Statistical Data Analysis of Migration Impact on the Spread of HIV Epidemic Model Using Markov Monte Carlo Method

Authors : Ofosuhene O. Apenteng, Noor Azina Ismail

Abstract : Over the last several years, concern has developed over how to minimize the spread of HIV/AIDS epidemic in many countries. AIDS epidemic has tremendously stimulated the development of mathematical models of infectious diseases. The transmission dynamics of HIV infection that eventually developed AIDS has taken a pivotal role of much on building mathematical models. From the initial HIV and AIDS models introduced in the 80s, various improvements have been taken into account as how to model HIV/AIDS frameworks. In this paper, we present the impact of migration on the spread of HIV/AIDS. Epidemic model is considered by a system of nonlinear differential equations to supplement the statistical method approach. The model is calibrated using HIV incidence data from Malaysia between 1986 and 2011. Bayesian inference based on Markov Chain Monte Carlo is used to validate the model by fitting it to the data and to estimate the unknown parameters for the model. The results suggest that the migrants stay for a long time contributes to the spread of HIV. The model also indicates that susceptible individual becomes infected and moved to HIV compartment at a rate that is more significant than the removal rate from HIV compartment to AIDS compartment. The disease-free steady state is unstable since the basic reproduction number is 1.627309. This is a big concern and not a good indicator from the public heath point of view since the aim is to stabilize the epidemic at the disease equilibrium.

Keywords : epidemic model, HIV, MCMC, parameter estimation
Conference Title : ICVID 2015 : International Conference on Virology and Infectious Diseases
Conference Location : London, United Kingdom
Conference Dates : September 25-26, 2015