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ABSTRACT | Eduardo Massad

Title

Estimation of R_0 from the initial phase of an outbreak of a vector-borne infection

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Abstract

The magnitude of the basic reproduction ratio R_0 of an epidemic can be estimated in several ways, namely, from the final size of the epidemic, from the average age at first infection, or from the initial growth phase of the outbreak. In this paper, we discuss this last method for estimating R_0 for vector-borne infections. Implicit in these models is the assumption that there is an exponential phase of the outbreaks, which implies that in all cases $R_0 > 1$. We demonstrate that an outbreak is possible, even in cases where R_0 is less than one, provided that the vector-to-human component of R_0 is greater than one and that a certain number of infected vectors are introduced into the affected population. This theory is applied to two real epidemiological dengue situations in the Southeastern part of Brazil, one in which R_0 is less than one, and one in which R_0 is greater than one. In both cases, the model mirrors the real situations with reasonable accuracy.