星球健康
Planetary Health
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课程简介
Course Introduction

Over the past several decades, the collective impact of humanity on the structure and function of Earth's natural systems has ballooned exponentially, and as a result we have entered a new epoch in which biophysical conditions are changing more rapidly than ever before in human history. Very rapid human population growth combined with even more rapid growth in per capita consumption are driving an extraordinary transformation of most of Earth's natural systems including its climate system, its oceans, land cover, biogeochemical cycles, biodiversity, and coastal and fresh water systems. These are the biophysical systems that underpin global food production, our exposure to infectious disease and natural hazards, even the habitability of the places where we live, and there is growing concern that global environmental change is likely to be a major driver of the burden of disease over the coming century. As the pace and scale of human impacts on Earth's natural systems continues to grow, there is increasing interest in understanding and quantifying the implications of these accelerating changes for human health. Recently this field has been termed "planetary health". The goal of this course is to provide exposure to this new interdisciplinary field and to provide opportunities for interested students to become involved.

在过去的几十年里，人类对地球自然系统结构和功能的集体影响呈指数级增长，因此我们已经进入了一个新的纪元，生存环境的变化比人类历史上任何时候都更加迅速。极快的人口增长与更快的人均消费增长相结合，正在推动地球自然系统的异常转变，包括其气候系统、海洋、土地覆盖、生物地球化学循环、生物多样性以及沿海和淡水系统。这些是支撑全球粮食生产、我们对传染病和自然灾害的暴露，甚至我们居住地可居住性的生物物理系统。人们越来越担心，全球环境变化可能是未来一个世纪疾病负担的主要驱动因素。随着人类对地球自然系统的影响在速度和规模上持续增长，对于理解和量化这些加速变化对人类健康的影响日益引起关注。最近，这个领域被称为"星球健康"。本课程的目标是为学生提供对这一新兴跨学科领域的认识，并为有兴趣的学生提供参与的机会。

课程信息
Course Information

课程名称： 星球健康	Course name: Planetary Health
课程号：	Course Code: XX
授课语种：英文	Language of Instruction: English with bilingual elements with Chinese

课程属性：本科 学分学时：2 学分 30 学时 开课时间：XX 学期 1-16 周 授课形式：讲授+实操 拟招收学生数量：XX 成绩：XX	Course Type: Undergraduate Level Course Credit Hours: 2 credits, 30 hours Course Schedule: XX Weeks 1-16 Teaching Method: XX Expected Number of Students: XX Grading: XX

课程安排
Course Syllabus

Module 1: Introduction to Planetary Health and Environmental Epidemiology
In this model, sIn this module, participants will be introduced to the fundamental concepts of Planetary Health and Environmental Epidemiology. The module aims to provide a comprehensive overview of the interconnections between human health and the environment, emphasizing the role of epidemiology in understanding and addressing global health challenges.

Module 2: Planetary Health and Infectious Diseases, and Global Pandemics
This module delves into the intricate relationship between planetary health and infectious diseases, with a specific focus on global pandemics. Participants will explore the environmental factors influencing the emergence and spread of infectious diseases, including climate change, biodiversity loss, and human-animal interactions. The module aims to equip participants with insights into the dynamics of pandemics, examining case studies and the role of epidemiology in mitigating global health threats.

Module 3: Global Burden of Disease
This module provides a comprehensive overview of the global burden of disease, emphasizing the role of environmental and planetary factors. Participants will delve into epidemiological methodologies used to assess the impact of diseases on populations worldwide, considering factors such as morbidity, mortality, and disability.

Module 4: Environmental Epidemiology
This module focuses on the principles and methodologies of environmental epidemiology, a crucial discipline in understanding the links between environmental exposures and health outcomes. Participants will explore key concepts such as study design, exposure assessment, and data analysis specific to environmental health research. Through practical examples and case studies, the module aims to enhance participants' skills in investigating and evaluating the impact of environmental factors on public health.

