Reviewer's report

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

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Reviewer: Wan Yang

Reviewer's report:

In this paper, authors aimed to estimate the burden of measles in the South West Shoa Zone of the Oromia Region in Ethiopia based on hospitalization and measles-related mortality data collected in Woliso Hospital. To do so, authors developed an age-structured transmission model for measles accounting for vaccination and hospitalization rate and used model outputs to estimate measles burden in the region including total numbers of infections, severe cases, and deaths. Assessing the underlying burden of measles in resource limited regions is important for devising more effective public health intervention measures to eliminate the disease therein. Therefore, such a study would be a welcome effort. However, as the methods were not clearly described, it was a guessing game for me as to how exactly the estimates were made. Please see comments/suggestions below.

1. One of the main findings was that hospitalization rate (or the likelihood of seeking medical attention when infected with measles) decreased with distance to the hospital. The differences were estimated based on a regression model. How the model was constructed was not clearly described. On the other hand, a single value (Ph) was used in the transmission model for hospitalization rate. If Ph differs by kebeles/woredas, shouldn't different values be used?

2. Transmission model: It reads like the model was fitted to data for all kebeles/woredas combined. But then authors wrote that "Estimates of the number of infected measles cases by kebele/woreda as provided by the transmission model were used as offset." (Lines 187-188). This is confusing. In addition, the estimates were based on outputs from the transmission model. This seems quite circular.

3. Transmission model: An age-structured SEIR model was used. But the same transmission rate was applied to all age groups. Differing transmission rate by age group is a major reason for using an age-structured model. In particular, for measles, increased mixing in schools corresponds to higher transmission rate among school-age children. Therefore, I would suggest authors consider in the model the difference in transmission rate by age group. And to reduce the number of parameters in the model, perhaps divide the population into fewer age groups (i.e. not 1-yr per group).
Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

No

Does the work include the necessary controls?
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Not applicable

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