Modeling the spread of Ebola

Young Lee
Manchester University, USA

This study aims to create a mathematical model to better understand the spread of Ebola, the mathematical dynamics of the disease, and preventative behaviors. An epidemiological model is created with a system of nonlinear differential equations, and the model examines the disease transmission dynamics with isolation through stability analysis. All parameters are approximated and results are also exploited by simulations. Sensitivity analysis is used to discuss the effect of intervention strategies. The system has only one equilibrium point, which is the disease-free state. If traditional burials of Ebola victims are allowed, the possible end state is never stable. Provided safe burial practices with no traditional rituals, the endemic-free state is stable if the basic reproductive number is less than one. Model behaviors correspond with empirical facts. The model can predict the total number of infected, number of deaths and duration of outbreaks among others, and it can be used to educate about prophylactic behaviors, and develop strategies that alter environment to achieve the disease-free state. A future work of this research is to incorporate vaccination in the model when the vaccines are developed and the effects of vaccines are known better.

e: yslee@manchester.edu