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THE UNIVERSITY OF BRITISH COLUMBIA

School of Population and Public Health

Environmental Impacts on Human Health

Course ID: SPPH 381C
CREDIT: 3 Credits
Instructors: Dr Matilda van den Bosch and Dr Michael Brauer
Schedule: Mon, Wed, 4.00pm – 5.30pm
Location: DMP 301

Course description
This course builds upon the concept of ecological public health to cover environmental factors as determinants of health of individuals and populations. It will take an integrative approach to how our surrounding environment influences various domains of health and wellbeing, covering local, regional and global health contexts. Scientific theories on the environment's impact on human health will be outlined. Biological mechanisms and pathways will be explained together with contextual mediators. The focus is on health protection and promotion as well as disease prevention. Both hazardous environmental conditions and environmental "good" will be discussed in terms of exposure or experience and how this can affect human biological systems and modify health and wellbeing. This will be considered in a social and economic context, including aspects of environmental justice, health inequalities, and community health. Exposures to chemical, biological and physical hazards in air, water, food and consumer products are considered along with current public health challenges related to urbanization, climate change, and sustainability. The course will elaborate on potential solutions to these challenges through incorporation of ecological principles in public health policy and practice.

Course format: Lectures, group discussions in seminars, and in-class and online exercises

Course readings:
- **Environmental Health: From Global to Local** edited by Howard Frumkin (3rd Edition, 2016)
- **Texts and video material as outlined in course schedule**

Optional readings:
- Gluckman & Hanson. 2006. *Mismatch. The Lifestyle Disease Timebomb*. Chapter 6-9.
- Millennium Ecosystem Assessment, 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC. http://www.millenniumassessment.org/documents/document.356.aspx.pdf
- Van den Bosch. 2017. *Natural environments, Health, and Wellbeing.* In: Oxford Research Encyclopedias. Environmental Science. (Ed. Shugart). http://environmentalscience.oxfordre.com/view/10.1093/acrefore/9780199389414.001.0001/acrefore-9780199389414-e-333?rskey=50b12H&result=9

- Rook. 2017. *Microbes, the immune system, and the health benefits of exposure to the natural environment.* In Nature and Public Health (Eds. van den Bosch & Bird), OUP, UK. In Press.
- Dahl et al. 2017. *Allergenic pollen emissions from vegetation – threats and prevention*. In Nature and Public Health (Eds. van den Bosch & Bird), OUP, UK. In Press.
- Wong. 2017. *Vector-borne diseases and poisonous plants*. In Nature and Public Health (Eds. van den Bosch & Bird), OUP, UK. In Press.
- Ten Brink P., Mazza L., Badura T., Kettunen M., and Withana S. (2012) *Nature and its Role in the Transition to a Green Economy.* Executive Summary. http://www.ieep.eu/assets/951/TEEB_Nature_the_green_economy_Executive_Summary.pdf
- Pruss-Ustun A, et al. Preventing disease through healthy environments: a global assessment of the burden of disease from environmental risks. World Health Organization. 2016. More info.
- Nieuwenhuijsen MJ. Introduction to exposure assessment. Chapter 1 in Exposure assessment in environmental epidemiology. Nieuwenhuijsen MJ (ed). Oxford University Press. New York, NY 2015. pp 3-22.
- "The Environment and Disease: Association or Causation", Sir Austin Bradford-Hill. 1965
- Canadian Handbook on Health Impact Assessment, 2004. Health Canada
- USEPA exposure factors handbook
- Canadian Exposure Factors handbook
- Watts et al. 2015. Health and Climate Change: Policy Responses to Protect Public Health. The Lancet.386(10006); 1861-1914. 2015
- IPCC Fifth Assessment Report. Chapter 11 " Human Health: Impacts, Adaptation, and Co-Benefits. 2014.
- Short answers to hard questions about climate change
- Ridding the world of POPs: A guide to the Stockholm Convention on Persistent Organic Pollutants. *United Nations Environment Program*. Geneva. 2002
- Fraser Basin Council: Sustainability Snapshot 2010: Working Together in the Lower Mainland
- United Nations. Millenium Development Goals 2013 Report.

