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Administration of defective virus via bang-bang control stops dengue transmission from a calibrated population of infectious patients

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As dengue is one of the human diseases with global concern, the host-vector shuttle and the bottleneck of dengue transmission is a significant aspect to study. For the four serotypes of dengue virus within host and their transmission to the vectors, we try to capture the variability in blood viremia and antibody levels of patients and their infectiousness to mosquitoes. The present model frames the occurrence of defective virus and the virus neutralization by the immune response. In order to calibrate and characterize the intrinsic variability in a dataset, collected from large number of patients, the population of models (POMs) is an efficient and reliable technique. We sample the parameters from Latin Hypercube within the biological feasible range to build the POMs. Once the POM is well-calibrated, we build a set of control settings simultaneously for every model as a mechanism for preventing transmission in a population. We use a bang-bang type control on the administration of defective virus (transmissible interfering particles, TIPs) to the symptomatic patients in course of their febrile period.

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