



Biology and Medicine Through Mathematics
Conference

The role of diversity amplification for personal protection control strategies in vector-borne disease models


Jeffery Demers
University of Maryland, jdemers@umd.edu

Sharon Bewick
Clemson University, sbewick@clemson.edu

Justin M. Calabrese
Smithsonian Conservation Biology Institute, CalabreseJ@si.edu

See next page for additional authors

Follow this and additional works at: <https://scholarscompass.vcu.edu/bamm>

 Part of the [Control Theory Commons](#), [Dynamic Systems Commons](#), [Life Sciences Commons](#), and the [Medicine and Health Sciences Commons](#)

<https://scholarscompass.vcu.edu/bamm/2020/talk/38>

This Event is brought to you for free and open access by the Dept. of Mathematics and Applied Mathematics at VCU Scholars Compass. It has been accepted for inclusion in Biology and Medicine Through Mathematics Conference by an authorized administrator of VCU Scholars Compass. For more information, please contact libcompass@vcu.edu.

Presenter Information

Jeffery Demers, Sharon Bewick, Justin M. Calabrese, and William F. Fagan

Personal protection measures, such as bed nets and repellents, are important tools for the suppression of vector-borne diseases like malaria, and the ability of health agencies to distribute protection and encourage its use plays an important role in the efficacy of community-wide disease management strategies. Modelling studies have previously shown that a counterintuitive diversity-driven amplification in community-wide disease levels can result from a population's partial adoption of personal protection measures, potentially to the detriment of disease management efforts. This finding, however, may overestimate the negative impact of partial personal protection as a result of implicit model assumptions regarding host compliance, access to, and longevity of protection measures. We establish a new modelling methodology for incorporating community-wide personal protection distribution programs in vector-borne disease systems which flexibly accounts for compliance, access, longevity and control strategies by way of a flow between protected and unprotected populations. Our methodology yields large reductions in the severity and occurrence of amplification effects as compared to previous models.