Reviewer’s report

Title: Mathematical Modelling for Health Systems Research: A Systematic Review of System Dynamics and Agent-Based Models

Version: 0 Date: 17 Aug 2019

Reviewer: Roch Nianogo

Reviewer's report:

This study entitled "Mathematical Modelling for Health Systems Research: A Systematic Review of System Dynamics and Agent-Based Models" summarized the application of Systems Dynamics Model (SDM) and Agent-Based Models (ABM) in healthcare setting. The authors identified 28 research articles which simulated the impact of health interventions and policies on various health system settings including emergency and acute care and elderly care and long-term care. Overall, this study is a well-conceived and well-written comprehensive review. However, this article could be improved by addressing the following comments:

1. The 4 objectives of the study could be simplified in one objective. For instance, it could be something along the lines of: "to examine and describe the use of SDM and ABM models in modelling of healthcare systems?"

2. The authors summarized the use of SDM and ABM, two popular modeling methods that are used in health services research. Is there a particular reason/motivation for not including microsimulation models and Markov models and DES-only models, three other popular models used in healthcare settings? In other words, a detailed justification of the selection of SDM and ABM is needed in the introduction.

3. Likewise, the paper could benefit from additional explanation for the choice of simulation models applied to health systems. In other words, what is the gap that this paper is trying to fill?

4. The authors found studies that used both SDM and DES models, termed as hybrid models. A short description of the other simulation models including DES (and possibly Markov models and microsimulation models) in comparison to ABM and SDM should also be included to guide readers.

5. The table in additional file 2 titled "A.2.1 Summary of studies included at full paper review (SDM)" should be included in the main manuscript as it is part of the main results.
Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

Yes

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Unable to assess

Are the conclusions drawn adequately supported by the data shown?
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Yes

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I am able to assess the statistics

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