

A Model for Epidemic Dynamics in a Community with Visitor Subpopulation

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Abstract

With a five dimensional system of ordinary differential equations based on the SIR and SIS models, we consider the dynamics of epidemics in a community which consists of residents and visitors/tourists over a short period of time. The total population size of the community is taken to be constant, ignoring its change due to any birth and death in the period under consideration. Also, the resident and visitor populations are respectively constant. We assume that every immigrating visitor is susceptible and is likely to be infected during their stay in the community. Furthermore, infected visitors can carry on their activities normally during their stay in the community thus still appearing like susceptible visitors. Some indices are derived for the isolated subpopulations. More so, we obtained the cross infection index as well as the basic reproduction number for each subpopulation when it is in contact with the other. From our analyses, the visitor subpopulation is seen as significant in determining the fate of epidemics in the community. With this discovery, we are able to propose relevant public health policies.