

## Advanced Environmental Epidemiology

### Epidemiology 799B

-Fall Semester 2016-

#### Course Description & Objectives

Epidemiology 779B provides an advanced discussion of the epidemiology of environmentally-related disease and the application of epidemiologic concepts and methods to protecting public health from environmental hazards. Substantive topics include some important environmental exposures; these are used to illustrate discussions regarding exposure assessment, the dynamic nature of environments, regulation and assessment of environmental hazards, and the methods used for environmental hazard identification and risk assessments. Learning takes place through a mix of didactic sessions, class discussions, and projects.

Instructor: David Richardson, PhD  
Associate Professor  
Department of Epidemiology  
Office: McGavran-Greenberg 2102  
Phone: 966-7433  
e-mail: [David.Richardson@unc.edu](mailto:David.Richardson@unc.edu)

Class meetings: Date and time: Monday, 12:20-2:15  
Location: McG-G 2303

Suggested book: Thomas D. *Research Methods in Environmental Epidemiology*.  
Oxford University Press, 2014. (*Suggested for students planning to do research in environmental epidemiology*)

## **Course Information**

### Communication

Course information, including the syllabus, reading list and assignments, will be posted on the course web site.

### Requirements

1. Facilitate discussion. Students will be assigned to lead discussion during in-class seminar periods. Seminars typically focus on criticism of published research, detailed discussion of the study design, exposure assessment approach(es), and statistical methods used; discussion leaders are encouraged to discuss the context of the research, current controversies or emerging topics. Facilitators are expected to read the assigned materials thoroughly, identify key issues, and lead class discussion of the materials on the assigned day.

2. Projects. Students will work to develop a plan for an epidemiologic study based on a real environmental health problem. Research plans should include a research question and describe the study design and strategies for selecting the study location and population, measurement of exposure, health outcome, and other key variables, and analysis plan. Each project will be presented in an oral report with time for discussion.

3. Final Paper. A course paper of no more than 12 pages (not including tables and references) is due at the end of the semester. The paper must address a current topic in environmental health or a relevant area of epidemiologic methods, and may be written as a critical review of the literature, commentary, or research proposal for an epidemiologic study. A brief (1-2 paragraph) summary of the theme of the course paper should be submitted in advance. Papers written as review articles should describe the search strategy used to identify the relevant literature and should discuss the methodological limitations of past work, in addition to summarizing and interpreting findings. A statistical meta-analysis can be a useful addition to a review when the literature lends itself to such treatment. Papers submitted in the form of research proposals should follow the standard format used for NIH grants (form PHS-398); only the scientific portions of the proposal are required (i.e., Abstract, Specific Aims, Background & Significance and Research Plan, not budget or personnel pages). Appropriate use of references is mandatory in all papers, and typescripts should be prepared to professional standards, with adequate margins, page numbers and a title page.

4. Attendance, preparation and participation. It is assumed that students in a graduate-level course take responsibility for their decisions. Discussion and course work depend on the consistent attendance and participation of all members of the course. Circumstances

nevertheless arise when it may not be possible to attend or prepare for class because of work, family needs, bad weather, or other events. Students who must miss class are expected to make their own arrangements to cover the material. Both consistently outstanding preparation and contributions to the class and consistent failure to attend or to prepare for class will be taken into consideration in evaluating performance.

### Course Evaluation

Students are expected to complete the online course evaluation during the 2 week time window at the end of the course as listed on the UNC academic calendar.

### Final Exam

There is no final exam for this course.

### Honor Code

The University of North Carolina at Chapel Hill has had a student-administered honor system and judicial system for over 100 years. The system is the responsibility of students and is regulated and governed by them, but faculty share the responsibility. Students are reminded that all work performed at UNC, is governed by the Honor Code. Working with others is educationally beneficial and encouraged through group projects. The Honor Code permits collaborative work, but means that all members of a group must be acknowledged as contributors, even in written materials prepared by one individual. As always, individual assignments must be the original work of the author, and intellectual contributions of others, whether written or oral, must be properly attributed. If further information is needed, the text of the Instrument of Student Judicial Governance is available on the UNC web site or from the Dean of Students.

### Grading

All written assignments should be submitted in printed (hard-copy) format. Late assignments carry a very severe penalty of 10% off per day late. Pleas of mercy for extenuating circumstances will be accepted only with written documentation. Final grades are based on the standard graduate school scale. The Satisfactory completion of all requirements will earn a Passing grade (P), an indication of solid, graduate-level work. Substandard completion of any requirement will be cause for re-evaluation of the grade. Consistently outstanding preparation and contributions to the class, projects, and final paper will earn a grade of Honors (H), indicating outstanding performance.

Facilitation: 20% Project: 30% Paper:30% Participation: 20%= Total: 100%

No incompletes will be given except under special circumstances to be agreed upon by the student and instructor.

## Course Schedule

FALL, 2016

August 29 - No class.

September 5 – Labor day - No classes held, university holiday.

