Reviewer’s report

Title: Vaccination against 2009 pandemic H1N1 in a population dynamical model of Vancouver, Canada: timing is everything

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Reviewer: Jacco Wallinga

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The manuscript explores three alternative vaccination strategies for the fall wave of pandemic influenza AH1N1 2009 in Vancouver, Canada: vaccination with the actual coverage (population coverage is 47%), vaccination with a uniform coverage (population coverage is 47%), vaccination of only parents and children (population coverage is 30%). These alternative vaccination strategies are evaluated with an age-structured compartmental transmission model. The results reveal that vaccinating only parents and children gives the largest reduction in infections, provided that the vaccine is available early on in the epidemic and that the vaccination campaign is short. The authors suggest that mathematical modeling in combination with real-time surveillance can help in setting goals and inform public health policy.

The manuscript is interesting as it shows how modeling has been used to assist decision making during the influenza pandemic. I would like to mention a few points where this manuscript can be improved.

Major compulsory revisions

First, it would be helpful to add a paragraph (in the introduction or discussion) that explains how these results were used in the decisions on vaccination in 2009. Were the strategies as presented here the only real policy options? Were the strategies proposed by the decision makers or by the authors? Which vaccination strategy was chosen for Vancouver?

Second, it would be essential to add a paragraph to explain how the results relate to other similar results that have already been published. Now the manuscript briefly mentions other work (“the results support the growing modeling literature claiming that the choice of vaccination strategy can have a substantive input on final attack rate.”) but it does not mention, cite or discus any article other than Medlock & Galvani (Science 2009). I would have expected to see references to e.g. Dushoff et al (PlosMed 2007), Wallinga et al (PNAS 2010), Keeling & White (Interface 2010) as these articles might help to explain the outcome that is reported here. The article that is the closest in methods and in results is, as far as I can see, Mylius et al (Vaccine 2008), and the article that opened up this field is Longini (Math Biosci 1978). The point is not to cite all these articles but to specify how this manuscript contributes to the existing literature.
Third, it would be good to expand the comparison of the model results with observations. Now there is only a check for a qualitative match of the observed age distribution (of reported cases?) and the simulated age distribution (of infecteds?) which provides a check on the right eigenvector of the contact matrix. The manuscript should provide a motivation why this single check suffices for the conclusions to hold; if there is no such motivation, it would be good to provide a comparison of the observed and simulated rate of growth or height of the epidemic peak (which would be a check on the reproduction number), and a comparison of the observed and simulated duration of the epidemic (which would be a check on the generation interval). The current choice of parameter values suggests that the generation interval in the model is 10 days. The reported generation times are around 2.7 days (give or take a few days). The large (fourfold) discrepancy between this duration of the generation interval in this model and observations should be discussed explicitly.

Minor essential revisions

Background
Page 4. In most regions on this planet there was no “first spring-summer wave”. Please indicate right away that this article focuses on Vancouver in Canada, otherwise the text doesn’t make much sense.

Page 5. What is the case definition? Without a case definition it is not clear what is meant by the per-case hospitalization and case fatality rates remain.

Methods
Page 5. Please provide the initial conditions for the model on September 1 2009.

Page 6. The latent period of 3 days and infectious period of 7 days suggest a generation interval of 10 days. This differs substantially from most published observations. Please discuss the implications of this assumption.

Page 6. Please indicate whether the vaccine is modeled as a leaky vaccine or as an all-or-nothing vaccine.

Results
Page 8. In comparing simulation results to observations, please indicate the case definition as used in the observations (reported cases?) and the case definition as used in the model (infecteds?)

Discussion
Page 11. “the growing modeling literature”: please make explicit which articles support the findings as reported here.

Table 1: mortality per 100,000. Does this mean mortality per 100,00 infections or per 100,000 cases?

Table 3: final attack rates. Does this refer to infection attack rates or clinical attack rates?
Level of interest: An article whose findings are important to those with closely related research interests

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