Reviewer's report

Title: Agent-based simulation for a weekend-extension strategy to mitigate influenza outbreaks

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Reviewer: Philip C. Cooley

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A review of the manuscript titled, “Agent-based simulation for a weekend-extension strategy to mitigate influenza outbreaks”, by Liang Mao

Background Comments and General Critique

This purpose of this manuscript is to assess a novel intervention for mitigating influenza transmission. The proposed intervention would extend the weekend for as many as 3 days per week. For this extended period both workplace and school activities would be curtailed – the argument being that by suspending the activities within these social networks a significant source of transmission would cease.

The investigation identifies 6 separate interventions that vary the length of closure and the pattern of closure. Thus, a three day closure has 2 possible patterns (i.e. Monday, Tuesday, Wednesday or Monday, Wednesday, Friday).

The model used for this investigation is an Agent Based model that is applied to the medium size city (slightly less than one million people) of Buffalo New York. The model has been previously published but it was necessary to review the cited publication to understand and assess the operations of the model for this study.

Four types of locations are represented defined as homes, workplaces, service places and neighbor households. The discussion that illustrates what constitutes a service place and neighbor household is an important detail that is lacking from the reviewed manuscript. An extremely important social network (schools) is not explicitly described in the submitted manuscript and it is left to the reviewer to determine if this is an oversight in the model itself or in the description of the submitted manuscript.

A review of the original paper that describes model details was necessary to obtain a more complete picture of model features. This additional review indicated that schools are treated as workplaces. A second set of descriptive information that is lacking that prevents a proper assessment of the submitted manuscript is the role and behavior within the model of asymptomatic cases. For example it is not explicitly indicated if the material in figure 3 represents clinical cases in the model or if the model results include infected but asymptomatic cases. The CDC reported cases would tend to only include clinical cases but
would also report an unknown proportion of ILI cases that are influenza. Also, no mention is made of the difference (if any) in infectiousness of symptomatic versus asymptomatic cases.

Also the infection rate in figure 3 is reported as 17.8% for the R0 = 1.4 epidemic and 26% for the R0 = 2.0 epidemic. The scale of these estimates suggests they must are symptomatic infections only.

Assessment

The central question posed by the author is an interesting flu containment mechanism that needs to be part of a larger discussion. The mechanism as described investigates extending the weekend behaviors into the weekday. Since weekday behaviors involve higher rates of contacts than weekend behaviors, the mechanism is expected to damp disease spread. The central issue to be determined is, does this mechanism have a long term containment benefit?

The experiments proposed to address the central question depend on a previously peer-reviewed flu transmission model. From this reviewer’s perspective a fuller description of model details that describes some important models assumptions (see section above) is an important addition that should be part of the discussion. (This is the first of 3 essential modifications to the manuscript that should be incorporated.)

The extant material cited by the manuscript that is used to parameterize the model is novel and a welcome addition to the agent-based modeling literature. The specific material that is not well specified is the definition of what constitutes an infection (i.e. symptomatic only) that is used in the text. (This is the second of 3 essential modifications to the manuscript that should be incorporated.)

In general the overall document and the experimental discussion in particular is clearly presented and well described.

However, a statement made on page 13 of the Discussion section that, “In practice the weekend strategies could be easily implemented,” is very debatable. Compliance to weekend extension would be a significant issue and should be investigated as part of an additional sensitivity analysis. This would set the stage for a more balanced treatment of this facet of the proposed containment mechanism. (This is the third of 3 essential modifications to the manuscript that should be incorporated.)

Still the material is presented clearly and the central question behind the paper is novel and worthy of additional discussion. For these reasons I endorse publication but further emphasize that the author add sufficient material to the model description to enable a thorough understanding of essential model details without having to review materials beyond the manuscript of focus.

Level of interest: An article of importance in its field

Quality of written English: Acceptable
Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests: 
I declare that I have no competing interests