

Malaria Model In Periodic Environments

Bassidy, Dembele, Grambling State University, Grambling, LO, dem_77@hotmail.com

We introduce models of malaria, a disease that involves a complex life cycle of parasites, requiring both human and mosquito hosts. The novelty of the model is that we introduce periodic coefficients into the system of ODEs, which account for the seasonal variations (wet and dry seasons) in the mosquito birth, death and infection rates; and the human death and infection rates. We then compute a basic reproduction number R_0 which depends on the periodic coefficients and prove that if $R_0 < 1$, then the disease becomes extinct, whereas if $R_0 > 1$, then the disease is endemic and may even be periodic. In addition, we make connections with experimental studies on malaria in Badiangara (a village in Mali), where sulfadoxine- pyrimethane (SP) has been used as a temporary vaccine. We successfully fit their experimental data and define drug administration protocols that would optimize the effectiveness of SP as a malaria vaccine.