

Mathematical Models of Mosquito Population Dynamics and Malaria

Nakul Chitnis
Swiss Tropical and Public Health Institute
nakul.chitnis@unibas.ch

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Malaria is an infectious disease, spread through mosquito bites, that is responsible for substantial morbidity and mortality around the world. In the last decade, through increased funding and a global scale up of control interventions that target mosquitoes, significant reductions in transmission and disease burden have been achieved. However, these gains in public health are faced with the twin threat of a decrease in funding for malaria control and the development of resistance (physiological and behavioral) in mosquitoes.

Mathematical models can help to determine more efficient combinations of existing and new interventions in reducing malaria transmission and delaying the spread of resistance. We present difference equation models of mosquito population dynamics and malaria in mosquitoes. We analyze these models to provide threshold conditions for the survival of mosquitoes and show the existence of endemic malaria states; and run numerical simulations to provide quantitative comparisons of interventions that target mosquitoes with varying levels of resistance.