October 23rd 2020

Nature Medicine

Submission Date: October 23rd ,2020

Dear Editor,

 I am writing to submit our manuscript entitled, "SIR-M: A new epidemic model with mobility" for consideration as a Nature Medicine research letter. We extend the existing SIR model considering the travelers’ activities and their mobility to study the impact of mobility on the evolution of the Coronavirus 2019 (COVID-19) pandemic. We found that our model (SIR-M) is able to predict the course of the COVID-19 pandemic more accurately, resulting in a better planning of the control strategies concerning mobility restrictions to effectively manage the impact of the pandemic in both time and space.

Given the alarming increase of transmission rate and the lack of any suitable vaccine, COVID-19 and its variants are spreading rapidly with deadly consequences and profound impacts on the global health and world economy. Even though the SIR (Susceptible-Infectious-Recovered) mathematical model and its variants have been widely applied to predict the course of the COVID-19 pandemic, they cannot evaluate the spatial spreading due to the lack of community’s mobility modelling within them. It is because in the conventional compartment models (i.e. SIR), individuals are assumed to be distributed evenly and behave homogeneously. To address this limitation, we proposed a new and more accurate epidemiological model (SIR-M) based on the conventional SIR model to study the course of the COVID-19 pandemic and its spatial impact considering the community’s mobility and mode of travel. Based on this epidemiology model, we obtained that applying simultaneously multiple mobility restrictions (including working from home and school closures) as soon as possible can effectively contain the outbreak. We believe that the findings will advance the toolset needed to combat the COVID-19 and will appeal to policymaker, Ph.D and M.D who subscribe to *Nature Medicine* that interested in effects of the environment in human health.

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