Author's response to reviews

Title: Quantifying behavioural interactions between humans and mosquitoes: Evaluating the protective efficacy of insecticidal nets against malaria transmission in rural Tanzania

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Summary of changed to BMC Medicine manuscript number 1322645668102174

G.F. Killeen et al.

Justification for BMC Medicine:

The revised version of this manuscript now not only consolidates the immediate application of the approach to estimation of the individual protection of ITNs, it also uses the latest malaria transmission models to predict likely consequences of scaling up such measures for community-level transmission and direct comparison with almost any intervention which can reduce malaria transmission intensity.

Reviewer 1: Dr Kim A. Linblade

General: We have now strengthened and extended the application of the results to enable simulated comparison of ITNs impacts on exposure of users and non users with alternative larviciding strategies (See new figure 5).

Major Compulsory Revisions:

1. We have extended the analysis, results and discussion to feed this evaluation into recently developed malaria transmission models which enable simulated comparison of a wide variety of interventions in terms of their potential to reduce exposure to malaria transmission (See new figure 5 and associated text)
2. We accept this point and have completely reformulated the terminology and mathematical notation accordingly. Nevertheless, further suggestions for improvement are very welcome.
3. The reviewer is correct and we thank her for her keen observation. Our mistake was with the description of the equation in the manuscript but the original excel version (now a supplementary file) remains correct so the results stand as per the last version. The revised equation (2 in the first draft, now 3) now corresponds to the reviewer's suggestion. Note also that the terms Hazard, Risk and Vulnerability and pseudo-equation have been replaced with more conventional entomological and epidemiological terms, harmonized with our recent and closely related transmission modelling article (Reference 19) but the results remain identical to the previous draft.
4. The extended manuscript now extrapolates the impacts of individual protection on population-wide scales and simulates the likely impacts of such up-scaling using appropriate transmission models.
5. See 4 and 1 above.

Minor essential revisions:

1. Implemented.
2. Agreed-this has now been clarified to specify individual protection in terms of the difference between a user and a non-user.
3. The terms Hazard, Risk and Vulnerability and pseudo-equation have been replaced with more conventional entomological and epidemiological terms, harmonized with our recent and closely related
transmission modelling article.
4. This term has now been replaces as per 3.
5. Indeed-corrected.
6. Corrected

Discretionary Revisions:
1. This data and the model itself are now available in an excel spreadsheet as an online supplement.
2. Agreed: the manuscript has been extensively edited to replace this term with the terms "efficacy" and "adherence".
3. The issues of net coverage and treatment levels have now been explicitly addressed in both the study site description and the discussion.
4. Namwawala is of particular relevance because it is sufficiently characterized to allow transmission modelling to a degree that is not possible in any other site we are aware of. These more powerful transmission models (Ref 19) are now integral to the interpretation and utilization of these results so this point has now been emphasised.
5. Agreed-Corrected.

Reviewer 2: Dr. Tom Burkot

General: The issue of minimal levels of treatment and selection pressure are now addressed more explicitly. Furthermore, both the limitations of the existing analysis, which was applied retrospectively to pre-existing data, and the opportunities for improvement have been expanded upon.

Major Compulsory Revisions:
None

Minor essential revisions:
1. The modelling terminology has been extensively revised and clarified and this section now begins with the text "Although EIR is the product of both the biting rate and sporozoite infection prevalence of vector populations, the latter is only reduced by community-level impacts of malaria interventions [19, 26]. Personal protection is therefore estimated purely in terms of biting rates and the impact that measures such as ITNs have upon them."
2. Agreed. We cannot do anything about this retrospectively but have now highlighted these as opportunities for improvement in future applications of this approach.
3. The issues of net coverage and treatment levels have now been explicitly addressed in both the study site description and the discussion.
4. Yes, the biting rates were calculated to compensate for the quarter of each hour which is used for rest. This is now explicitly outlined in the methods.
5. Indeed-corrected.
6. Now clarified to explicitly consider those with a functional ITN versus those with no net.
7. A percentage is a unit which can be applied to a dimensionless proportion.
8. a) This terminology has been comprehensively replaced and harmonized with existing entomological and modelling terminology. b) Removed, c) Removed, d) Comprehensively edited, e) Now explicitly outlined in the study site description, f) corrected and harmonized throughout the text

Discretionary Revisions:
1. We have expanded on this text briefly.