

# Stochastic Modelling of Vaccine Preventable Diseases by Age-dependent Branching Processes

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## Abstract

The aim of this study is to provide tools to analyze the rate of vaccination coverage in case of fast newly emerging infectious disease, so that the spread cannot lead to large-scale epidemics. To this end, the epidemic spreading is modeled through an age-dependent branching process, appropriate for diseases with incubation period and allowing different transmission rates during the infection period. We investigate theoretically the properties of the time to elimination of an epidemic, depending on the rate of the immunized and/or extra-immunized individuals into the population. From these results, we are able to suggest a vaccination strategy to have the epidemic ceased before a given period of time. The results are simulation-based, without focusing on any specific disease. Finally, our model is widely applied in scope, in that it is in continuous time and allows heterogeneities in contact rates.

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