Foundations of Environmental Health Sciences

EHS C200A/C185A
Lecture 1

Fall 2014

Time: MWF 3-4:50 pm
Location: 41-235 CHS
Office hours by appointment

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Course Description

Multidisciplinary aspects of environmental health sciences in context of public health for master's and doctoral students pursuing degrees in the Department of Environmental Health Sciences (C200A) and for IoES undergraduate majors who are pursuing a concentration in Environmental Health or Public Health Minors (C185A). Letter grading. Preparation required: one year each of undergraduate biology, calculus, chemistry, and physics. *Please note that there are two sections of EHS 200A being offered in Fall 2014. This section (LEC 1) is designed for students pursuing the **MS degree** in Environmental Health Sciences.*

Every day the front page of every newspaper in the world has an article that touches on Environmental Health. The threats can be global climate change, heat waves or floods, air and water pollution, oil spills or contamination from geologic fracturing, effects on vulnerable populations, radiation threats, shelter failures, and many more.

The purpose of this course is to develop the content knowledge and thought processes to be a successful environmental health researcher. The lectures on Mondays and Wednesdays present the fundamental science behind critical environmental health issues and their application to human health. Friday sessions are devoted to developing critical thinking skills and training in R, a programming language useful for data management, plotting and statistical analyses.

Course Website

The course website is https://ccle.ucla.edu/course/view/14F-ENVHLTC200A-1. The assigned readings, links to videos, and homework assignments will be on the website. If you are unable to access the course website, please contact Rich Ambrose (rambrose@ucla.edu).

Course Learning Objectives

Upon completion of this course, you should be able to demonstrate the skills listed as "Course Learning Objectives" below. These learning objectives were selected to help you build skills related to help undergraduates build competencies outlined in the ASPH Undergraduate Public Health learning Outcomes Model (http://www.asph.org/document.cfm?page=1085) and to help MPH, MS, and PhD students in Environmental Health Sciences .

COURSE LEARNING OBJECTIVES	***HOW THESE LEARNING OBJECTIVES ALIGN WITH COMPETENCIES FOR SPECIFIC DEGREE PROGRAMS***			
	Undergraduate Public Health Learning Outcomes	***ASPH MPH Competencies***	***EHS MS Competencies***	***EHS PhD Competencies***
1. Accurately and effectively communicate environmental health risks to critical stakeholders individually and as part of a team.	2.4 Communicate health information to a wide range of audiences through an array of media.	F. 7. Demonstrate effective written and oral skills for communicating with different audiences in the context of professional public health activities. H.4. Engage in dialogue and learning from others to advance public health goals. H. 7. Use collaborative methods for achieving organizational and community health goals. H. 9. Develop strategies to motivate others for collaborative problem solving, decision-making, and evaluation.	E. 2. Deliver effective oral presentations individually and as part of a team E. 3. Explain and interpret research findings for students, professionals, the public, and media E. 4. Work effectively as part of an interdisciplinary team	E. 1. Gauge the cultural background, knowledge base and skills of an audience to appropriately customize communications for the target audience E.2. Organize and make oral presentations to professionals ranging from brief scientific presentations of research findings to longer presentations E.5. Demonstrate leadership in interdisciplinary teams, including project management, negotiation and conflict resolution
2. Tailor written communications so that they are appropriate to the target audience.	2.4 Communicate health information to a wide range of audiences through an array of media.	F. 7. (see above)	E. 3. (see above)	E. 1. (see above)

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3. Using specific examples in Environmental Health, describe the major barriers to implementing policies of prevention in the area of public health and critical strategies for overcoming these barriers.	3.5 Champion the role of prevention in promoting a healthy community.	B. 3. Describe federal and state regulatory programs, guidelines and authorities that control environmental health issues.	A. 1. Retrieve and organize literature; synthesize and critically evaluate scientific literature in Environmental Health, Public Health and other relevant fields A. 3. Evaluate seminars and presentations in Environmental Health and distill the critical and salient issues from them D.1. Make reasonable inferences from results of analysis of observational and analytic studies	A. 1. Judge, critique and interpret reports of individual Environmental Health studies; evaluate strengths and limitations of Environmental Health reports
4. Describe the major threats to health in homes and the primary strategies currently used to combat these threats in the United States.	2.3 Discuss the interconnectedness among the physical, social, and environmental aspects of community health.	B. 1. Describe the direct and indirect human, ecological and safety effects of major environmental and occupational agents.	A. 1. , A.3. and D.1. (see above)	A. 1. (see above)

