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The Influence of Temperature Variation on Dengue Fever: A Model-based Investigation

Michael A. Robert
University of New Mexico, marobert@unm.edu

Paula D. Weber
University of New Mexico

Rebecca C. Christofferson
Louisiana State University at Baton Rouge, rcarri1@lsu.edu

Christopher N. Mores
Louisiana State University at Baton Rouge, cmores@lsu.edu

Helen J. Wearing
University of New Mexico, hwearing@math.unm.edu

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Michael A. Robert[1,2,*], Paula D. Weber[2], Rebecca C. Christofferson[3], Christopher N. Mores[3], Helen J. Wearing[1,2]

1 Department of Biology, University of New Mexico, Albuquerque, NM

2 Department of Mathematics and Statistics, University of New Mexico, Albuquerque, NM

3 Department of Pathobiology, Louisiana State University, Baton Rouge, LA

* corresponding author: marobert@unm.edu

Abstract

Dengue fever is a viral disease vectored primarily by the mosquito species, *Aedes aegypti.* Each year, about 390 million cases occur globally, and it is estimated that approximately 50% of the world's population is at risk for dengue. Transmission and spread of dengue depends upon interactions among humans, mosquitoes, the virus, and the environment. Several experiments suggest that rate of mosquito development and the mosquito lifespan fluctuate with changes in temperature. Temperature also impacts the extrinsic incubation period (EIP) of the virus within the mosquito host. However, the optimal temperature for EIP and the optimal temperature for mosquito development and survival are not necessarily the same. In this talk, we develop an ordinary differential equations model and a stochastic analog to investigate the influence of both inter-annual and diurnal temperature fluctuations on the transmission of dengue and the ability of introductions of dengue to lead to outbreaks. We explore scenarios for temperature profiles of a number of U.S. cities that are currently naïve to dengue as well as San Juan, Puerto Rico, where dengue is endemic.