Modeling risk perception, vector-borne diseases, and environmental integrity: Understanding environmental impacts of policy decisions for vector control

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Public responses to epidemic threats are shaped by the convergence of individual opinions that are themselves shaped by the influence, not only of social and political leadership, but also of conversations within and among communities of average citizens. These public responses then strongly influence the policy decisions taken by public health and environmental control agencies. While there already exists a rich literature on opinion formation and dynamics in social networks, this work has focused primarily on agent based simulation and has targeted the spread of opinions as either an infective or purposefully persuasive process. These models do not yet include impacts to the environment from policies chosen in reaction to perceived risks based on socially derived opinions, nor how those environmental risks are also perceived by the public, and can therefor fail to understand critical drivers that shape environmental policy.

To fill this gap in understanding, this team will address novel questions about the feedbacks among actual disease risks, public demand for vector control, and environmental degradation. They propose to integrate perspectives from network science, physics, computer science, mathematics, social psychology, epidemiology, medical geography, vector ecology, and environmental science to study how communication within social networks shapes public understanding of the risks from both vector-borne diseases and the environmental contamination/degradation that results from control strategies. Each of these fields has its own set of specialized modeling tools to explore emergent properties of self-organizing systems. The team will focus specifically on models from network science, topology, and epidemiology using ordinary differential equations, game theory, difference equations, and numerical simulation.

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