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The Effects of Quarantines on Epidemics in a Kindergarten Setting

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Abstract

In this thesis we examine how a so called SIQS epidemic spreads in a kindergarten setting with a multitype structure. When using the SIQS model we can model the flow of individuals between the subgroups as **S**usceptible → **I**nfectious → **Q**uarantined → **S**usceptible. By doing this we can examine how the diseases spread and how to combat them. We also implement a system of forced withdrawal to examine how such a method would affect the spread of the disease and the total number of days in quarantine.

Every day a child spends in quarantine, or at home as in this case, implies that a working adult has to take care of them. From an economic point of view, which is the primary view of this thesis, it is therefore important to minimize the total number of sick days during an epidemic. Furthermore we also wish to examine how the optimal number of days of forced withdrawal varies for epidemics with different degrees of infectiousness.

By using a forced withdrawal model we come to the conclusion that the spread and total number of days in quarantine can be reduced compared to the reference SIQS model. The method which leads to the minimization of quarantine days, and as a result the minimization of economic loss, is one where the number of days of forced withdrawal are large. By choosing a larger number of days of forced withdrawal we are able to isolate all initially infected individuals such that they can recover without infecting anyone else at the kindergarten. If the number of days is large enough we can be relatively sure that all quarantined children will have recovered upon return, leading to an early termination of the epidemic. Through simulation we are able to derive the number of days of forced withdrawal which minimizes quarantine days for a variety of diseases.

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