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Use of Lifespan-Shortening *Wolbachia* to Control Dengue Fever: Demographic Factors

Dengue fever has been recognized in over 100 countries and 2.5 billion people live in areas where dengue is endemic. It is currently a serious arthropod-borne disease, affecting around 50 million people worldwide every year. As there is no vaccine, prevention is approached by reducing the number of mosquitoes and limiting exposure to bites. However, none of these methods can effectively reduce its transmission.

Dengue fever requires a relatively long extrinsic incubation period in its mosquito vector *Aedes aegypti* before transmission to a new human host, so the life expectation of infectious vectors strongly influences the spread of the disease. The bacterium *Wolbachia* greatly shortens the lifespan of *A. aegypti* and reduces the transmission of dengue viruses. Some previous models have incorporated the effect of *Wolbachia* on mosquito lifespan and reducing disease transmission, but none of them have combined the spread of *Wolbachia* in mosquito population with an SEIR model of dengue fever. My current research focuses on a new SEIR model that explores the effect of *Wolbachia* on humans, using numerical solutions to investigate demographic factors that influence basic reproductive number and equilibrium prevalence. The persistence of the dengue fever sensitively depends on the mosquito survival profile. We studied the relationship among the number of *Wolbachia*-infected mosquitoes, the mosquito mortality rate, and the number of infectious humans at equilibrium. We found that the disease can be eliminated under certain circumstances.