover epidemiologic study designs, issues of validity, measurement of exposure, ascertainment of health outcomes, approaches to analysis, and special considerations for studying the health of a working population or the effects of environmental exposures. By the end of the course, students will gain a sufficient understanding of the application of epidemiologic methods to the study of occupational and environmental exposure disease relationships to facilitate their comprehension of published epidemiologic literature and assist in the design and conduct of original research.

Course Requirements
Directed readings, classroom exercises, and participation in discussions: (20%) Students will read selected works from current epidemiologic literature for discussion in class. For selected readings, students will hand in a brief written summary of the reading to be evaluated for credit. (details below)

Term Project: (80%) Students working in groups of three or more will complete a term project on a current topic in occupational or environmental epidemiology. The project is divided into three sections: (1) Summarizing the problem (25%), (2) Issues in measurement of outcomes and exposure (25%), (3) Proposal for a study (30%). A more complete description of the term project follows. The term paper is due in class on May 7.

Grading There are two grading options, A/F (+/-), or S/N where S=C- or better. Students may change grading options during the initial registration period or during the first two weeks of the semester. The grading option may not be changed after the second week of the term.

Course Website:
The course website will contain PDF files of the readings so you can produce your own copy. Lecture notes will also be posted. Go to http://vista.umn.edu to log in to the website.

The website will be updated on a regular basis. The students are responsible for checking the website for changes. Required readings will be posted at least one week in advance.

Spring 2009 Lecture Schedule (subject to change)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>January 22</td>
<td>Introduction: Review of study designs</td>
<td>Church</td>
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<tr>
<td></td>
<td>Homework reading to read before class on January 29:</td>
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<tr>
<td></td>
<td>Prepare a 1-page summary to hand in</td>
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<tr>
<td>January 29</td>
<td>Applied study designs: Cohort and Case-Control Studies</td>
<td>Church</td>
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<td>Homework readings to be read before class on Feb 5:</td>
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<tr>
<td>February 5</td>
<td>Exposure Assessment</td>
<td>Alexander</td>
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<td>To be read before February 12:</td>
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<tr>
<td>February 12</td>
<td>Analytical Plans, Causal Models and Fundamentals</td>
<td>Church</td>
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<td>To be read before February 19:</td>
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<td>Chapter 2 reading regarding &quot;TCE Methods.&quot; Prepare a 1-page summary to hand in.</td>
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<td>Also please read:</td>
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<td>February 19</td>
<td>TCE and Occupational Safety</td>
<td>Mandel</td>
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<tr>
<td>Date</td>
<td>Event</td>
<td>Required Reading</td>
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<tr>
<td>February 26</td>
<td>Applied study designs: Cross sectional/Case only</td>
<td>Church</td>
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<td>Read prior to class on March 5: Pope, Burnett, Thurston et al:</td>
<td><strong>Cardiovascular mortality and long-term exposure.</strong></td>
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<td>March 5</td>
<td>Group Presentations Review of Epidemiology</td>
<td>Church</td>
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<td>March 12</td>
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<td>March 19</td>
<td>Spring break: no class</td>
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<tr>
<td>March 26</td>
<td>Topic: Molecular Biology and Genomics in Epidemiology</td>
<td>L. Spector</td>
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<tr>
<td>April 2</td>
<td>Presentation of projects: Exposure and Outcome Measurement Issues</td>
<td>Church</td>
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<tr>
<td>April 9</td>
<td>Topic: Occupational Injury and Violence</td>
<td>Nachreiner</td>
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<td>April 16</td>
<td>Case Study: Putting it all together, Part I</td>
<td>Olsen</td>
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<td>Preparation for April 16 class</td>
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<td>Prior to class, please read Erikson, et al, JNCI (2009) and be prepared to discuss this paper during class on April 16</td>
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<td>Date</td>
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<tr>
<td>April 23</td>
<td>Case Study: Putting it all together, Part II</td>
<td>Olsen</td>
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<td></td>
<td>Homework readings to be read before class on April 30:</td>
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<td>April 30</td>
<td>Exposure Assessment and Modeling in Occupational Epidemiology</td>
<td>Ramachandran</td>
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<td>May 7</td>
<td>Presentations of Project Proposals</td>
<td>Church</td>
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<td>May ???</td>
<td>Final Exam Period</td>
<td>Church</td>
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**Classroom Lectures**

The lectures in the class will cover a wide range of topics related to how epidemiologic methods are utilized in the sub-discipline of occupational and environmental epidemiology. Included will be discussions of the types and sources of data available for research, how populations are defined, how outcomes and exposures are measured, and some of the practical aspects of epidemiology. Issues of validity and the interpretation of observed associations will be emphasized. The lectures will be presented in modules related to epidemiologic study designs; however, similarities in study designs, rather than differences will be emphasized. Some of the topics addressed include:

**Cohort Studies**
- Prospective and retrospective approaches
- Defining, enumerating, following-up and tracing a cohort
- Ascertainment of exposure and outcomes
- Latency analysis

**Case-control studies**
- Nestest within a cohort
- Community based
- Selection of cases and appropriate control population

**Cross sectional studies**
- Appropriate application
- Special limitations
- Selection of reference population

**Case only studies**
- Case-crossover studies
- Case only studies for gene-environment interactions

**Surveillance**
- Uses for public health tracking and etiologic research

**Exposure assessment**
- Sources of exposure information: self-reported exposure, employment records, industrial hygiene,
biological monitoring, environmental sampling.
Treatment of exposure data
Uncertainty in exposure estimates

Causal Models
Use in planning studies and analyses, interpreting results
Use of directed acyclic graphs

Applied epidemiology in a regulatory and business environment

Molecular biology and genomics in environmental epidemiology

Classroom Exercises
The classroom exercises will involve discussions of the assigned readings from the occupational and environmental epidemiology literature. In preparation for the class discussion, the students will critically read the paper. When indicated a brief (500 word maximum) review and critique of the paper will be handed in. The critiques should address the major strengths and weaknesses of the paper with particular attention to potential threats to validity and presentation and interpretation of results. The objectives of the written critiques are to give the student practice putting their interpretation of a paper in writing, and to guide discussion. The critiques are due at the end of the discussion period. The written critiques are to be critical reviews evaluating the scientific communication in the paper. They are not to be book reports. The goal is to summarize what is learned from the paper and how well conclusions drawn are supported, and ask relevant questions about the paper. Points will be awarded for being clear and concise. When reviewing the papers and preparing for discussion, be mindful of the following questions:

1. What is the underlying hypothesis or research question of this paper?
2. What is the target population? How well does the study population(s) represent the target? Is it appropriate for addressing the study question?
3. Are the disease or outcome, exposure, and covariates measured in a reasonable manner? How well do these measured factors relate to the intended objective of the paper and the conclusions drawn? If not, what are the limitations of the methods and how could the limitations affect the study results?
4. Is the analysis appropriate?
5. Is the presentation of the data clear? If not, what additional information in table or text would be helpful for interpreting the study?
6. To what extent, and how, could the results of the paper be influenced by:
   - Selection bias?
   - Misclassification of exposure, disease, or potentially confounding variable?
   - Confounding?
7. If so, is there evidence to support this?
8. Have the authors addressed the limitations of the study?
9. Are the results and conclusions drawn from the results reasonable?
10. What is your overall interpretation of the paper?
11. What else would you like to know to help you understand the paper?

This list is not exhaustive. These points are meant to be a guide, but not all of the points necessarily need to be answered in each critique. The critique should summarize key points.

Group Projects

Purpose
The purpose of the project is to allow the students to explore in depth one issue in occupational and environmental epidemiology, and communicate that information to a wide audience. The group will be responsible for distilling information from the scientific literature about a current topic and planning a study to help fill the knowledge gaps. The project will evolve over the semester and each group will be responsible for sharing their knowledge with the rest of the class. The final project will be a proposal to conduct an epidemiologic study of the issue. The topics available for this semester are listed below. Groups will be assigned in the second week of class. The background and expertise of the members of the class will be mixed to create a multi-disciplinary feel to the project.

Requirements
The project will be broken into three sections. For each section, the group will be responsible for making a brief presentation to the class. The presentations need to be informative, but not formal. For each presentation, the class will be responsible for
being fully engaged: asking questions, offering observations, challenging assumptions. It is expected that all members of the group take part in oral presentation at some point during the semester. The group decides the division of duties. At least one week prior to the first two presentations, the groups will provide one PDF file of a paper for the rest of the class to read. This will be uploaded to the course website. The class will be responsible for reading the paper and participating in the discussion.

Part I. Summarize the Problem:
In a brief presentation to the class, summarize the epidemiology of the problem and what is currently known. Discuss the public health relevance of the problem, e.g. burden of morbidity and mortality. Discuss the origins of the environmental exposures, potential economic consequences of the diseases and modifying the exposure. What competing hypotheses are relevant to this problem? Present some plausible hypotheses. Expansive thinking is encouraged for this section. You will have approximately one hour for presentation and discussion.

Part II. Issues in Measurement of Exposure and Outcome: The biggest problem in epidemiology is properly ascertaining an outcome or exposure understudy. These issues are often glossed over. What we want to measure is not always what we can measure, and if we can measure it, we may have difficulty measuring it in the population of interest. In a second brief presentation, the group will examine how this has played out in the current literature and propose plausible metrics for potential studies, including the advantages and the limitations of the different metrics. Each group should expect to present this with room for discussion in about one half hour.