Session	Date	Topic	Related readings
1	12 Sept	Orientation, organization of course & introductions. Topic: Hazard identification, risk assessment, regulation, and compensation: the context of environmental health and regulation.	Pearce et al. IARC Monographs: 40 Years of Evaluating Carcinogenic Hazards to Humans. EHP (2015) volume 123.
2	19 Sept	Characterizing the environment: principles of exposure assessment; historical exposure reconstruction; and, measurement of current exposure.	Smith and Kriebel Introduction: Relating Disease to Exposure in <i>A Biologic Approach to Environmental Assessment and Epidemiology</i> . Oxford Press (2010). Full texts available via UNC-Chapel Hill Libraries
3	26 Sep	<u>Unintentional release from a fixed site</u> . From Sveso to TMI and Chernobyl. Study designs in environmental epidemiology. Confounding & criticism in environmental studies. Difference-in-difference designs.	Pesatori AC, et al. Dioxin exposure and non-malignant health effects: a mortality study. OEM (1998) 55:126–131.  Wing S, Richardson D, Armstrong D, et al. A Reevaluation of Cancer Incidence Near the Three Mile Island Nuclear Plant: The Collision of Evidence and Assumptions. Environ Health Perspect 1997;105(1):52 - 57.
4	3 Oct	<u>Routine releases from fixed sites</u> . <i>Spatial studies</i> . Proximity to hazardous sites. German KIK study and the National Academy of Science’s plans for a US study. Critiques and	Spix et al. Case–control study on childhood cancer in the vicinity of nuclear power plants in Germany

Session	Date	Topic	Related readings
		controversy. Doubly-robust models for environmental exposures.	1980–2003. <i>Eur J Cancer</i> 44(2): 275–284. Schwartz J. A Direct Estimate of the Effect of PM2.5 on Life Expectancy using Doubly Robust Quantile Regression. Zigler and Dominici. Point: Clarifying Policy Evidence With Potential-Outcomes Thinking—Beyond Exposure-Response Estimation in Air Pollution Epidemiology. <i>AJE</i> 2014
5	10 Oct	<u>Ubiquitous exposures</u> . <i>Exposure time response models in cohort and case-control</i> . Radon in domestic and occupational settings. Quantitative dose-response analysis. Sensitivity to measurement error and classical models for exposure-time-response functions.	Spycher “Background Ionizing Radiation and the Risk of Childhood Cancer: A Census-Based Nationwide Cohort Study” <i>EHP</i> (2015) 123:622–628 (and associated letters); NAS BEIR VI report (Ch 3). Statistical methods in environmental epidem. Thomas, DC. Oxford University Press, 2009. Full text available via the UNC-Chapel Hill Libraries
	17 Oct	No Class – Submit course paper proposal	<b>Due: 1-2 paragraph description of course paper</b>

Session	Date	Topic	Related readings
6	24 Oct	<u>Recurrent exposures and responses. Panel designs and longitudinal data.</u> Livestock operations; recurrent exacerbations and air pollution. Fixed effect models for recurrent outcomes.	Schinasi et al. "Air Pollution, Lung Function, and Physical Symptoms in Communities Near Concentrated Swine Feeding Operations" <i>Epid(2011);22: 208 –215</i> ; Dumas "Asthma history, job type and job changes among US nurses" <i>OEM doi:10.1136/oemed-2014-102547</i> ; Jiang "Association between Arsenic Exposure from Drinking Water and Longitudinal Change in Blood Pressure among HEALS Cohort Participants" ( <i>EHP 2015</i> ) 123:806–812; Wing and Moreland "Environmental Injustice Connects Local Food Environments with Global Food Production" CRC Press (2014).
7	31 Oct	<u>Acute response to a time-varying exposure. Time series studies.</u> Ambient temperature and morbidity and mortality. Instrumental variables (IV) for estimating causal effects of environmental exposures.	Bhaskaran et al. "Time series regression studies in environmental epidemiology." <i>IJE (2013)</i> 42:1187-95 Schwartz J et al. Estimating Causal Effects of Local Air Pollution on Daily Deaths: Effect of Low Levels. <i>EHP (2016)</i> [Epub ahead of print]. Auger "Ambient Heat and Sudden Infant Death: A Case-Crossover Study Spanning 30 Years in Montreal, Canada" ( <i>EPH 2015</i> ) 123:712–716; Quiao et al. "Assessment of Short- and Long-Term Mortality Displacement in Heat-Related Deaths in Brisbane, Australia, 1996–

Session	Date	Topic	Related readings
			2004”EHP (2015) 123:766–772. (See also: Flanders)
8	7 Nov	<u>Acute effects of mixtures and correlated exposures.</u> <i>Cross-over and time series designs.</i> Air pollution and non-malignant disease.	Wang et al. “Air Pollution and Lung Function in Dutch Children: A Comparison of Exposure Estimates and Associations Based on Land Use Regression and Dispersion Exposure Modeling Approaches” EHP (2015) 123:847–851 Thomas, Statistical Methods for Environmental Epidemiology
9	14 Nov	<i>Intervention studies and natural experiments.</i> Ingested exposure to arsenic. EPA regulations inhalation and ingestion. Utah smelter.	Rich et al. “Differences in Birth Weight Associated with the 2008 Beijing Olympics Air Pollution Reduction: Results from a Natural Experiment” EHP (2015) 123:880–887.
10	21 Nov	Presentation of projects	<b>Due: Student project presentation</b>
11	28 Nov	Presentation of projects	<b>Due: Student project presentation</b>

Session	Date	Topic	Related readings
12	5 Dec	<i>Bridging occupational and environmental studies.</i> Asbestos, Libby dusts, studies of mesothelioma in the US and abroad, and the global trade in hazards.	“Current Research and Opportunities to Address Environmental Asbestos Exposures” EHP (2015); Vinikoor (EHP 2010)
	Dec 9	READING PERIOD	<b>Due: Final course paper</b>