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5. Describe a type of physical threat to human health and provide both a historical example of how this threat has impacted human health on a catastrophic scale and how this threat impacts the daily lives of some people today.		B. 1. (see above)	A. 1. , A.3. and D.1. (see above)	A. 1. (see above)
6. Describe how Health Impact Assessment differs from traditional Risk Assessment. Provide an example of a situation where HIA would be more useful than traditional Risk Assessment.	1.8. Outline approaches for assessing and controlling environmental hazards that affect community health.	B. 4. Specify current environmental risk assessment methods. B. 5. Specify approaches for assessing, preventing and controlling environmental hazards that pose risks to human health and safety.	A. 1. , A.3. and D.1. (see above)	A. 1. (see above)

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7. Describe how both scientific data and community engagement are critical to implementing important environmental health policies.	2.10 Recognize the impact of policies, laws, and legislation on both individual and population health. 3.2 Discuss the role of community engagement in promoting population health and social justice. 3.4 Advocate for evidence-based social changes that improve the health of individuals and communities.	B. 7. Discuss various risk management and risk communication approaches in relation to issues of environmental justice and equity. E. 4. Identify critical stakeholders for the planning, implementation and evaluation of public health programs, policies and interventions.	A. 1. , A.3. and D.1. (see above)	A. 1. (see above)
8. Describe an example of an occupational health problem and how a prevention approach could be used to address this problem.	3.5 Champion the role of prevention in promoting a healthy community.		A. 1. , A.3. and D.1. (see above)	A. 1. (see above)

COURSE LEARNING OBJECTIVES	***HOW THESE LEARNING OBJECTIVES ALIGN WITH COMPETENCIES FOR SPECIFIC DEGREE PROGRAMS***			
	Undergraduate Public Health Learning Outcomes	***ASPH MPH Competencies***	***EHS MS Competencies***	***EHS PhD Competencies***
9. Describe the most pressing health problems associated with climate change faced by Southern Californians; provide examples of how resiliency towards these effects might be built.			A. 1. , A.3. and D.1. (see above)	A. 1. (see above)
10. Describe an example of how regulations and/or inspections have been used to prevent environmental health problems; describe who has the authority to impose these regulations in our region.			A. 1. , A.3. and D.1. (see above)	A. 1. (see above)

Reading

Required readings will be available on the course Moodle site (available through My UCLA or https://ccle.ucla.edu/course/view/14F-ENVHLTC200A-1). Class discussions depend on the assigned reading, so all of the readings for each class session **must** be completed **before** class.

Grading

	EHS 185A	EHS 200A
Papers (3 @ 150 pts each)	450	450
Critical evaluations of papers	180	180
Homework	160	160
Data analysis project	-	100
Class participation	110	110
TOTAL	900	1000

Papers

Three papers will be required. The topic of each paper will be chosen from an environmental health topic currently reported in the media. Current newspaper articles, news websites, or other media can be the source of the topic. Topics must be submitted to the instructors for approval before the paper is written. The papers will be brief (3 pages) reviews of the scientific information about the topic. Information about each topic should come mainly from the peer-reviewed literature. In addition to a review of information in the papers referenced, an emphasis should be placed on critical assessments of the information presented and synthesizing the results from different studies.

Critical evaluations of papers

For the critical evaluation papers to be discussed during the Friday sessions, each student must create a list of three substantive scientific questions about each paper. These questions could relate to methods (e.g., “Was the sample size adequate for the question asked?), conclusions (e.g., “Did the author recognize the potential impacts of unusual climatic conditions during the study?”), or any other aspect of the paper (note: the questions should be more specific to the study than the examples here), but they should reflect a critical evaluation of the paper and focus on areas where you feel the paper may be lacking. The primary goal of this assignment is to sharpen your critical evaluation skills, so you should think carefully about the paper when developing your questions.

