Author's response to reviews

Title: The risk of Type 2 oral polio vaccine use in post-cessation outbreak response

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Responses to reviewers

We would like to again thank both reviewers for providing us with comprehensive feedback that has contributed to a much-improved manuscript.

Reviewer #4 James Koopman:

General comments

Response to my numerous issues was appropriate. My minor caveats remaining are not sufficient to hold up the urgent need for publication of this work.

Prof. Koopman, we would like to thank you again for supporting the publication of this work, and for your work in providing constructive feedback that guided us to closing many of the gaps in the original manuscript. Below, we address the remaining comments individually, and copy any revisions to the manuscript or supplement that resulted.

Specific comments

The last sentence of the abstract is awkward and hard to understand

We have replaced the final sentence of the abstract with the following, which we hope is clearer (Lines 42-48): “It is unclear whether this risk can be mitigated in the long-term, as mucosal
immunity against Type 2 poliovirus declines globally. Therefore, current programmatic strategies should aim to minimize the possibility that continued OPV2 use will be necessary in future years: conducting rapid and aggressive outbreak responses where cVDPV2 lineages are discovered, maintaining high-quality surveillance in all high-risk settings, strengthening the use of the inactivated polio vaccine as a booster in the OPV2-exposed and in routine immunization, and gaining access to currently inaccessible areas of the world to conduct surveillance.”

The equation in line 124 seems to have a surplus of parameters. kP(j) would not seem to need both a k and P. Maybe for some purposes both parameters are needed. If so, there should be an explanation of why they are needed.

Both of these parameters are necessary - Pj represents the population of province j and thus has a defined scale, while k represents an overall scaling parameter on the migration rates. Essentially, the parameter k scales the absolute rate of individual migration; from there, the relative probabilities of migration to any possible destination province j are set by the population pj and the distance dij. We have added the following text immediately after the statement of this equation to clarify this. Lines 127-131: “Where Mij is the per-person, per-day rate of travel from province i to j, pj is the population of the destination province j, dij is the distance between the population-weighted centers of provinces i and j, and κ is a parameter that scales the total migration rate from all sources to all destinations. As Mij represents a per-person, per-day rate, a source population term (pi) that usually appears in the formulation of a gravity model is implied here.”

There are incomplete references, such as 8 and 9.

Our apologies for the mistake. We have completed both of the noted references, and reviewing the remainder revealed a couple of other mistakes in the references that we fixed as well: reference 8 accidentally appeared twice, as both 8 and 43, and DOI numbers were added where missing to a few other references.

Reviewer #5 Walter Orenstein:

The authors have addressed well this reviewers prior comments.

Thank you, Prof. Orenstein, for providing us with feedback that has substantially improved the content and presentation of this manuscript. Below, we address your remaining comments individually, and copy any revisions to the manuscript or supplement that resulted.

Just some very minor comments:

1) Line 124 - it would be helpful to have terms like "M" and "d" more clearly defined. Perhaps they can be added to Table 1.
We have added the following clarification immediately after the appearance of the equation in Line 124. Lines 127-131: “Where $M_{ij}$ is the per-person, per-day rate of travel from province $i$ to $j$, $p_j$ is the population of the destination province $j$, $d_{ij}$ is the distance between the population-weighted centers of provinces $i$ and $j$, and $\kappa$ is a parameter that scales the total migration rate from all sources to all destinations. As $M_{ij}$ represents a per-person, per-day rate, a source population term ($p_i$) that usually appears in the formulation of a gravity model is implied here.”

We would prefer not to add these to Table 1, which as it stands, presents only the model parameters that are varied in the modeling scenarios, and most of these terms do not. We hope that the additional lines clarifying the meaning of the terms in the equation will suffice instead.

2) Figure 1 says "mean" not "median" but line 130 mentions "median". Are both correct or should "mean" be changed to "median" of vice-versa?

Thank you for catching this. An earlier version of the code that generated that figure did use the median, but that was replaced with the mean, and we missed updating the text here to reflect that. Line 130 (now Line 135) has been updated to use “mean” instead of “median”.