OPEN PEER REVIEW

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You can find out more at:
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Health Scope
Article DOI: 10.5812/jhealthscope.102837
Published in: Health Scope: 9(3); e102837

Peer Review Report for "A New Model for Epidemic Spreading with a Focus on COVID-19"

Author(s): Babak Jamshidi, Mansour Rezaei, Khansa Rezaei

Review Timeline:

Submit Date: 18 Mar 2020
Revised Date: 16 May 2020
Accepted Date: 9 Jun 2020

Revision (0)

Here, you can see the **Reviewers**, **Associate Editors** and **EICs'** comments from the beginning to the end of the revision process.

REFEREE: Reviewer | **Revision** (0) — 28 Apr 2020

Dear AE,
Comments for the authors:
1- Please mention the presumptions of this model
2- It is not clear that the authors have checked and verified the reliability and validity of the model
3- Please mention to the limitations of this model
4- Please refer to the resources number used in the method section
5- How did the authors examine the distribution of hypothetical data?
Thanks.

REFEREE: Reviewer | **Revision** (0) — 11 May 2020

Dear AE,
Comments for the authors:
- Abstract
Background:

It needs to be corrected

- Keywords:

Social network, Facebook is not necessary

- Introduction:

The end of paragraph 6 does not require deletion strategy.

- Discussion: There is little discussion. It can be interpreted mostly

- References

References 1 and 2 are incomplete

References 3 to 9 are old and can be replaced with newer ones if possible

Thanks

REFEREE: Associate Editor | **Revision** (0) 11 May 2020

Dear EIC

The reviewer(s) have recommended publication, but also suggest some minor revisions to the manuscript. Therefore, I invite the author to respond to the reviewer(s)' comments and revise his manuscript.

Kind regards,

REFEREE: EIC | **Revision** (0) 11 May 2020

Dear Author,

Your article is reviewed by the reviewers carefully. According to their comments, this document needs minor revision. Please follow their comments as requested.

Thanks.

OPEN PEER REVIEW

Revision (1)

Reply to Reviewers

Ideally, the reviewing process can significantly improve the submitted manuscripts by allowing the authors to take into account the advice of reviewers. Author(s) must reply to all reviewers' comments in a separate Word file, point by point. A "**Reply to Reviewers**" document is submitted along with revised manuscript during submission of revised files, summarizing the changes that the authors made in response to the reviewers' comments. The responses to reviewers' comments specifies how the authors addressed each comment the reviewers made.

You can read the authors' responses to the reviewers' comments in the next page.

Dear Prof. Ramazan Mirzaei
Editor in Chief

Thank you for your Email. We revised the manuscript with ID 102837 according to reviewers' recommendations and corrected the modified manuscripts as you wanted. Comments of reviewers and answers of questions are as follows:

Reviewer1:

1- Please mention the presumptions of this model.

Answer: This was added and corrected:

Presumptions of the Model

The model is based on the following assumptions:

- The number of the susceptible individuals is proportional to the growth rate (the relative increment).
- The rate of the growth is taken fixed in the first days of the propagation, so, the cumulative number of confirmed cases follows an exponential behavior.
- The trend of the time series of growth rates is decreasing. Firstly, it faces a significant sudden decrease, thereafter it falls gradually.
- A number of successive lower rates of growth lead to low growth rates in the next few days (due to increasing the steps or stages).

2- It is not clear that the authors have checked and verified the reliability and validity of the model.

Answer: This was added and corrected:

Now, we consider the flexibility of the proposed model that leads to the model's ability to represent a wide range of epidemic data. The validity of the model is considered in two ways; the ability of modeling past observations and the validity of the predictions based on the model. The former is illustrated with Plot 3, and Plot 6 implies the latter ability of the model.

3- Please mention the limitations of this model.

Answer: This section was also added:

Based on the presumptions, the model is not suitable to represent the propagation of the epidemics that after some serious restrictions (Quarantine, Staying home, Social distancing, etc.), the condition of the population return to the previous status. To model this sort of epidemics, we need to update the model through changing the step of the model.

4-Please refer to the resources number used in the method section.

Answer: The main part of these methods section is completely new and unprecedented. The basis of this section is the new model that a new model introduced by this paper. As we used the studies of others, we discussed their research.

5- How did the authors examine the distribution of hypothetical data?

Answer: Our paper is fully independent of the discussion of the distribution. The flexibility of the model is due to a random variable ($U(t)$) which is distributed according to a random variable based on Bernouli distribution. Generally, in time series modelling the data distribution is not investigated, and we just consider the error distribution (noise) in the model based on error (noise). It is to be noted that our model is not defined in terms of white noise or error term.

Reviewer2:

1- Abstract

Background:
It needs to be corrected

Answer: It was modified as:

Background: It is extremely useful to construct mathematical models in order to forecast and control of the real phenomena. One of the common applied statistical models to represent the data involving with time is time series modeling. A new time series model is presented to demonstrate the spread of an epidemic in a population .This model deals with the increasing number of confirmed cases.