Students should come to class prepared to discuss their questions and their implications for the paper. Students should also be prepared to discuss the questions raised by other students in the class, and critically evaluate their implications. The three questions for each assigned paper are due at midnight before the beginning of the class period during which the papers will be discussed.

Homework

The homework will be posted on the course website. Homework will focus on applying lessons learned in the Friday sessions on R. Homework assignments must be submitted through the course website (https://ccle.ucla.edu/course/view/14F-ENVHLTC200A-1) prior to the beginning of class on the day they are due.

Data analysis project

A data analysis project is required for students enrolled in EHS C200A. Students will acquire a large dataset (most likely from a publicly available dataset such as air or water quality monitoring) that will be used to address simple environmental health questions. Using R, students will import the dataset, perform simple quality control assessments (and any necessary corrections) to the dataset, make relevant graphs of the data, and perform relevant simple statistical analyses.

The data analysis project is due Friday December 5. Students will make a brief presentation about their project in class, followed by class discussion.

The data analysis project is not required for students enrolled in EHS C185A.

Class participation

Class participation is essential for this course. Every student is expected to be an active and well-informed participant in all class discussions. Class participation is particularly important during the discussion about paper critiques, but students are also expected to participate during lectures and the R training.

As noted above, each student should develop three substantive questions about each paper read for the critical evaluations. Students should come to class prepared to discuss their questions and their implications for the paper. Students should also be prepared to discuss the questions raised by other students in the class, and critically evaluate their implications.

Completing the assigned reading before class is essential for you to be a well-informed participant.

Although you are allowed to use computers during class, we are relying on you to exercise restraint and not engage in non-class activities during class.

	Joint Session w/MPH Section	Topic	Lecturer	Reading
Session 1 Fri Oct 3	X (start in 61-262	Introduction to the course. Discussion of MPH and MS sections of EHS 200A	Godwin Ambrose	

	CHS)	What is Environmental Health Sciences? Key concepts: Defining the environment, Environmental insults and contribution to diseases, Key examples of environmental disasters/issues and related diseases.	Collins	Gross 2013; Burnside et al. 20
Week 1		Environment and Disease		
Session 2 Mon Oct 6		Environmental influences on diseases. Zoonotic diseases, linkage between ecosystem health and human health.	Ambrose	Patz and Confalonieri 200
Session 3 Wed Oct 8		Gene-environment interactions. Key concepts: What is a gene, going beyond gene vs environment, epigenome as an environmental sensor, concepts in pathophysiology.	Allard	Faulk and Dolinc 2011
Session 4 Fri Oct 10		Critical evaluation of scientific papers. Key concepts: Features of a scientific paper, Design of scientific studies, Critically evaluating a scientific article.	Allard Ambrose Collins	Critical evaluatic papers
Week 2		Population and consumption pressures		
Session 5 Mon Oct 13		Ecological concepts: population dynamics, ecosystem services, sustainability, resilience, habitat alteration, biodiversity, extinction, ecological footprint	Ambrose	MEA 2005 (pp. 1 16)
Session 6 Wed Oct 15		Human population, consumption, Earth's carrying capacity, urbanization, urban design, rule of 15, zoobiquity	Collins	Gross 2012; Lyn 2010
Session 7 Fri Oct 17		Introduction to R (a programming language)	M. Ambrose	
Week 3		Energy		
Session 8 Mon Oct 20		Ecological concepts: energy flow and cycling, ecological efficiencies, bioenergetics	Ambrose	Covich 2000; Cohen et al. 201
Session 9 Wed Oct 22	X	Energy utilization by humanity, energy alternatives, sustainability, health impacts, Chernobyl, Fukushima	Collins	Chu and Majumc 2012; Smith et al 2013
Session 10 Fri Oct 24		Importing data and plotting in R Discussion of journal article	M. Ambrose Allard Ambrose Collins	 Critical evaluatic papers
Week 4		Land		
Session 11 Mon Oct 27		Ecological concepts: nutrient cycling (e.g. C, N, O_2), food webs, predator-prey relationships	Ambrose	Gruber and Galloway 2008;

