Review of: "The Spherical Horse and COVID-19"

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Potential competing interests: No potential competing interests to declare.

The paper brings forth the shortcomings of the classical SIRD models and extensions. It provides insightful explanations of the model weaknesses and restrictions. It pinpoints possible pitfalls that are very important and discusses why fitting real data to obtain the model parameters allows the SIRD models to approximately represent limited, short-time epidemic evolution in practice. The proposed plug flow model for infected (I_{nd} and I_d) is an improvement over the perfectly mixed stirred tank model, tacitly assumed by SIRD models. However, the dynamics of the epidemic are more complex than this. For instance, the process is not FIFO. A person infected may run to the hospital within the first few days from infection, another after a week or more. This can hardly be considered a stochastic variation of the plug flow. Also, the set of Susceptibles may not be a perfectly mixed and rigid box, especially under restrictive measures. In addition, the model does not consider reinfections. Also, the model structure, fig, 2, does not consider deaths from I_{nd}, including interactions with other diseases. Another issue shared by all SIRD based models, including this one, is that they do not relate infected with the key variable to be controlled, i.e., the entry rate to health care units. Despite these weaknesses I think the paper is publishable and I would like to see the tuning of the plug flow model (which parameters and how) under highly unstable conditions (outburst of the disease) its performance compared to conventional SIRD for short range representation and whether it may represent medium-range COVID-19 evolution, e.g. double peak, under mobility and social distancing measures, or 3-4-season long. Multi-pattern, long range evolution of infectious diseases is adequately represented by the stochastic models in the works below.

1. Christiana Tsiligianni, Aristeides Tsiligiannis, C. Tsiliyannis, A stochastic inventory model of COVID-19 and robust, real-time identification of carriers at large and infection rate via asymptotic laws, European Journal of Operational Research, DOI:10.1016/j.ejor.2021.12.037, Corpus ID: 245831891
2. C. Tsiliyannis, Beyond SIRD models: A novel dynamic model for epidemics, relating infected with entries to health care units and application for identification and restraining policy. To appear, Mathematical Medicine and Biology.