

**Research Center on Climate  
Change Impacts  
University of Padova - Rovigo**



**Dipartimento  
ICEA  
Università degli Studi di Padova**

## **SHORT COURSE: The Climate Change, Environment, and Health Nexus**

**INSTRUCTOR: PROF. WILLIAM PAN, [WILLIAM.PAN@DUKE.EDU](mailto:WILLIAM.PAN@DUKE.EDU)**

Professor of Population Studies & Global Environmental Health  
Duke Global Health Institute  
Nicholas School of Environment - Duke University

**Where:** Room 1 – WGRE Building, via Badaloni, 2, Rovigo

**When:** Wed 8 October at 16:30-18:30; Tue 14 Oct at 16:30-18:30, and Fri 17 Oct at 11:30-13:30

### **OBJECTIVES**

How do scientists demonstrate that climate change or environmental change has adverse or beneficial effects on humans? Since 2010, there has been an explosion of research driven by the hypothesis that a causal relationship exists between climate (and environmental) change and human health. In many cases, studies have concluded that the data provided demonstrate strong evidence for such a relationship; however, given the interdisciplinary nature of climate, environment, and health studies, there is often a lack of familiarity with the fundamental principles that guide the logic behind causal statements in epidemiology. In this short course, students will be introduced to principles and methods used in epidemiology to establish causality, and we will explore examples of these methods in applications to infectious diseases.

### **OUTLINE**

This short course will consist of four lectures and an interactive discussion of select readings. The three lectures will cover the following topics:

- Introduction to epidemiological methods
- Koch's Postulates, Bradford-Hill Criteria
- Study designs (blinding, randomization, observational vs. experimental, etc.)
- Defining change (climate, land use, water/air quality, etc.) – temporal, extreme events, spatial extent
- Epidemiology of malaria, dengue, and enteric infections
- Intervention assessment
- Regression and time series analysis

### **READINGS**

We will read a set of three papers that evaluate the PAMAFRO program in Peru, whose objective was to reduce malaria through a series of interventions. The three papers each use different spatial and temporal time scales, different climate and land cover data, and different analytical methods to assess the causality of the PAMAFRO interventions on malaria burden in Peru. We will discuss these papers during the third lecture as an example of heterogeneity in environmental epidemiology research even when evaluating the same

hypothesis. If you would like access to the datasets to evaluate the relationships on your own, please notify the instructor. The three papers are (listed in chronological order):

- (1) **Soto-Calle, G., A. Rosas-Aguirre et.al. (2017)**, “Spatio-temporal analysis of malaria incidence in the Peruvian Amazon Region between 2002 and 2013”, *Scientific Reports*, Jan 16:7:40350. doi: 10.1038/srep40350 (<https://pubmed.ncbi.nlm.nih.gov/28091560/>)
- (2) **Carrasco-Escobar, G., J. Qquellon, et.al. (2021)** “Time-Varying Effects of Meteorological Variables on Malaria Epidemiology in the Context of Interrupted Control Efforts in the Amazon Rainforest, 2000-2017” *Frontiers in Medicine (Lausanne)*, Sep 29:8:721515. doi: 10.3389/fmed.2021.721515. (<https://pubmed.ncbi.nlm.nih.gov/34660633/>)
- (3) **Janko, M., GC Recalde-Coronel, et.al. (2023)** “The impact of sustained malaria control in the Loreto region of Peru: a retrospective, observational, spatially-varying interrupted time series analysis of the PAMAFRO program”, *LANCET Regional Health: Americas*, Mar 16:20:100477. doi: 10.1016/j.lana.2023.100477. (<https://pubmed.ncbi.nlm.nih.gov/36970494/>)

**CERTIFICATION:** All students participating in this short course will receive a certificate of completion.

If interested, send an email to [marco.marani@unipd.it](mailto:marco.marani@unipd.it) with “Registration Pan Course” in the message Object, including name, affiliation (e.g. WGRE Program, or Department and University), for organizational purposes.