				Ellis et al. 2011
Session 12 Wed Oct 29		Agriculture: loss of biodiversity from agriculture, use of resources/energy, nutrition, food safety, genetically-modified organisms, mycotoxins, fertilizer, water utilization, pesticides, occupational health issues	Collins	"King Corn" (DVD); Casida a Durkin 2013
Session 13 Fri Oct 31		Developing programming skills with R Discussion of journal article	M. Ambrose Allard Ambrose Collins	 Critical evaluatio papers
Week 5		Water		
Session 14 Mon Nov 3		Water as a critical environmental parameter. Ocean and freshwater ecology: fisheries depletion, coastal habitat destruction, mangroves, aberrant nutrient distribution, algal blooms, red tides, aquaculture ecology	Ambrose	Keeler et al. 201 Halpern et al. 20
Session 15 Wed Nov 5		Water, its contaminants and health. Key concepts: Toxic Organisms, Toxic compounds, Water borne pathogens and diseases.	Allard Collins	TBD; Shannon et al. 20
Session 16 Fri Nov 7		Statistical analysis and quantitative exercises with R Discussion of journal article	M. Ambrose Allard Ambrose Collins	 Critical evaluatio papers
Week 6		Air		
Session 17 Mon Nov 10		Atmospheric chemistry, reductive versus oxidative pollution, primary and secondary air pollutants, inversions	Zhu	Pacyna et al. 200 Zhu et al. 2002
Session 18 Wed Nov 12		London fog, health effects of air pollution, gases and vapors, particulate matter, compensatory physiology, occupational respiratory diseases, diacetyl, volatile pesticides, radon	Zhu	Pope and Docker 2006; Araujo et a 2008
Session 19 Fri Nov 14		Discussion of journal article	Allard Ambrose Collins	Critical evaluatio papers

Week 7		Microbes		
Session 20 Mon Nov 17		Ecological concepts: microbial ecology, role of microbes in the ecosphere, descriptions of bacteria, archaea, viruses, fungi, protozoa, algae, prions, environmentally protected forms of microorganisms (spores, conidia, cysts), ecology of Lyme disease	Collins	Wolfe et al. 2007 Falkowski et al. 2008
Session 21 Wed Nov 19	X	Microbial pathology. Key concepts: Genetic basis of antibiotic resistance, persistant organisms, microbiome, zoonoses, vectors, immune-microbe interactions, immunizations	Allard	TBD
Session 22 Friday 21		Discussion of journal article	Allard Ambrose Collins	Critical evaluatio papers
Week 8		Waste		
Session 23 Mon Nov 24	X	Ecological view of waste, wastewater, wastewater treatment, radiological waste, solid waste, hazardous waste, plastic, green chemistry, leachate, organic versus inorganic compounds, Love Canal, TCDD (Seveso, Times Beach, Vietnam)	Collins	Castaldi 2014; Sheldon 2012
Session 24 Wed Nov 26		No class		
Fri Nov 28		THANKSGIVING HOLIDAY		
Week 9		Climate change		
Session 25 Mon Dec 1	X (61-262 CHS)	Chemical and ecological issues in global warming, climate change, ocean acidification, and ozone depletion, Keeling curve, ozone depletion, potency of greenhouse gases	Godwin (physical) Ambrose (ecological)	TBD; Penuelas et al. 20
Session 26 Wed Dec 3	X (61-262 CHS)	Human health and climate change. Key concepts: Changes in the patterns of diseases in response to climate changes. Effects of ozone depletion, potential health effects of global warming and feedback on previously covered parameters (agriculture, infectious disease, energy, etc.)	Godwin	TBD
Session 27 Fri Dec 5		Data analysis project discussions	Allard Ambrose Collins	

Week 10		Global health issues		
Session 28 Mon Dec 8		Bringing together: global health issues in a changing environment. Analysis of the global disease burden from the WHO in the light of what we learned about current and future environmental challenges. http://www.healthdata.org/gbd	Allard	TBD
Session 29 Wed Dec 10		It's not all bleak: Innovative research solutions to tackle current environmental and ecological challenges. Ocean cleanup, bioremediation, etc.	Allard	TBD
Session 30 Fri Dec 12		Concluding remarks Review	Allard Ambrose Collins	