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A Mathematical Model of the Spread of Dengue Fever Incorporating Mobility

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A MATHEMATICAL MODEL OF DENGUE FEVER INCORPORATING MOBILITY

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Dengue fever is a disease spread by mosquitoes in tropical, urban areas. There is currently no vaccine for dengue fever, so preventative measures are the only solution to slow the spread of the disease. Previous mathematical research on malaria (another disease spread by mosquitoes) and dengue fever provide supportive background information in order to develop a mathematical model on dengue fever. Mathematical models that include rates of change over time show how the disease can impact susceptible, infected, and recovered people. Mathematics, specifically in the application to public health, can be used to help investigate methods of intervention by predicting and estimating where the disease might spread without having to infect people with the disease. In order to develop a model to simulate dengue fever spreading between two populations, an in-depth analysis was conducted on a malaria model with human traveling aspects and on a general dengue fever model. Then, parameter values relevant to dengue fever were investigated and implemented into both of the models. The results from both the malaria model and dengue fever model were regenerated in *Mathematica*. A thorough investigation of previous research in the field allowed for a combination of the malaria model and the general dengue fever model by adding the human travel aspects to the dengue model. The combination resulted in ten ordinary differential equations, which simulate humans of two different communities visiting the other community. Further simulations have been conducted on how the spread of dengue fever is affected by the length of time spent in each community, the population size differences in the communities and on the mosquitoes' biting rate. It has been

seen that the time factor does heavily impact the rate at which dengue spreads across a community.