COVID-19 spreading under containment actions

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We propose an epidemiological model that includes the mobility patterns of the individuals, in the spirit to those considered in Refs.[1-3]. We assume that people move around in a city of 120x120 blocks with 300 inhabitants in each block. The mobility pattern is associated to a complex network in which nodes represent blocks while the links represent the traveling path of the individuals (see Fig. 1). We implemented three confinement strategies in order to mitigate the disease spreading: 1) global confinement, 2) partial restriction to mobility, and 3) localized confinement. In the first case, it was observed that a global isolation policy prevents the massive outbreak of the disease. In the second case, a partial restriction to mobility could lead to a massive contagion if this was not complemented with sanitary measures such as the use of masks and social distancing. Finally, a local isolation policy was proposed, conditioned to the health status of each block. It was observed that this mitigation strategy was able to contain and even reduce the outbreak of the disease by intervening in specific regions of the city according to their level of contagion. It was also observed that this strategy is capable of controlling the epidemic in the case that a certain proportion of those infected are asymptomatic.

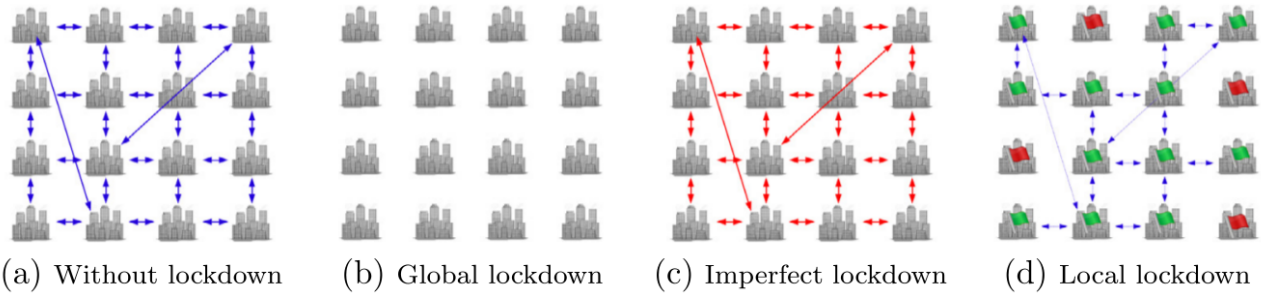

Fig. 1. (a–d) Schematic representation of different types of mitigation strategies (exemplified by a 4 × 4 grid). The lines represent the human mobility pattern between blocks. (a) People are allowed to evolve freely, equivalent to a "continuous activity" scenario. That is, there is no intervention during the epidemic. (b–d) Before a given day, individuals move freely from one block to another according to the mobility pattern. After that, (b) all blocks are

isolated, (c) the flow between blocks (represented by red arrows) is reduced but the mobility pattern is unaffected, (d) those blocks with a number of infected individuals greater than a certain threshold are isolated (labeled with a red flag). The other blocks remain linked to each other (labeled with a green flag). See text for more details.

References:

[1] A.D. Medus, C.O. Dorso, Diseases spreading through individual based models with realistic mobility patterns, 2011, arXiv:1104.4913.

[2] D.H. Barmak, C.O. Dorso, M. Otero, H.G. Solari, Dengue epidemics and human mobility, Phys. Rev. E 84 (2011) 011901.

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