Reviewer's report

Title: The potential impact of expanding target age groups for polio immunization campaigns

Version: 2 Date: 20 December 2013

Reviewer: Bryan Mayer

Reviewer's report:

The narrative of the paper is clearer to me after reading the authors’ responses. The authors’ model is interesting and incorporates important features of polio transmission. The results indicate that expanding SIA coverage to older populations (under some conditions) combined with better targeting of under-vaccinated populations could be an effective strategy in eliminating/preventing polio transmission. However, how the success of this strategy depends on the combination of vaccinating susceptible individuals and boosting waned immunity is not elucidated.

I think the authors should consider the issues of clarity that were raised by myself and the other reviewer. I agree with the other reviewer that components of the discussion section feel out place (e.g., 2nd paragraph covering waning immunity contains some material that might be better suited for methods or results). Additionally, some components of the methods section could also be moved to the supplemental material. Lastly, the authors should be careful not to overuse the word “impact” as it provides no insight about the magnitude or directionality of the effect.

I have a few remaining comments below.

Major Revisions

1) The transition from infection to case is one of the main outcomes the authors explore. The distinction between infection and cases is not introduced in the main text but it is important and a key step of the model simulations (it is mentioned that the case-fatality rate is constant in the Tajikistan results). Further, the authors should also say explicitly if reinfections can become cases in their model.

2.1) Last sentence of Conclusion. What does interplay mean? The authors have demonstrated that the combination of expanding SIAs to older age groups and targeting under-vaccinated subpopulations is the most effective vaccination strategy but they have not explicitly demonstrated what this is attributable to. To prove that waning immunity plays an important role the authors should show that reinfections contribute meaningfully to their scenarios. Should I be assuming that all individuals in older age groups are not fully susceptible? One could argue that age-mediated contact rates (combined with coverage <100%) may reduce vaccination effectiveness and could explain difficulties in achieving eradication. This has been shown in models without waning immunity (see Rohani et al.,

2.2) In their response to my comment 6 in the previous submission, the authors provide a nice summation of the usefulness of expanded SIAs based on their results and generalizations of their scenarios. They should consider adding a similar sentence to their conclusion section.

3.1) Tajikistan Results: In the hypothetical Tajikistan scenario where the date of importation is later, the pSIA is less effective. The authors attribute this to R0 seasonality, which seems reasonable. However, the total incidence for the alternative scenario is presented as if it is identical to the historic scenario (based on Table 1) while the curves look different comparing Figure 1a to 1c (a ‘no response’ curve is not presented for comparison). I would expect the total incidence for the scenario with a higher R0 (at importation time) to be higher (in a no vaccination scenario) or at least different? I understand that oSIAs might eventually mitigate the outbreaks similarly.

3.2) Tajikistan Results-last few sentences: The authors state that there is a "significant reduction of approximately 50% of the number of cases" comparing the 0-5 pSIA to the 0-14 pSIA in the alternative scenario. Based on the table, two doses of pSIA for 0-5 year olds prevents 471 cases compared to 476 for two doses given to 0-14 year olds. This amounts to 10 cases compared to 5. These are a small numbers of cases accounting for about 2% of the total outbreak cases so I do not agree with the use of the word 'significantly' when it could be argued the effect is roughly the same. Furthermore, the next two sentences hinge directly on the presentation of this result. For comparison, the strongest effect occurred with the addition of the second 0-5 pSIA (471 compared to 430 prevented cases). It seems that the second dose is more important than the age expansion, and the authors should address this. Is this because of waning immunity in 0-5 year olds, partial boosting, or missed coverage?

3.3) The pSIA prevents paralysis cases but it is not clear to me if there is still asymptomatic infections occurring in the model simulation. Similarly, how does the 0-5 SIA compare to the 0-14 SIA in preventing total infections?

3.4) Last sentence of the Tajikistan subsection of the results section: I don’t think this sentence is very clear. What does “sufficient added impact” mean? Is this quantifiable? Comments 3.2 and 2.1 also apply here.

Minor Comments

4) Results, Northwestern Nigeria, 2nd paragraph, penultimate sentence: “upper bound of potential impact” should be written more specifically to address the outcomes the authors are measuring (prevented cases, quicker die-out) and what direction they are bounded by.

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