Multiscale tales in epidemiology

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ABSTRACT

Epidemiological models spans several scales in time, space and population size. We shall address a number of different problems: (i) the dynamics of a SIR-SI model for arboviruses accounting for the fast mosquito time-scale In this case, we shall show how a natural dichotomy in time-scales appear and leads to a reduced model that fully approximates the original one. (ii) In the case of dengue, the main vector (*Aedes aegypti*) is highly adapted to the human environment. However, unexpected consequences may arise of such adaptability. This is the case of how human mobility can contribute to dengue epidemics. (iii) Epidemics for finite and infinite populations: we study a stochastic SIS model for large, but finite populations. We shall obtain a PDE that contains all the relevant information of the model and, in the infinity population limit, recovers the classical SIS model. In particular, we obtain additional results for disease invasion. If time allows we may discuss further applications to ecological and evolutionary models.