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Understanding the Impact of Social Factors on the Transmission Dynamics of Infectious Diseases

The possible impacts of environmental dependent risk on disease dynamics within a Lagrangian modeling perspective; where the identity (defined by place of residency) of individuals is preserved throughout the epidemic process are explored. Scenarios include the dynamics of Zika virus and Tuberculosis in two highly distinct idealized environments defined by a parameter that models highly distinctive levels of risk. The underlying assumption is that these two communities are intimately connected due to economics with the impact of various patterns of mobility being incorporated via the use of residency times. Hence, the impact of mobility within these two highly distinct risk environments on the dynamics and control of these diseases is systematically explored. It is found that collaboration and mobility, under some circumstances, can reduce the overall disease burden. In addition, the impact of individuals who refuse to be vaccinated is explored. MMR vaccination and birth rate data from the State of California are used to determine the impact of the anti-vaccine movement on the dynamics of growth of the anti-vaccine sub-population. Results suggest that under realistic California social dynamics scenarios, it is not possible to revert the influence of anti-vaccine contagion.