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Hybrid SORS/E4ES/Global Health Resilience seminar: Infectious disease management under climate change: Models and applications

Objectives

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Abstract: The sensitivity of disease vectors to the environmental fluctuations brought by climate change will dictate their response to public health interventions. Operational questions such as the timing, frequency, and development or deployment expense of interventions are also impacted by climatological factors. We have developed GeneDrive.jl, a software package for the analysis and optimized control of biological systems subjected to anthropogenic and environmental change. Its components include (i) a data model to store unique problem information, (ii) a dynamic model comprised of ordinary differential equations, and (iii) a decision model formulated using a nonlinear mathematical program. GeneDrive.jl enables replicable, scalable, and extensible computational experiments and is the first biocontrol-relevant library with the capacity for mathematical optimization, bringing operations research methods to the ecological domain. Here, we apply GeneDrive.jl to the question of whether and how rising temperatures and increasing temperature variability may impact the efficacy of a promising technology that replaces wild mosquitoes with those carrying the virus-blocking Wolbachia bacterium. We then explore how optimization using GeneDrive.jl can help redesign the operational implementation of this transgenic intervention under alternative environmental conditions to maximize public health impact.

Short Bio: Váleri Vásquez is a PhD candidate at the University of California Berkeley with a Designated Emphasis in Computational Data Science and Engineering. She conducts most of her work in the Division of Epidemiology and Biostatistics under the School of Public Health. There, Váleri develops mathematical models to simulate and optimize the use of genetic-based biocontrol under environmental change. She holds one MSc in Energy and Resources and a second MSc in Electrical Engineering and Computer Science. Prior to graduate school Váleri specialized in international climate policy at the U.S. Department of State, serving on the senior team to shape the 2015 Paris Agreement.

Speakers

Speaker: Váleri Vásquez, University of California Berkeley (USA)

Host: Rachel Lowe, Global Health Resilience Leading Researcher, Earth Sciences

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