Author’s response to reviews

Title: The hidden burden of measles in Ethiopia: how distance to hospital shapes the disease mortality rate

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POINT-TO-POINT RESPONSE TO EDITOR AND REVIEWERS

Editorial point:

In addition to the comments below, please make sure that Reviewer's 3 concerns are carefully addressed. In comment 3, a sensitivity analysis was performed to address this point; unfortunately, this was not explicitly stated within the main text of your manuscript. There is no reference to this analysis no further statement aside from the information in the Supplement material; please make sure to point the reader to this result in the main text.

Following the editorial suggestion, we have now better highlighted that a sensitivity analysis was performed on the assumption of homogeneous mixing, which consists in applying the same transmission rate to all age groups (3rd comment of Reviewer #3). The point was addressed by rewriting two paragraphs of the main text. The first one can be found in the sub-section “Sensitivity analysis” of the section
Methods, and it now reads as follows:

"We explored whether the assumption of homogeneous mixing, consisting in applying the same transmission rate to all age groups, can affect the model ability in reproducing the observed epidemiological patterns. To do this we fitted the time series of cases with a transmission model encoding age-specific contacts as recently estimated for Ethiopia by Prem et al. [21]. In this case, increased mixing in schools corresponds to higher transmission rate among school-age children."

The second one can be found in the sub-section “Measles transmissibility and seasonal patterns in measles circulation” in the section "Results", and it now reads as follows:

"Simpler transmission models with r=1, cS=0, or cS=0.92 and the one based on heterogeneous mixing by age were all ruled out by the DIC analysis. Best model performances were obtained with the baseline transmission model. Remarkably, even if based on the assumption of homogeneous mixing, the baseline transmission model well reproduced the number of measles cases observed over time, among different age groups: 0-6 years, 7-14 years and >15 years (details in Additional file 1). Interestingly, we found that considering different transmission rate by age groups, as a consequence of heterogeneous mixing by age, does not improve the model ability in reproducing the observed time series of measles cases."

Reviewer #1: I am satisfied with the changes made and thank the authors for their efforts to clarify the methods. I would raise one editorial point that may be addressed at the editor's discretion.

The Results section contains many speculative comments and connections/comparisons to other literature that are, in my opinion, better suited to the Discussion. As a general rule, I advocate for results sections only to present the novel results of the present analysis. For example L371 "The low impact of 2013 vaccination campaign with respect to past SIAs might have been influenced by problems in cold chain operations or vaccine maintenance [24] and the short duration of this campaign. However, the low impact of 2013 SIA may also reflect difficulties in immunizing individuals who escaped routine programs and past immunization efforts, especially through vaccination activities performed as a response strategy to ongoing epidemics [31]." makes an important point, but one that is speculative and in no way directly supported but he evidence presented here. Thus, this kind of point should be presented in the discussion.

Following the Reviewer #1 suggestion, we moved to the last section of the manuscript (which is now entitled “Discussion and conclusions”) all the text previously displaced in the section
“Results and discussion” that contains comments to obtained results and connection and comparisons to other literature.

Please note that section “Results” now presents only the results obtained within the present analysis.