Title: COVID-19 in the US: Estimates of Scenarios with Possibility of Reinfection

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Abstract: Can an individual catch the new coronavirus twice? To date, there is not enough evidence about the answer to this question. Hence it is instructive to study the scenarios that allow for the possibility of reinfection. In this note, I consider a standard Susceptible-Exposed-Infectious-Recovered (SEIR) model with an additional assumption that recovered individuals can become susceptible to infection again. Through the lens of this model, I consider the progression of COVID-19 in the United States over the 18-month period. The main lessons from the simulations are the following. First, the no-reinfection and reinfection scenarios are indistinguishable before the infection peak. After the infection peak, the reinfection scenario leads to worse outcomes in terms of the number of actively infected people and the cumulative number of deaths. The strong mitigation measures — such as quarantine, travel restrictions, and social distancing — may delay the infection peak and reduce its size. This is true under both the no-reinfection and reinfection scenarios. Hence by delaying the infection peak, we delay the moment when the difference between the no-reinfection and reinfection scenarios comes into play. Second, what matters is not just the extent of the mitigation measures but also the speed of their implementation. Higher speed of mitigation allows to delay the infection peak, and then, again, the difference between the reinfection and no-reinfection scenarios does not come into play over the 18-month period. Third, temporary and extremely severe mitigation measures with subsequent gradual relaxation lead to (i) short-run decrease in the number of actively infected individuals and (ii) pandemic situation afterwards. This is true both with and without reinfection. Fourth, the mitigation measures, imposed without delays at the early stages of the infection, allow to significantly reduce the number of actively infected people at the peak and the cumulative number of infected people.

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