A Generic Arboviral Model Framework for Exploring Trade-Offs between Vector Control and Environmental Concerns

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Abstract

Effective public health measures must balance potentially conflicting demands from populations they serve. In the case of infectious disease risks from mosquito–borne infections, such as Zika virus, public concern about the pathogen may be counterbalanced by public concern about environmental contamination from chemical agents used for vector control. Here we introduce a generic framework for modeling how the spread of an infectious pathogen might lead to varying public perceptions, and therefore tolerance, of both disease risk and pesticide use. We consider how these dynamics might impact the spread of a vector-borne disease. We tailor and parameterize our model for direct application to Zika virus as spread by Aedes aegypti mosquitoes, though the framework itself has broad applicability to any arboviral infection. We demonstrate how public risk perception of both disease and pesticides may drastically impact the spread of a mosquito-borne disease in a susceptible population. We conclude that models hoping to inform public health decision making about how best to mitigate arboviral disease risks should explicitly consider the potential public demand for, or rejection of, chemical control of mosquito populations.

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

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