Review of: "An Optimal Control for Ebola Virus Disease with a Convex Incidence Rate: Imputing from the Outbreak in Uganda"

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Potential competing interests: No potential competing interests to declare.

Summary of the Work

The authors proposed a mathematical model with the aim to predict and control the Ebola Virus Disease (EVD) outbreak. More specifically, the dynamics of the six compartments *Susceptible*, *Exposed*, *Infected*, *Treated*, *Recovered*, and *Death* (SEITRD) is governed by space-independent ordinary differential equations with a convex incidence rate. Three control measures have been taken into account

1) *Tracing of contacts*;

2) *The Lock-down measures*;

3) *Effect of the Treatment*

Main Result Obtained

The main result obtained is that the imposition of lockdown and curfew together with the contact tracing of infected people appears to be the most expensive strategy while the cheapest alternative is to combine the measure of the lockdown with the treatment of infected people.

General Considerations

- Please, check English, some typos were found.

- The present work should be better framed in the (by now very vast) literature in modeling the spread of a virus outbreak.

- The list of references must be completed.

- There are some points that need to be clarified (e.g., see point**4)** below).

- Limitations of the authors' approach are not well specified (see point**6)** below).

In my opinion, there are some flaws and several weak points in this work. The following tips are meant to fill some gaps.

Suggestions

One of the main subjects of the current research is to construct a realistic model able to determine space-time patterns of the spreading of outbreaks of a virus (e.g., outbreaks of EVD) that have appeared in a determined region of a Country. More specifically, it is crucial to be able to construct software based on a particular model. The model should be able to determine these patterns by taking into account the presence of poles of attraction and the distribution of the Hospitals.

1) System 2.1 needs further clarification. Indeed, it implies Eq. (2.3) which, at first glance, sounds quite weird. Indeed, in all dynamical equations, the sum of all Compartments must be constant. Please explain the presence of the constant factor \lambda and why, if we set \lambda =0, we do not find dN/dt=0.

2) Please specify how the role of the hospitals in a Country can be taken into account by modifying the dynamical equations 2.1.

3) Usually, the *Lockdown* and the *Quarantine measures* to be adopted by the Government of the Country must enter directly into the equations governing the dynamics

(e.g., G. Sonnino, P. Peeters, and P. Nardone, *Modelling the spreading of the SARS-CoV-2 in presence of the lockdown and quarantine measures by a kinetic-type reactions approach*, Oxford University Press, Mathematical Medicine and Biology: A Journal of the IMA, **39** (2), 105 (2021); G. Sonnino, P. Peeters, and P. Nardone, *Modelling the Spread of SARS-CoV2 and its variants. Comparison with Real Data. Relations that have to be Satisfied, to Achieve the Total Regression of the SARS-CoV2 Infection*, European Society of Medicine (ESMED), **10** (7) (2022), etc.). The authors' approach is completely different. This point deserves to be explored. The authors are asked to highlight the added value of their method with respect to the usually adopted one consisting in incorporating the role of restrictive measures directly into the equations governing the dynamics.

4) Generally, the dynamics for the spread of a virus outbreak is strongly affected by the intrinsic (i.e., spontaneous) fluctuations to which a macroscopic system is usually subjected. Generally, the correlation functions of fluctuations are obtained by statistical mechanics. The authors are invited to discuss this important aspect by mentioning how their approach can somehow take into account the role of intrinsic fluctuations.

5) Usually, the spread of a virus outbreak is described by *space-time stochastic differential equations*. These equations must take into account the spatial distribution of the hospitals as well as the poles of attraction of susceptible people (e.g., shopping centers, workplaces, etc.). The author's approach does not take into account these crucial elements and this may constitute a real limitation of this work. The authors are asked to discuss this point.

6) The authors are invited to complete the list of references, perhaps by expanding Introductory Section **1.**

7) As said above, the main conclusion of this work is that the imposition of lockdown and curfew together with the contact tracing of infected people appears to be the most expensive strategy while the cheapest alternative is to combine the measure of the lockdown with the treatment of infected people. We may object that we could have guessed this conclusion without introducing any model and solving any differential equation. The authors are asked to dispel this possible objection.

Conclusions

The work is interesting, but written in this form it contains many flaws and the analysis conducted by the authors is sometimes incomplete. The author is encouraged to take into account the suggestions expressed above.