Module 5: Case Studies
In this module, participants will engage in a practical application of the concepts learned

throughout the course by examining real-world case studies related to planetary health and environmental epidemiology. These case studies provide an opportunity to analyze and synthesize the complexities of addressing global health challenges within specific contexts.

模块一: 星球健康与环境流行病学导论
在这个模块中，学生将被介绍到星球健康和环境流行病学的基本概念。该模块旨在提供关于人类健康与环境之间相互关系的全面概述，强调流行病学在理解和解决全球卫生挑战中的作用。

模块二: 星球健康与传染病以及全球大流行
这个模块深入探讨了星球健康与传染病之间错综复杂的关系，特别关注全球大流行。学生将探讨影响传染病发生和传播的环境因素，包括气候变化、生物多样性丧失以及人类与动物的互动。该模块旨在为学生提供对大流行病动态的洞见，审视案例研究和流行病学在缓解全球卫生威胁中的角色。

模块三: 全球疾病负担
这个模块全面介绍全球疾病负担，强调环境和星球因素的作用。学生将深入研究用于评估疾病对全球人口影响的流行病学方法，考虑发病率、死亡率和残疾等因素。

模块四: 环境流行病学
这个模块聚焦于环境流行病学的原则和方法，这是理解环境暴露与健康结果之间联系的关键学科。学生将探讨诸如研究设计、暴露评估和与环境卫生研究相关的数据分析等关键概念。通过实际案例和案例研究，该模块旨在提高学生在调查和评估环境因素对公共卫生的影响方面的技能。

模块五: 案例研究
在这个模块中，学生将通过研究与星球健康和环境流行病学相关的实际案例，将深入理解这个课程中学到的这些概念。这些案例研究提供了分析和综合在特定情境中应对全球卫生挑战的复杂性的机会。

Module 1: Introduction to Planetary Health and Environmental Epidemiology

Week 1-2: Planetary Health and Environmental Epidemiology
  - Planned in-class activities
    1. Introduction: syllabus, case study examples, news presentation sign up, general planetary health discussions and lectures
    2. Part I: Introductions, course logistics, and an overview of global environmental change and human health. What is planetary health, where has it come from, and what characterizes it?
    3. Part II: Explore basic concepts of environmental epidemiology, emphasis is placed on the principles and methods of epidemiologic investigation, appropriate summaries and displays of data, and the use of classical statistical approaches to describe the health of populations.
  - Assignments   Reading Assignment (to be completed before class)
    1. Executive Summary of Rockefeller Foundation—Lancet Commission Report on Planetary Health. 2015.

2. Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation—Lancet Commission on planetary health. The Lancet

Week 2-3: Introduction to Environmental Epidemiology Starting from Air Pollution
   - Planned in-class activities
   1. To delve into environmental epidemiology, we first start with air pollution, which is the biggest topic and area of research in environment and health.
   2. The learning objectives of this lesson are: define air pollution and the common air pollutants, understand study designs, identify common sources of outdoor air pollution, understanding confounding and selection biases in air pollution epidemiology studies.
   3. In the first part of class, we will cover cohort studies and case-crossover studies.
   4. In the second part of class, we will discuss a case study based on air pollution management measures in Mexico City.
     - Students should read Pre-class work for students
       1. The Lancet Commission on pollution and health. The Lancet
       2. Dockery DW, Pope CA, Xu X, et al. An association between air pollution and mortality in six US cities. New England Journal of Medicine, 1993
       3. Cong Liu et al. Ambient Particulate Air Pollution and Daily Mortality in 652 Cities. New England Journal of Medicine, 2019

Weeks 3-4: Epidemic Investigative Team
   - Group Assignments
   For this class, we will enact as the planetary health investigative team to study climate change adaptation.
       For each section, please use 500-1000 words + 2 figures or tables.
       Citations should be made in the Vancouver style.

       Team 1: History
       -Describe the climate change adaptation and compare with different climate change adaptation policy
       -What is climate change adaptation?
       -How many climate change adaptations?

