Reviewer's report

Title: Modeling the public health impact of malaria vaccines for developers and policymakers

Version: 2 Date: 15 May 2012

Reviewer: Hope L Johnson

Reviewer's report:

Review of:
Modeling the public health impact of malaria vaccines for developers and policymakers
Julia K. Nunes et al. BMC Infectious Diseases

The reviewed manuscript describes a tool that can be used by policymakers and suppliers to make decisions regarding the potential use of a malaria vaccine. Utilizing user inputs, the tool provides projections on the supply and demand of malaria vaccines, the public health impact, implementation costs and possible financing requirements. A scenario of routine infant immunization demonstrates functionality and potential outputs of the tool and their importance for public health decisions regarding development and implementation.

Major Compulsory Revisions

1. While functionality is an important issue in modeling demonstration of this alone does not typically warrant publication; performance is critical for potential users and the scientific community and the authors do not present any information on this. A comparison of how similar model inputs perform in another tested model, such as LiST, for example, is essential. Without this, the reader does not have a benchmark to compare the performance of the model. Plausibility checks for assumptions and outputs are imperative. If the purpose is only to make the scientific community aware of the availability of and functionality of the MVM, then this may be better suited to a Commentary.

2. Use of a more realistic demonstration scenario, such as with use of input values consistent with the latest RTS,S results, would be more useful than an ideal scenario which may never come to fruition because this would not be useful to a policymaker (intended audience). A realistic demonstration scenario of how the vaccine could be rolled out and its impact over the first 10 years of use would use a 50% efficacy. This discrepancy should be stated earlier in the manuscript and again its impact should be understood early on.

3. Need to present the assumed disease burden impact model and source for assumed model values (e.g. disease incidence, CFR, etc.) as this is critical for understanding how the model works and potential issues to consider in terms of both functionality and performance. Does the model take into account, for example, general trends in demographics and the declining under-five mortality
rates which occur irrespective of a malaria vaccine?

4. All model assumed values should be provided with respective sources and rationale for use, even for demonstration purposes, to allow the reader to make more informed assessment about the way the model works and plausibility of the inputs and outputs.

5. The impact of the introduction assumptions in the demonstration scenario is not clear. For example, the fact that all countries that introduced Hib vaccine past 2003 were assumed to accelerate malaria vaccine introduction by two years implies that all 40 African countries introduced the malaria vaccine in the first eight years of use. It is understandable to not specifically list the assumed introduction dates for each country; however a figure that shows the distribution of the countries across years 1-10 would be helpful in understanding its implications. Second, it is mentioned briefly in the discussion that these assumptions were made for demonstration purposes. But an assumption such as Nigeria introducing after five years (as the authors note is against previous experience) would have a large impact on the findings. A better defense is needed as to why year 5 was chosen as it appears as though this was just to show greater impact. A mention of the level of impact this assumption has (as opposed to introducing in year 8 or not in the model) would improve the analysis.

Minor Essential Revisions

6. In the Introduction, LiST is described as currently being extended to individual country use. Countries have been trained to use the tool for at least four years now.

7. What is the base year for the demonstration scenario in terms of population and other inputs?

8. If only one discounting rate is used, 3% is the most common. Why was 5% used instead? Also, please mention what year the dollars are and the baseline they were discounted back to.

9. Given the computing requirements, need for knowledge of translating disease burden information into EIR, the fact that this model is focused on a single disease and intervention, it is highly unlikely that the intended user is a national-level policy maker in a malaria endemic country. Based on the inputs and design of the model, authors should indicate that the intended audience is for vaccine developers and regional and global policy-makers and then state that the functionality would also allow for country-level use.

10. Need to provide the rationale for the selected EIR categories as the log-fold difference between categories may not be intuitive to the reader.

11. Is there any evidence to support assumptions about the proportion of population by EIR category and how this may change over time (e.g. assumed linear change on page 15)? This would be useful for the user/reader.

12. In the Discussion section, for the implementation costs and financing module it would be helpful to discuss how the output of costs per DALY/death/case averted translates into terms of affordability or cost-effectiveness or compares to costs associated with other relevant interventions (e.g. other new vaccines or
other malaria interventions).

13. Authors should also address the degree of flexibility of the model to incorporate alternative measures of disease transmission as this is an evolving field.

14. How does the model handle changes in other malaria (e.g. ITN use) and malaria-relevant interventions (e.g. improved nutrition)? Presumably one could adjust the disease transmission portion of the model to account for this, but some statement to this effect should be provided as policy-makers are typically never contemplating only one type of public health solution.

Discretionary Revision

15. The reference to Figure 2 on page 11 is confusing as it comes right after the description of benchmarking introduction and scale-up to Hib. As such, it sounds like this is a graph of Hib coverage over time.

16. Page 15 – The choice of scenario would be made clearer if it was corresponded with a scenario number from Table 4.

17. The potential occurrence of decreased use of other interventions after the introduction of a vaccine due to lowered perception of risk is not addressed. This should either be a scenario or mentioned in the discussion.

18. Immunization of pregnant women may have large public health impacts and should be addressed.

19. May need to translate some of the model language for more general consumption. For example, we don’t typically think of duration of protective immunity as a half-life.

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

'I declare that I have no competing interests'