Reviewer's report

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

Version: 0 Date: 08 May 2018

Reviewer: John W Glasser

Reviewer's report:

The authors studied an important problem, the impact of access to healthcare on mortality due to measles in Ethiopia. They believe that hospital-based care reduces mortality due to severe disease, and observe that hospitalization rates for comparable conditions vary inversely with distance to hospital. Because reported morbidity and mortality are based on hospital records, moreover, the authors argue that there is a hidden burden of measles and deaths attributable to measles in Ethiopia.

The authors argue that disease incidence of is the same throughout the hospital's catchment area, but rural and urban populations typically differ in density, age distribution, vaccination programs, …, all of which affect incidence. The authors mention migration to urban areas during the dry season, when school is in session, but not its possible consequences. Moreover, the assumption that all severely ill people die, absent hospital-based care, is a worst-case scenario.

Other relatively minor comments and questions:

The dependent variables in the authors' spatial regressions seem to be rates and proportions. Negative binomial models are fine for counts, but might Poisson or logistic models be more appropriate?

The authors' native language doesn't always translate well into English. For example, in the first paragraph of results and discussion, what the authors mean by "… in correspondence of …" is unclear. Are they suggesting causal or temporal connections? Later, by "compliant," I believe that they mean "consistent," but am unsure. Similarly, they might search for "occurred" and replace with "occurring" throughout the manuscript.

Is the low estimate of SIA coverage consistent with the impact apparent in figure 1?
Supplement

In the equations, hospitalization doesn't seem to affect the force of infection. Infection-control protocols require isolation of infectious people.

H(t) is defined as an integral over age in the equations, but used as though it were an integral over time in the subsequent text.

Quite a bit of information about mixing is available for use in age-structured models. Might the authors evaluate the impact of their assumption about mixing?

In baseline scenario 1, isn't $p_h$ a fraction, versus rate? In 3, please be consistent (i.e., use either continuous or discrete notation).

What are the pink bars in figures S2 and S3?

Under sensitivity analysis and additional results, some of the tabulated quantities aren't parameters. Also, what formula was used for $R_0$?

**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?**
If not, please specify which controls are required in your comments to the authors.

Not applicable

**Are the conclusions drawn adequately supported by the data shown?**
If not, please explain in your comments to the authors.

Yes

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