

A Geographical Framework for Analyzing Infectious Diseases

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Abstract

The infectious diseases is a world-wide problem that has a greater impact on low-income countries. Mathematical modeling is a useful tool to better understand these diseases and to plan prevention and interventions. In this article, discrete-time binomial chain models, which are used for modeling the transmission of infectious diseases, have been extended by the addition of a spatial component. The spatial component is included in the function which represents the number of contacts that an individual makes. The spatio-stochastic model is derived to form three cases to match different modelling scenarios, namely: a model with only local transmission, a model with interaction between spatial units but no migration, and a model with interaction and migration between spatial units. Simulations are then used to compare the different models. The spatio-stochastic model is also demonstrated with an application to measles data. From this study, it can be seen that the type of model and inclusion of a spatial component plays an important role in the transmission of infectious diseases.

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