Reviewer’s report

Title: Quantitative assessment of behavioural interactions between humans and mosquitoes: Application to measuring the protective effectiveness of insecticidal nets in Tanzania

Version: 1 Date: 19 July 2006

Reviewer: Tom Burkot

Reviewer’s report:

General

The manuscript presents a novel approach to determining the protective efficacy of bed nets by modeling human behaviors that expose individuals to biting mosquitoes together with estimates of mosquito biting density both indoors and outdoors. The authors postulate that this approach can be adapted to evaluate protective efficacy of other interventions in a cost effective way prior to the initiation of more costly and intensive clinical trials as well as changes in mosquito behavior that result from implementation on new interventions.

I like the approach of the technique but I am not convinced that the study design (comparing one site with a different site) allows us to make any conclusions regarding whether any changes in mosquito behavior following the introduction of ITNs occurred (or didn’t occur in this case). More information on the number of people sleeping under untreated and insecticide treated bednets in 1997 and 2004 are needed to determine if sufficient pressure on the mosquito population occurred to expect a change in behavior.

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Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

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Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

The model includes defined the actual risk of malaria exposure by the vulnerability (V) of residents to infectious mosquito bite, yet there is no mention in the methods of any determination of the proportion of the biting mosquito population with sporozoites.

Details on how human behaviors were measured are needed: How many people were interviewed on their sleeping habits? Were differences in behaviors of people sleeping under ITNs, untreated bednets and no nets observed? Were the people interviewed regarding the sleeping habit of children? Adults? Both? This also raises the question of how the protective efficacy of the 1997 site was determined if the survey of human behaviors occurred during recent surveys. Were the human activity patterns assumed to be constant between 1997 and 2004 or were the results of recent human surveys on behavior used to analyze the 1997 data?

What were the observed low levels of insecticidal treatment (last sentence of background)? More details on the proportion of the human population sleeping under ITNs in 1997 and 2004 would be useful.

Mosquito collections were made for 45 min/hr. Am I correct in assuming that the biting rates were adjusted for full 60 minute collections? The calculations of mosquito biting densities could use more detail for clarification.

The Y-axis on figures 1 and 3 should read mosquitoes per person per hour. As it now stands, the labels on the x and y-axis are contradictory.

In figure 3, does ITN non-user include both people using an untreated bednet and people without bednets?

The y-axis of figures 2 and 4 is contradictory a proportion is not the same as a percentage.
There are a number of confusing sentences and terms including the following:

a. What is a “pseudo equation”?

b. The phrase, “necessarily simple multiplicative relationship in reality” is confusing - please clarify/define.

c. What is a “lucid quantitative comparison”?

d. The paragraph entitled “Estimating the personal protection provide to users by bednets” has several confusing sentences (the first and third)

e. In the first paragraph of the “Discussion” the authors state that only a minority of users in the Kilombero Valley have nets that are insecticidal, yet the “Abstract” compares before (1997) to after (2004) implementation of ITN promotion. If only a small proportion of the nets are ITNs, it is difficult to justify a title on “measuring the protective effectiveness of insecticidal nets in Tanzania”. What proportion of the nets in 1997 and 2004 were ITNs?

f. The terms “bednet” and “ITNs” seem to be used interchangeably (or so it seemed to me). The authors should clarify when a bednet is an ITN and when it is not.

Discretionary Revisions (which the author can choose to ignore)

In the second paragraph of the “Methods”, it is stated that mosquitoes were classified as being fed, unfed part-fed, fed, gravid “was this information incorporated into the model? If not, why is this detail in the “Methods” given? 

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

What next?: Accept for publication in BMC Medicine after minor essential revisions

Quality of written English: Needs some language corrections before being published

Statistical review: No

Declaration of competing interests:

I declare that I have no competing interests™