2- Keywords:
Social network, Facebook is not necessary.

Answer: They were removed.

3- Introduction:

The end of paragraph 6 does not require deletion strategy.

Answer: The paragraph ends with the classification of different stages of the outbreak. This classification has been mentioned again and again in the text, especially in the case of formulation and table. There are 29 “stages” in the text referring to this classification. Therefore, by removing these stages, we will face with some problems.

4- Discussion: There is little discussion. It can be interpreted mostly

Answer: We have extended this part.

The novel time series model, presented by the present paper, is able to represent epidemic behavior including social and infectious spreading. This model is based on some assumptions. Therefore, when there is no reduction in growth rates, it does not work well because it is the main presumption of the model. Also, as information in the early days has the greatest importance for this model, one of the challenges in this model is to modify it to obtain data sets that lack information in the first days.. For example, in relation to COVID19, if we model the spread of the disease after the beginning of March, there will be no information on the first days. To overcome this challenge, we have to collect data before the World Health Organization reports. The rationale behind this point is that exponential expansion in the first days is one of our model assumptions.

This model is not suitable to indicate the propagation of the epidemics that after some severe limitations (Quarantine, Staying home, Social distancing and etc.), that the population conditions are returned to the previous one .To model this sort of epidemics, we need to update the model through changing the step of the model.

It is noticeable that the model is dynamic and similar to other time series models, estimates must be updated because our data is limited. Generally, the more information we have is that we can obtain more accurate amplification model.. Moreover, the implementation of strict prevention and control measures, the intense spread of the disease, or the emergence of new epicenters of spread such as South Korea and Iran requires new estimates for each model, particularly us. It is to be mentioned that to overcome this challenge, we used a mechanism to return to the previous stage, when a new epicenter of spread is found.

Finally, we propose that the performance of this model is evaluated by comparing other families of time series and artificial intelligence methods.

5-

References:

References 1 and 2 are incomplete

References 3 to 9 are old and can be replaced with newer ones if possible

Answer: We have checked both of the first two papers. Information on both of them is complete. We don "t have access to any additional information, including Number, Issue, and etc. We did not remove the old references, but in the case of more recent publications, we added the following resources (10-15).

Time series models can be categorized as the stochastic macro-dynamic models. In addition, to some extent, time series modeling in epidemiological applications is restricted to ARIMA models [10-12]. Finally, there are some novel methods in this field, including artificial intelligence methods and time series of two parts [13-14].

Perone G. An ARIMA model to forecast the spread and the final size of COVID-2019 epidemic in Italy, Preprint in SSRN Electronic Journal, 2020 DOI: 10.2139/ssrn.3564865

Tabataba F, Chakraborty P, Ramakrishnan N et al. A framework for evaluating epidemic forecasts, BMC Infect Dis 2017: **17,** 345. https://doi.org/10.1186/s12879-017-2365-1.

Li Q, Guo N-N, Han Z-Y, Zhang Y-B, Qi S-X, et al. Application of an autoregressive integrated moving average model for predicting the incidence of hemorrhagic Fever with renal syndrome. The American journal of tropical medicine and hygiene 2012: 87: 364–370.

Ribeiro MHDM, da Silva RG, Mariani VC, dos Santos Coelho L. Short-term forecasting COVID-19 cumulative confirmed cases: Perspectives for Brazil. Chaos, Solitons & Fractals, 2020: 135, doi: 10.1016/j.chaos.2020.109853.

Jamshidi B, Rezaei M, Najafi F, Sheikhi A. The Prediction of COVID-19 Spread in Iran From 15 March to 15 April 2020, Iran Red Crescent Med J. 22(4); Online ahead of Print: e102822. doi: 10.5812/ircmj.102822.

Some additional changes:

Covid-19 is changed to COVID-19

Korea is modified to South Korea (in Conclusion)

Kind Regards,
Authors

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Revision (1)

Here, you can see the **Reviewers**, **Associate Editors** and **EICs'** comments from the beginning to the end of the revision process.

REFEREE: Reviewer | **Revision** (1) — 31 May 2020

Dear AE,
Updates are well done and this article is ready to accept and publish in the journal.
Thanks.

REFEREE: Reviewer | **Revision** (1) — 6 Jun 2020

Dear AE,
The authors have revised the manuscript based on the reviewer's comments. If the authors mentioned it to the application of this study in the current epidemic, it would be better.
Thanks.

REFEREE: Associate Editor | **Revision** (1) — 6 Jun 2020

Dear EIC
Based on the authors' answers to the reviewers' comments, the reviewer(s) have recommended publication.
Kind regards.

REFEREE: EIC | **Revision** (1) — 9 Jun 2020

Dear author
Your article has been accepted for publication.
Best Regards