Part III. Proposal to Study the Problem: Building on the first two sections, the groups will write and present a proposal to study the issues. The presentations will be about one half hour with discussion.

The format of the paper will loosely follow that of a NIH grant application, but much shorter. The papers should be about 2500 words (10 pages, double-spaced) excluding abstract, references and tables/appendices. The paper should contain the following sections:

1. Abstract
2. Specific Aims: The hypotheses that your study will address. The specific aims should have a lead-in paragraph summarizing the problem and indicating the overall objective of this area of research. The specific aims are best stated as specific hypotheses. The hypotheses can be followed with the tasks that will be done to address the hypotheses.
3. Background and Significance: A concise summary of up-to-date relevant literature with attention to the limitations of cited literature.
4. Study Protocol
   ○ Study design
   ○ Data sources and methods of data collection. It should be clear why the study population is appropriate for addressing the study question, i.e., the results can be extrapolated to the target population.
   ○ Brief detail of how the population will be selected and recruited, how the disease or outcome will be assessed, and how exposure and potentially confounding variables will be measured.
   ○ Proposed analytical plan: What you will do with the data to address the specific hypotheses.
   ○ Limitations, threats to validity and how they will be characterized and addressed.
   ○ Estimate of sample size needed or power calculations for a given sample size.
5. Literature cited
6. Appendices:
   ○ A basic causal diagram (required)
   ○ Supporting documents, tables, etc.

Potential Topics:

- Parental occupational exposures and latent effects in offspring (cancer, neurological effects, developmental problems)
- Environmental determinants of autism (e.g. mercury)
- Persistent organic pollutants and neurological disease
- Environmental causes of cardiovascular disease (e.g. air pollution)
- Household exposures and asthma in children: use of molecular markers
- Pesticide exposure and cancer incidence
A. Course Withdrawal Policy

School of Public Health students may withdraw from a course through the second week of the semester without permission. No "W" will appear on the transcript.

After the second week, students are required to do the following:

1. The student must contact and notify their advisor and course instructor informing them of the decision to withdraw from the course.
2. The student must send an email to the SPH Student Services Center (SSC). The email must provide the student's name, ID#, course number, section number, semester and year with instructions to withdraw the student from the course, and acknowledgement that the instructor and advisor have been contacted.
3. The advisor and instructor must email the SSC acknowledging that the student is canceling the course. All parties must be notified of the student's intent.
4. The SSC will complete the process by withdrawing the student from the course after receiving all emails (student, advisor, and instructor). A "W" will be placed and will remain on the student transcript for the course.

After discussion with their advisor and notification to the instructor, students may withdraw up until the eighth week of the semester. There is no appeal process.

B. Policy on Incompletes

An incomplete grade is permitted only in cases of extraordinary circumstances and following consultation with the instructor. In such cases, an "I" grade will require a specific written agreement between the instructor and student specifying the time and manner in which the student will complete the course requirements. Extension for completion of the work will not exceed one year.

C. Statement on Scholastic Dishonesty and Plagiarism

Students are responsible for knowing the University of Minnesota Board of Regents' policy on student conduct and scholastic dishonesty:

http://www.umn.edu/regents/policies/academic/StudentConduct.html

Scholastic dishonesty as defined in the policy will be reported to the Office of Student Judicial Affairs:

http://www.sja.umn.edu/

and will result in a grade of "F" or "N" for the entire course. Plagiarism is an important element of this policy. It is defined as the presentation of another's writing or ideas as your own. Serious, intentional plagiarism will result in a grade of "F" or "N" for the entire course. For more information on this policy and for a helpful discussion of preventing plagiarism, please consult University policies and procedures regarding academic integrity:

http://cisw.cla.umn.edu/plagiarism/uofmpolicies.html

Students are urges to be careful that they properly attribute and cite others' work in their own writing. For guidelines for correctly citing sources, go to http://tutorial.lib.umn.edu/ and click on "Citing Sources." In addition, original work is expected in this course. It is unacceptable to hand in assignments for this course for which you receive credit in another course, unless by prior agreement with the instructor. Building on a line of work begun in another course or leading to a thesis, dissertation, or final project is acceptable. If you have any questions, consult the instructor.

D. Statement on Disabilities

Any student with a documented disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the instructor and Disability Services at the beginning of the semester. All discussions will remain confidential. For further information, contact the University of
Minnesota Disability Services website at:

http://ds.umn.edu/

or call 612/626-1333 (V/TTY).