

# Lockdown: a non-pharmaceutical policy to prevent the spread of COVID-19. Mathematical modeling and computation

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## Abstract

In this paper, we derive and analyze an extended SIRS-model which includes lockdown policies at the early stages of the pandemic. The latter play a salient role for flattening the curve of infectious diseases such as COVID-19, and is introduced as a model compartment. An error function is reported, which serves as a bridge between the outcomes of the model and available databases; we estimate the values of the model parameters by minimizing the error function. The intervention function, obtained from the equivalent system of the proposed model, and effective reproduction function are also derived to understand the underline scenario of the coronavirus outbreak. We then estimate the epidemiological variables such as susceptible, recovered, lockdown etc. for Canada and three of its provinces, Ontario, Qu\`ebec and British Columbia, significantly affected by the coronavirus. Some improvements, such as spatial dependence or “at risk” vs “healthy” population, will finally be proposed in order to increase the accuracy of the modeling.

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