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Approximating the time to endemic fade-out

Abstract

For infections which can become endemic in a population, a random variable of particular interest is the time until extinction of infection. Starting from a population in which infection is endemic, which is to say that the population is initiated in a quasi-stationary state, then the time to extinction of infection is exponentially distributed, so that it is sufficient to approximate its mean. An approach based upon ideas from Hamiltonian mechanics has recently received a lot of attention in the theoretical physics literature, but not so much in the applied probability or mathematical biology literature. I will review this technique from an applied probabilist's perspective, giving examples of applications to a number of well-known stochastic infection models.