A Mathematical Analysis of the Transmission of Ebola Hemorrhagic Fever using Intuitive Graphical Representations and a Stochastic SEIR Epidemiological Model

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The behaviorisms and parameterization of Ebola hemorrhagic fever (EBOV) transmission define the methods that must be taken in order to effectively mediate dissemination and prevent large-scale infection; understanding how certain population characteristics influence or relate to transmission/parameterization can help improve intervention methodology. Epidemiological models, specifically the SEIR model, are used to predict the future behavior of a disease and used parameters must be accurate in order to be successful in preemptive disease control. This can potentially determine the totality of the consequences of an epidemic and its potential to enter an endemic or pandemic state. I analyzed the relationship of five intuitively related variables by pairing their value with the average value of the rate at which new cases accumulate in terms of their respective country and compared the infected nations to determine the possible existence of a relationship and its probable nature. The computer program MATLAB was used to model EBOV transmission using parameters from a prior study. I evaluated the value of the definite integral of 10 subsequent time steps of the model function output and evaluated the residual between these values and reported data from the WHO website. The results suggested a plausible relationship between EBOV transmission and physician density, national health expenditures, and death rate, and no relationship could be derived for GDP per capita, life expectancy, and population growth rate. The residual values suggest that the stochastic SEIR model using given parameters did not accurately represent raw data regarding EBOV transmission in Western Africa.

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