ROBERT SMITH?, The University of Ottawa

Controlling Malaria with Indoor Residual Spraying in Spatially Heterogeneous Environments

Indoor residual spraying – spraying insecticide inside houses to kill mosquitoes – has been one of the most effective methods of disease control ever devised, being responsible for the near-eradication of malaria from the world in the third quarter of the twentieth century and saving tens of millions of lives. However, with malaria resurgence currently underway, it has received relatively little attention, been applied only in select physical locations and not always at regular intervals. We extend a time-dependent model of malaria spraying to include spatial heterogeneity and address the following research questions: 1. What are the effects of spraying in different geographical areas? 2. How do the results depend upon the regularity of spraying? 3. Can we alter our control strategies to account for asymmetric phenomena such as wind? We use impulsive partial differential equation models to derive thresholds for malaria control when spraying occurs uniformly, within an interior disc or under asymmetric advection effects. Spatial heterogeneity results in an increase in the necessary frequency of spraying, but control is still achievable.