Review of: "Qualitative Analysis of a Time-Delay Transmission Model for COVID-19 Based on Susceptible Populations With Basic Medical History"

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Potential competing interests: No potential competing interests to declare.

Review of the manuscript “Qualitative Analysis of a Time-Delay Transmission Model for COVID-19 Based on Susceptible Populations With Basic Medical History”

- Modify the title to better describe the study.

Suggested keywords: stability analysis, Time-Delay Transmission Model for COVID-19, susceptible population with underlying disease (rather than with basic medical history)

- In Section 1, clearly state the problem that the study would like to address.

Based on the literature mentioned in the manuscript, what gaps were not yet addressed by the past studies? What had motivated the authors to consider the proposed model?

- On page 3 first paragraph, note that simulation/s cannot verify the correctness of the theory.

On the same paragraph, explain further, possibly in a different section of the manuscript, how “shortening the incubation effectively controls the spread of the disease”. Also suggest ways on how this can be done in practice.

- On Figure 1 and Model 2, what about removing the E compartment? The τ in Model 2 represents the delay in infection, which is related to what the compartment E represents.

- Clarify the statement on page 3 regarding the incubation period and infectious force, as well as the meaning of the two susceptible populations.

- To better understand the model, explain the meaning of the expression

$e^{-d\tau}I(t-\tau)[\beta_1 S_1(t-\tau) + \beta_2 S_2(t-\tau)]$

and the effect of adding the delay. How is the delay related to the latent period (time between exposure to being infectious) and incubation period (time between exposure to onset of symptoms).

- On page 5, the F and V vectors not the same as the F and V after linearization. Use different labels.

- On page 6, proof of f(I) monotonically decreasing on (0,A/d) is insufficient. Why is there a need to show monotone decreasing f?

- Starting from page 8 onwards, there are multiple typographical errors on the subscripts of S.

Typographical error in page 8: “Rough” to “Routh”

Check entire manuscript for grammatical errors.

- Organize the theorems/cases better. Include assumptions in the statement of the theorems.

- Page 12, where was Δ used?

- On the numerical simulations, add units in the parameters to facilitate in the interpretation of the results. Explain the choice for small values of β_1 and β_2. Label in English the x- and y-axis in Figures 2 and 3.

Figure 2 does not seem to show stability and hence, in Page 16 first paragraph, does not seem to “prove” the existence of a non-negative endemic equilibrium point.

- There are missing values for the time delay values in the manuscript, page 16 second paragraph.