PubH 6140
Occupational and Environmental Epidemiology
Spring Semester 2015

Credits: 2
Meeting Days: Thursdays
Meeting Time: 9:05-11:00 am
Meeting Place: Moos Tower (MoosT) 2-116
Instructor: Timothy R. Church, Ph.D., M.S.
Office Address: 350 McNamara Alumni Center
Office Phone: 612-625-9091
Fax: 612-624-3370
E-mail: trc@cccs.umn.edu
Office Hours: Arranged by appointment

I. 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.

II. Course Prerequisites
Coursework in epidemiology, biostatistics.

III. Course Goals and Objectives
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.

IV. Methods of Instruction and Work Expectations
Guest Lecturers
Bruce H. Alexander, Ph.D., Professor, Division of Environmental Health Sciences
Course Web Site
The course web site is available through Moodle: access your myU account, click on my Courses tab, click on PubH 6140 Moodle Site link.

Information on how to navigate through Moodle is available at: http://www1.umn.edu/moodle/.
The web site will contain PDF files of the required readings. Lecture notes and/or PowerPoint presentations will also be posted.

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

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
  - Nested 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 occupational and environmental epidemiology literature. In preparation for class discussions, students will critically read the assigned readings (papers). When indicated, a brief (500 word maximum) one page review and critique (summary) of a paper will be assigned. The papers should be submitted to the Moodle page. The critique 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 that report on studies 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 presentation of the data clear? If not, what additional information in table or text would be helpful for interpreting the study?
5. Do the authors indicate what their causal assumptions are? Is the analysis appropriate?
6. To what extent, and how, could the results of the paper be influenced by:
   a. Selection bias?
   b. Misclassification of exposure, disease, or potentially confounding variable?
   c. Confounding? If so, is there evidence to support this?
7. Have the authors addressed the limitations of the study? Quantitatively or qualitatively?
8. Are the results and conclusions drawn from the results reasonable?
9. What is your overall interpretation of the paper?
10. 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.

When the paper is methodological in intent, the critique should summarize key points the authors make, consider the validity and applicability of the methodology, how it is illustrated using real data, whether you feel the methods are helpful in understanding study results, and how you would use the method in your own work.

Group Project
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 consist of three parts and evolve over the semester. Each group will be
responsible for sharing their knowledge with the rest of the class. Part three of the project will be a proposal to conduct an epidemiologic study of the issue. The topics available for this semester are listed below in the Potential Topics section. Groups will be formed 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 parts. For each part, the group will be responsible for making a 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 the oral presentations 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 related to their project for the rest of the students in the class to read. Students will be responsible for reading the papers and participating in a class discussion on the papers.

Please email the PDF paper file to me at trc@umn.edu. I will post the papers to the course Moodle web page and notify you when the papers have been posted.

Part I. Summarize the Epidemiology of 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 half 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 under study. 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 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 Part I and II, student 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 proposal will loosely follow that of a NIH grant application, but much shorter. The proposals should be about 2,500 words (10 pages, double-spaced) excluding abstract, references and tables/appendices. The proposal 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
   o Study design
   o 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.
   o 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.
   o Proposed analytical plan: What you will do with the data to address the specific hypotheses.
   o Limitations, threats to validity and how they will be characterized and addressed.
   o 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 (not exhaustive; feel free to propose your own)
- Parental occupational exposures and latent effects in offspring (cancer, neurological effects, developmental problems)
- Metals in the water supply and infant cognitive development
- 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

V. **Course Text and Readings**


VI. **Course Outline/Weekly Schedule**

**Readings and schedule are subject to change, especially readings for guest lecturers. Students will be notified via email when readings for guest lecturers have been updated or the schedule has been changed.**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Instructor</th>
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| January 22 Week 1 | Introduction: Review of Study Designs  
Assignment: Form groups for group projects | Church     |
| January 29 Week 2 | Analytical Plans, Causal Models and Fundamentals, Part I  
Reading(s):  
Submit one page summary on Hernan, et al.; see Classroom Exercises below for instructions. | Church     |
| February 5 Week 3 | Applied Study Designs: Cohort and Case-Control Studies  
Reading(s):  
Assignment: Devise and prepare to discuss/present a causal model for environmental toxins and breast cancer. | Church     |
<p>| February 12 Week 4 | Applied Study Designs: Cross Sectional/Case Only | Church     |</p>
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<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading(s)</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>February 26</td>
<td>Group Project Part I Presentations: Summarize the Epidemiology of the Problem</td>
<td>Class discussion on project-related papers submitted by groups.</td>
<td>Church</td>
</tr>
<tr>
<td>March 12</td>
<td>Analytical Plans, Causal Models and Fundamentals, Part II</td>
<td>Assignment: prepare a causal diagram for your group project and be prepared to present/discuss</td>
<td>Church</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>Molecular Biology and Genomics in Epidemiology</td>
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<td>Stepanov</td>
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<tr>
<td>April 9</td>
<td>Group Project Part II Presentations: Issues in Measurement of Exposure and Outcome</td>
<td>Class discussion on project-related papers submitted by groups.</td>
<td>Church</td>
</tr>
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April 16
Week 12

An Assessment of Trichlorethylene (TCE) and Non-Hodgkin’s Lymphoma
Reading(s):
Chapter 2, “Methodological considerations in evaluating the epidemiologic literature on cancer and exposure to trichloroethylene.”
Submit one page summary on Mandel, et al.