       Team 2: Climate Change Adaptation Measures Evidence
       -What are the climate change adaptation measures?
       -What are the the climate change adaptation measures evidence on human health?
       -Compare and contrast the climate change adaptation measures in different country.

       Team 3: Transportation
       -Assess the role of transportation in disease outbreak
       -Simulation and models of outbreak

       Team 4: Policy
       -Create a timeline of policies enacted, and the subsequent consequences
       -How was the quarantine decision enacted? What are the repercussions

      -Describe the players and roles of global policymakers (WHO)
      -Describe the players and roles of national policymakers (China CDC, Ministry of Health)
      -Describe the players and roles of local policy makers

Weeks 4-5   Mexico City Air Pollution Case Study Debate
With your assigned group (Yes/No) for Hoy No Circula, each group should meet ahead of time to prepare slide and evidences supporting your side. Please prepare a 10 minute presentation to argue your side, and then two 5 minute rebuttals. Use epidemiology evidences, and economic cost-effectiveness studies. At the end, we will discuss whether similar policies will work for other countries.

Reading: Air Quality and Public Health in Megacities

Module 2: Planetary Health and Infectious Diseases, and Global Pandemics

Weeks 5 Planetary Health and Infectious Diseases, and Global Pandemics.
  - Learning Point 1: Host-Pathogen Disease Triangle and Koch's Postulate
     Understand the environment-host-pathogen disease triangle.
     Read Zhu et. al's "A Novel Coronavirus from Patients with Pneumonia in China, 2019," published on 1/25/2020 in the New England Journal of Medicine.
     Study Koch's Postulate on Germ Theory, does 2019 n-CoV description from the NEJM article meet the four criteria? What is the strength and weakness of using this Koch's Postulate?
  - Learning Point 2: Establishing Causation
     Read Huang et. al's "Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China" published on 1/24/2020 in The Lancet. Study Bradford Hill's Criteria of Causation. Does epidemiological association of 2019 n-CoV and pneumonia from meet the criterial? Can the investigators ascertain the source of the agent to the seafood market? What more needs to be done?
     Second, what is the drug names mentioned in the article? What is the difference between clinical and preclinical drugs? Why is a randomized controlled trial needed (think causatively)?
  - Learning Point 3: John Snow and Cholera
     In August 1854, Soho in London was struck with a severe cholera outbreak. Cholera is a gastrointestinal infection caused by the bacterium Vibrio cholerae. It is still prevalent in areas with inadequate sanitation and poor food and water hygiene and remains a major global public health problem today.
  - Learning Point 4: Planetary health and disease pandemics
     Learning from past experiences of the Zika virus in 2016, SARS in South China in 2003, Middle East Respiratory Syndrome (MERS) Middle East in 2012, and Ebola in West Africa in 2014, what experiences can be translated for the coronavirus from Wuhan? What is the evidence that environment plays a critical role in serving as a buffer against infectious disease?

Explain how environmental change can change the incidence, prevalence, geographical distribution, and/or severity of infectious diseases.
Describe the criteria for an infectious disease hot spot and explain their characteristics with regard to environmental change.

Recognize the interface between human and animal health in the contexts of environmental change and infectious diseases.

Read the article in The Guardian, and students are responsible for finding their own evidence to discuss whether climate change is responsible for the spread of West Nile Virus?

Module 3: Global Burden of Disease

Weeks 6-8 Global Burden of Disease
Below is the flipped classroom readings and youtube videos to finish before class.
 - The first half of class will be on the infectious disease elements.
 - The second half of class will be on the introduction to the global burden of diseases.