Videos

Nature is everywhere: we just need to see it (Emma Maris) - TEDSummit
The Ghost Map (Steven Johnson)
Sanitation is a basic human right
The simple power of handwashing
Nicholas Stern: The state of the climate — and what we might do about it

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Al Gore: The Case for Optimism on Climate Change
How We Can Make the World a Better Place by 2030 | Michael Green Video
Stewart Brand: 4 environmental 'heresies' Video

Supplementary websites
EnviroAtlas
Green Cities Good Health
Natural Capital
Gapminder, e.g. Dollar Street
BC legislation relevant to environmental health
WHO Air Quality and Health Resources

Air quality levels
Vancouver: https://gis.metrovancouver.org/maps/Air
BC: http://www.bcairquality.ca/readings/
Canada: https://airnow.gov/index.cfm?action=airnow.canada
Global: https://openaq.org/
Global: https://www.stateofglobalair.org/

News articles
Provided on course website, for exercises and class discussions

Course website: Blog (TBD)

Learning objectives:
By the end of the course, the student will be able to:

- Discuss environmental determinants of health within the population health paradigm and describe variations between populations in a global health context.
- Outline and explain health threats related to harmful environmental exposures, such as air, food and water pollution, noise, waste, and radiation
- Outline and explain health promoting factors related to beneficial environmental exposures, such as green and blue spaces
- Explain the main scientific approaches used to assess potential environmental health hazards or benefits. Discuss the benefits and limitations of these approaches with reference to specific hazards or benefits
- Outline and explain environmentally related hazards, such as natural disasters, allergenic pollens, and vector-borne diseases

- Discuss the impacts of urbanization, climate change and environmental degradation on the global disease scenario
- Explain how risks are perceived by the public and how risk perception can be incorporated into the management of environmental health risks
- Give examples of and discuss ecological principles of relevance for public health, such as ecosystem services, Ecohealth, Planetary Health, and One Health
- Suggest practical solutions for planning and creating healthier, sustainable cities
- Analyze at least one current issue related to environmental impacts on health, including its potential health significance and the scientific, social and legal/political approaches to its management.

Course size: 75 maximum

Prerequisites: None

Course schedule

Week	Topics	Readings/viewings/exercises
1.1	**Course introduction** • learning objectives, learning activities and assignments • Expectations (instructors' and students') • Ecological public health – principles, concepts, definitions; Environment as a determinant of health	• (Frumkin) 3rd ed: Intro 3 - 13; • Public Health Agency of Canada. What determines health? • Video: Your health depends on where you live • Video: Causes of Death: Global Burden of Disease Study 2015 • Rethinking development and Health: Findings from the Global Burden of Disease Study.
1.2.	**Exercise/seminar:** • Global Gapminder quiz about global development	GBD Compare and Environmental Performance Index data visualizations

	with focus on environmental determinants/factors • Gapminder World map, card game on health gaps across the globe	Gapminder video: "The seemingly impossible…"
2.1.	**Planetary health** • DPSEEA-framework • Ecosystem services	• Frumkin (3rd Ed.) pp. 13-58. (Ch. 2: Ecology and ecosystems as foundational for health and Ch. 3: Sustainability and health) • Lang and Rayner. 2012. *Ecological public health: the 21st century's big idea? An essay by Tim Lang and Geof Rayner*. BMJ 345:e5466 • Whitmee et al. 2015. *Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health*. The Lancet 386:1973-2028.
2.2	**Exercise/seminar:** • ***Reading quiz I*** • Fischbowl discussion on ecology and health in personal and global contexts.	
3.1.	**Biological mechanisms, epigenetics, and the life course approach**	• Ch. 7 (Genes, genomics, and environmental health)
3.2.	**Exercise/seminar:** • Group discussions on change of health and disease burden from grandparents – parents – yourself – children and future children	• Low et al. 2017. A Life Course Approach to Public Health: Why Early Life Matters (pdf provided on course website)

