Reviewer's report

Title: Malaria hospitalization between 1999 and 2008 across Kenya

Version: 1 Date: 21 September 2009

Reviewer: Patricia Graves

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This manuscript describes important and novel information on incidence of paediatric admissions for malaria in Kenya in a sample of sites over time. The results are valuable especially for showing that there is not a consistent decline in admissions across the country in the last ten years. The increased gathering and use of these kinds of population-adjusted clinical data is to be strongly encouraged. The collection of data from registers and definition of hospital catchment areas using actual data on patient’s homes is a thorough approach to estimating incidence, although hard to replicate on a routine basis. Appropriate imputation and adjustment for rainfall and for all cause admissions to account for changes in utilization lend validity to the data on malaria specific admissions and the trends over time.

- Major Compulsory Revisions

1. I find that the attempt to impose the predictions of transmission intensity from the prevalence model (described under “defining parasite prevalence within the catchment area” on page 6) detracts from the presentation of this paper’s important findings on incidence and trends. Those estimates of infection risk derived from the prevalence model perhaps represent potential transmission or vulnerability in the absence of control measures, but in this paper you are presenting rich empirical monthly data over a lengthy time period that should speak for itself. The data could even be used (especially if you had more detailed data on control measures applied) to validate the prevalence model. The admissions data may be as useful as, or even better than, the prevalence model as an indicator of actual (rather than potential) transmission intensity. It seems preferable to me to use the incidence data here to inform the decision about whether the areas around each hospital should be described as low, medium or high intensity transmission, and whether that has changed over time. Therefore please downplay the prevalence model predictions and speculations throughout the paper. This would include:

   a) rewriting the first two paragraphs of discussion to clearly distinguish the incidence intensities and trends found in this study from the confusing information interspersed there from the prevalence model predictions.

   b) removing or qualifying all references in text to sites as being of “low transmission intensity” (para 2 results page 8); “exceptionally low transmission areas” (para 1 discussion page 10); “moderate to low transmission intensity” and “predominantly high transmission” (page 11) etc., unless they are derived from
the estimates of incidence in this study.
c) editing abstract results and conclusions as I am not convinced that different
patterns of decline related to ‘transmission intensity’ have been demonstrated
and in discussion it is only regarded as a ‘suggestion’ (middle of page 13). Some
of the highest incidence sites (using estimates from these data, not other models)
show a decrease.

- Minor Essential Revisions
The author can be trusted to make these. For example, missing labels on figures,
the wrong use of a term, spelling mistakes.

1. Please order the 17 hospital sites consistently throughout. That includes the
supplementary material. For example, Table 1 in the main manuscript starts with
Busia, Bungoma, Homabay….. (the latter spelled as two words in text and other
tables). Tables in Supplementary info are in the same order. However Figure 1
starts in a different order with Bungoma, Busia… The maps in supplementary
info 1 are in the order Bondo, Kisumu, Homa Bay, Siaya, Busia, Bungoma. This
is very confusing to the reader trying to put the pieces together so please make
them consistent and describe them in same order in text (e.g. page 4).

2. In paragraph 2 of results please describe the groups of hospitals using the
same categories as in the tables and maps i.e. “Western/Lakeside”, “Highlands”
etc.

3. Figure legend to Fig 2 is not clear at all. I had to refer to supp 2 tables to work
out what the different coloured lines in left panels referred to. Please expand.

4. The description of defining health facility catchment population on page 5 is
repeated in the Supp 1, but that has more details, suggesting that the summary
in text is not quite correct (doesn’t talk about the radius for example but only the
hull polygon). Please give a consistent description in one place or the other.

- Discretionary Revisions

1. It would be interesting to more directly compare the admission incidence
estimates described here with predictions from the prevalence model, rather than
trying to impose categories of transmission intensity from the prevalence model
onto the sites. Because of change in incidences over time I suggest doing the
comparison at the beginning and end of the time period.

2. I would be interested in more discussion of the painstakingly derived absolute
incidence estimates – how they relate to other countries for example, and the
differences in these incidence estimates between the sites and possible reasons
for that. The incidence of admissions for malaria at some of the Arid/Semi Arid
sites (Supp info 2 table 2) are as high or higher than the Western/Lakeside sites,
for example. Regarding changes over time, can you add any information on
differences between the sites in when ITN coverage was scaled up or drug policy
changed?

3. While actual rainfall data is used, sometimes the stations are located relatively
far from the hospitals or had missing data. Presentation of the trends over time in rain would be interesting. Use of satellite derived rainfall estimates (averaged over the catchment areas) would add to the analysis.

**Which journal?**: Appropriate or potentially appropriate for BMC Medicine: an article of outstanding merit and interest in its field

**What next?**: Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

**Quality of written English**: Acceptable

**Statistical review**: Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests**: I declare that I have no competing interests