Read: The Global Burden of Disease Study 2021

Module 4: Environmental Epidemiology

Weeks 8-10   Environmental Epidemiology
Epidemiology is the "study of distribution and determinants of health-related states among specified populations and the application of that study to the control of health problems."
These materials provide an overview of epidemiology investigations, methods, and data collection. Topics
- Key concepts and terms
- Calculating rates
- Approach and methodology
- Data sources and study design

Module 5: Case Studies

Weeks 11-12   Case Study: Biodiversity
Biodiversity and Traditional Chinese Medicine : A Case Study on China's Partial Lifting of the Ban on Use of Tiger Bones & Rhino Horns for Medicinal Purposes
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Weeks 12-13   Case Study: Grow Big or Grow Home
Planetary Health Implications of Business and Ideological Choices of the Beijing Farmers' Market
Guest: Christine Gerbode
Biography: https://www.aceee.org/about/aceee-staff/christine-gerbode

Week 13-14   Climate Change
  - The first half will be a guest lecture by Huang Cunrui, an professor of Tsinghua, his research interest focus on Climate Change. He is a lead author of IPCC report. Professor Huang will give a presentation, followed by a question and answer session.
  - For the second half of the class, please read "The 2023 report of the Lancet Countdown on

health and climate change: the imperative for a health-centred response in a world facing irreversible harms". Each student will be responsible for presenting a section. Please make a PPT presentation with the key concepts, and a list of terms and their definitions. Each presentation should be around 10 minutes + 5 minutes of discussion. If we run out of time, we will use some time in the following class.

After this reading, we will go into the specifics of The Paris Agreement and understand the Nationally Determined Contributions (NDCs). More details to follow!

Week 14-17   The Paris Agreement and NDCS
        Students will be assigned a region on countrys to compare and contrast NDCs

Week 17-18   Environmental Epidemiology Article Critique
        Title "Interactive effects of ambient fine particulate matter and ozone on daily mortality in 372 cities: two stage time series analysis"

Week 18-19   Environmental Epidemiology Article Critique
        Title "Association between ambient temperature and mortality risk and burden: time series study in 272 main Chinese cities"

Week 19-20   Case Study showcase

Module 1: Air Quality Monitoring

Week 1-2: Introduction to Air Quality Monitoring
    - Overview of urbanization and industrialization impacts on air quality.
    - The role of engineers in designing air quality monitoring systems.
    - Epidemiological use of air quality data in studying health impacts.

Week 3-4: System Design and Implementation
    - Engineering principles behind air quality monitoring systems.
    - Hands-on projects designing and implementing monitoring systems.
    - Case studies on the effectiveness of monitoring in public health policies.

Week 5-6: Epidemiological Analysis of Air Quality Data
    - Techniques for epidemiologists to analyze air quality data.
    - The impact of air quality on public health.
    - Group projects on interpreting and presenting air quality data.

Module 2: Disease Modeling and Simulation

Week 7-8: Introduction to Disease Modeling
    - Basics of disease modeling and its significance.

- Overview of collaboration between engineers and epidemiologists.
- Historical context and development of disease modeling.

Week 9-10: Computational Tools for Modeling
- Advances in computing for disease modeling.
- Practical use of computational tools in predicting disease spread.
- Case studies on successful disease modeling influencing health policies.

Week 11-12: Infrastructure and Health Facility Design

- Influence of disease modeling on infrastructure design.
- Role of engineers in creating health facilities based on modeling predictions.
- Group projects on designing infrastructure considering disease spread.

Module 3: Wearable Health Technology

Week 13-14: Introduction to Wearable Health Technology
- Overview of wearable devices and their impact.
- Engineer's role in designing hardware and software.
- Epidemiological applications in observing health trends.

Week 15-16: Data Utilization and Health Trends

- Data science applications in utilizing wearable health technology data.
- Analyzing population health trends using wearable device data.
- Final projects on designing a health monitoring system with wearable technology.

Module 4: Climate Change Rapid Responses

Week 17-18: Post-Event Response Strategies
- Collaborative efforts of engineers and epidemiologists after natural disasters.
- Case studies on rapid responses to earthquakes, tsunamis, or hurricanes.
- Rebuilding infrastructure to prevent disease outbreaks.

Week 19-20: Group Project and Final Assessments
- Group projects on developing a rapid response plan.
- Final assessments covering all modules and practical applications.
- Course review and reflections.