April 23
Week 13

Case Study: Putting It All Together, Part I
Reading(s):

April 30
Week 14

Case Study: Putting It All Together, Part I
Reading(s):

May 7
Week 15

Group Project Part III Presentations: Proposal to Study the Problem
Submit written proposals.

No Final Examination

VII. Evaluation and Grading

Grading

Directed readings, classroom exercises, and participation in discussions (20%).

Students will read selected works from 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 in Classroom Exercises). Written summaries will be assigned a letter grade and averaged (10%). Grade will depend upon thoroughness and thoughtfulness of the summary. Participation in class discussion and exercises other than summaries is also required (10%).

Group 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 outcome and exposure (25%), (3) Proposal for a study (30%). A more
complete description of the group project is given in Section IV above. The group paper is due in class May 8, 2014.

Because so much of the value of the course is participatory, attendance is mandatory. If you must miss a class period, let the instructor know ahead of time. If more than 3 days are missed, a failing grade will result.

**Course Evaluation**

SPH collects student course evaluations electronically using a software system called CoursEval: www.sph.umn.edu/courseval. The system will send email notifications to students when they can access and complete their course evaluations. Students who complete their course evaluations promptly will be able to access their final grades just as soon as the faculty member renders the grade in SPHGrades: www.sph.umn.edu/grades. All students will have access to their final grades through OneStop two weeks after the last day of the semester regardless of whether they completed their course evaluation or not. Student feedback on course content and faculty teaching skills are an important means for improving our work. Please take the time to complete a course evaluation for each of the courses for which you are registered.

**Incomplete Contracts**

A grade of incomplete “I” shall be assigned at the discretion of the instructor when, due to extraordinary circumstances (e.g., documented illness or hospitalization, death in family, etc.), the student was prevented from completing the work of the course on time. The assignment of an “I” requires that a contract be initiated and completed by the student before the last official day of class, and signed by both the student and instructor. If an incomplete is deemed appropriate by the instructor, the student, in consultation with the instructor, will specify the time and manner in which the student will complete course requirements. Extension for completion of the work will not exceed one year (or earlier if designated by the student’s college). For more information and to initiate an incomplete contract, students should go to SPHGrades at: www.sph.umn.edu/grades.

**University of Minnesota Uniform Grading and Transcript Policy** - A link to the policy can be found at onestop.umn.edu.

**VIII. Other Course Information and Policies**

**Grade Option Change** (if applicable)

For full-semester courses, students may change their grade option, if applicable, through the second week of the semester. Grade option change deadlines for other terms (i.e. summer and half-semester courses) can be found at onestop.umn.edu.

**Course Withdrawal**

Students should refer to the Refund and Drop/Add Deadlines for the particular term at onestop.umn.edu for information and deadlines for withdrawing from a course. As a courtesy, students should notify their instructor and, if applicable, advisor of their intent to withdraw.

Students wishing to withdraw from a course after the noted final deadline for a particular term must contact the School of Public Health Office of Admissions and Student Resources at sph-ssc@umn.edu for further information.

**Student Conduct Code**

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: Student Conduct Code. To review the Student Conduct Code, please see: http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf.

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."
Use of Personal Electronic Devices in the Classroom
Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each faculty member to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please reference: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

Scholastic Dishonesty
You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. (Student Conduct Code: http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf) If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see: http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: http://www1.umn.edu/oscai/integrity/student/index.html. If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.

Makeup Work for Legitimate Absences
Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoena, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see: http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html.

Appropriate Student Use of Class Notes and Course Materials
Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: http://policy.umn.edu/Policies/Education/Education/STUDENTRESP.html.

Sexual Harassment
"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf.

Equity, Diversity, Equal Opportunity, and Affirmative Action
The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf.
Disability Accommodations
The University of Minnesota is committed to providing equitable access to learning opportunities for all students. Disability Services (DS) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.

For more information, please see the DS website, https://diversity.umn.edu/disability/.

Mental Health and Stress Management
As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: http://www.mentalhealth.umn.edu.

Academic Freedom and Responsibility: for courses that do not involve students in research
Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost. [Customize with names and contact information as appropriate for the course/college/campus.]

* Language adapted from the American Association of University Professors "Joint Statement on Rights and Freedoms of Students".

Template update 9/2013