Reproduction numbers
for epidemic models with households
and other social structures
I: Definition and calculation of $R_0$

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October 2011

Abstract

The basic reproduction number $R_0$ is one of the most important quantities in epidemiology. However, for epidemic models with explicit social structure involving small mixing units such as households, its definition is not straightforward and a wealth of other threshold parameters has appeared in the literature. In this paper, we use branching processes to define $R_0$, we apply this definition to models with households or other more complex social structures and we provide methods for calculating it.