
C3: Modelling and Optimal Control of Malaria Epidemic

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Abstract

We propose and analyze a compartmental nonlinear deterministic mathematical model for the Malaria epidemic and optimal control strategies. The model is studied qualitatively using stability theory of differential equations and the basic reproduction number that represents the epidemic indicator is obtained from the largest eigenvalue of the next-generation matrix. The local and global asymptotic stability conditions for disease-free equilibrium are determined. The optimal control problem is designed by applying Pontryagin maximum principle with three control strategies. Numerical results for the malaria epidemic dynamics and its optimal control revealed that a combination of prevention through the use of bed-net and annual mass treatment is the best strategy to eradicate the malaria epidemic.

Keywords: malaria epidemic, optimal control, pontryagin maximum, mathematical model.