4.1.	**Core Methods I:** • Exposure Assessment • Epidemiology • Toxicology	• Ch 8: 188-196 (Exposure Science); • Ch 4: 83-106 (Epidemiology) • Ch 5: 111-121 (Geospatial Data for Environmental Health) • Ch 6: 123-150 (Toxicology)
4.2.	**Exercise/seminar:** • ***Reading quiz II*** • Estimate your own exposure	
5.1	**Core Methods II:** • Risk Assessment • Health Impact Assessment	• Ch 27: 747-766 (Risk Assessment in Environmental Health) • Ch 15: 393-394 (Health Impact Assessment)
5.2.	**Exercise/seminar:** Risk perception and risk communication	
6.1.	**Harmful environmental exposures I** • Outdoor air pollution • Indoor air quality • POPs	• Ch 13: 319-341 (Air Pollution) • Ch 14: 460-461 (Air quality) • Video "Under the dome" Chinese w/english subtitles - the first ~20 minutes are an excellent overview • Video: Persistent Organic Pollutants • Ch 20: 539-570 (Buildings and Health) • Ch 14: 345-351 (Energy and human health, Household energy)

6.2.	**Exercise/seminar:** • ***Reading quiz III*** In-class debates: • malaria and DDT • e-cigarettes • mercury and seafood • cell phones.	Video: Malaria and the Silent Spring ▪ Ch 18: 487-488, 494-495
7.1.	**Harmful environmental exposures II** • Water • Physical Hazards (Radiation, noise)	Video: Drinking water in Metro Vancouver (Parts 1 and 2) • Ch. 16: 413-438, 440-445 (Water and Health) • Ch. 22: 603-629 (Radiation) • Ch 15: 391-392 (Noise)
7.2.	***Midterm exam***	
8.1	**Biological agents** • Environmental allergens • Vector-borne diseases and poisonous plants • Microbial contaminants • Microbial diversity	
8.2.	**Exercise/seminar** • ***Reading quiz IV*** • Learning from mistakes: pick a disaster – what happened, what was the cause, what did we learn/could it happen again	Ch 24: 667 – 688 Videos: Donora, London, Bhopal, Minimata, Seveso
9.1.	**Food systems, health, and the environment**	Ch 19. (Food systems, the environment, and public health.)
9.2.	**Exercise/seminar** Jigsaw exercise on sustainable and non-sustainable food systems, land use development, population growth and increasing demand for food, and the paradox of disrupted	Ch 1.2. in GEO-6, UNEP/UNECE 2016. Pp. 39-41 + suppl. material, pdf provided on course website

	food systems (obesity vs undernutrition).	
10.1	**Climate change and sustainability**	▪ View video (and II) from the Lancet Climate Change Commission ▪ Ch 12: 275 - 306 (*Climate Change)* ▪ McMichael (2017). Population health deficits due to biodiversity loss, climate change, and other environmental degradation In Nature and Public Health (Eds. van den Bosch & Bird), OUP, UK. Pdf provided on course website.
10.2	**Exercise/seminar** • ***Reading quiz V***	
11.1.	**Urban health and the built environment** • Public health impacts of urbanisation • Health and mobility (Active transport) • Land use change	• Ch 15 (Healthy communities) • Ch 20 (Buildings and health)
11.2.	**Exercise/seminar** HIA or Urban HEART group exercise of selected case	• Urban HEART and manual • HIA guide for safe routes to school
13.1.	**Health and environment in global and local policies:** Sustainable Development Goals, Precautionary principle, Health in All Policies	• Ch 26 (Environmental public health: From theory to practice • Ch 28, Communicating environmental health • Video SDGS • Sustainable Development Goals (SDGs)
13.2.	**Exercise/seminar**	Use e.g. EnviroAtlas

	Case study group work linking health issues to ecosystem services as potential contributors to solutions.	Natural Capital iTree
	FINAL EXAM	

Learning activities/Assignments

- Exercises in class – 15%
- Reading quizzes (N=5) – 15%
- Midterm exam – 20%
- Final exam – 20%
- Create a video on selected topic – 30%