Analysis of the effect of a therapeutic treatment in a SIC model

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Abstract: A Susceptible-Infections-Contaminant (SIC) epidemic model is a mathematical model that fits the evolution of a disease through indirect transmission. In this model, in addition to the variables of susceptible and infected individuals, we incorporate the variable that measures the amount of contaminants or bacteria found in the environment. In our case, this contaminant has been produced by infected individuals. We start from a discrete-time SIC epidemic model that describes the spread of an infectious disease. Several control strategies can be considered: vaccination, quarantine, therapy, [1, 2]. As a control strategy, we incorporate a medical treatment for infectious individuals. This treatment decreases, among other things, the production of bacteria that affects the infection (this is the effect that we are going to analyze). In particular, we are interested in knowing how the percentage of individuals to whom the treatment is applied affects the eradication of the disease. To do this, we analyze the significance of the effectiveness of the treatment, the percentage of individuals who are treated, and the regimen used to reduce bacterial production. Once a strategy is defined, this analysis can precisely indicate the steps to be followed to combat the disease. Our numerical simulation also suggests under which conditions the treatment is effective.

References:

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