

Reviewer 2

Long-lasting insecticidal nets (LLINs) have been a major contributor to malaria reduction in sub-Saharan Africa over the past two decades. The development of pyrethroid insecticide resistance threatens the effectiveness of these LLINs, especially when holes develop in the nets and the insecticides degrade. This paper reports the physical durability of LLINs containing three classes of dual active ingredients compared to standard pyrethroid-only nets (Interceptor®). Approximately 40,000 nets of each type were distributed to various villages in Tanzania in February 2019, and a total of 3,072 LLINs were interviewed and net observed 6, 12, 24, 30, and 36 months later. Comparing the survival status of the net and the integrity of the fabric, it was found that the net containing dual active ingredients was physically vulnerable, and it was reported that the net's effectiveness was less than the three years recommended by the WHO.

The scale of the observations was large enough, the results were clear, and I think the data is important and worth publishing.

There are just a few points to be concerned about. I do not think this paper should be published unless these questions are dispelled.

Figure 2. Number of household and study nets enrolled for follow-up.

The biggest question is the numbers shown in Figure 2. It looks that the number of observed and unobserved bed nets is similar among the four groups.

These numbers are not supposed to be linked between groups, so I feel this is intentional. When it comes to managing large amounts of data, especially data that can be manipulated arbitrarily, such as from questionnaires, I think it is necessary to take the time to randomly compare the raw data with the data used for analysis to check the soundness of the data. I think it is important to check what kind of consideration was or was not given to the soundness of the data in this study. Also, if consideration has not been given, I think the authors should check whether the data is correct.

Response: The number are different between each arms e.x. at 6 months the number observed were 590 for interceptor while it was 649 for interceptor G2 and 642 for Royal Guard. This number are based on observation in the field and are independent. If some are close or similar this is by chance. The number observed decreased over time also as nets are discarded and the different net are not discarded at the same speed as some as Olyset plus are getting torn and thrown away quicker than the other groups.

Figure 3

I think it would be easier to see Figure 3 if it were shown as a bar graph like Figure 4. Not a pie chart.

Response: Correction has been made by replacing pie chart by bar graph.

I also think that what the authors want to show is the proportion of discarded mosquito nets, so wouldn't it be better to use a noticeably different color? Isn't there a reason why there's no need to differentiate between items that have been given to someone or are being used somewhere else?

Response: Nets given away to relatives or other (now merged together and the new variable is Given away) could result from households having more bed nets than their immediate needs, leading them to share with others who may have fewer or no nets at all. It is not anticipated that these nets will be returned to the original house. On the other hand, nets used in other locations might be taken by family members traveling to school or using them during farming activities, which could extend over a week. These nets may returned in the households later.. Net sold was not included in graph because it has less than 0.5% per each time point, but now added for clarity.

Isn't it okay to use a similar color for similar reasons? If what we want to show here is that mosquito nets are physically damaged and are no longer being used or thrown away, they should create a graph that makes it easy to see that. Also, if ABCDE simply indicates 6, 12, 24, 30, and 36 months later, using ABCDE would actually make it more difficult to understand. Wouldn't it be better to just show the number of months?

Response: Corrected in bar graph (see line 275)

Discussion

This argument is a bit too simplistic, and I think it is necessary to point out and discuss the contradictions with previous research reports. Cited References 15 to 18 are all published in well-known journals and evaluate the effectiveness of bed nets containing multiple active ingredients when used outdoors, compared to bed nets containing only pyrethroids. Some papers have concluded that it is also economically effective. These papers evaluated the effectiveness of bed nets for a shorter period of time than 36 months, but they all reported that they were effective for more than a year. Since this paper reports on the short lifespan of bed nets, it is necessary to consider why this is so, if it differs from previous data.

Response. See page line 345 -350

Furthermore, the WHO recommends that bed nets last for 3 years, and rather than criticizing them for not meeting that requirement, the cited papers 15-18 all did not follow up for 3 years, so the WHO recommends 3 years. I think we need to reconsider the year period. I think the material of the mosquito net will change along with the type of drug used. Regardless of whether bed nets containing multiple active ingredients are ineffective, the lack of discussion beyond reporting the physical weaknesses of bed nets that are reported to be effective gives the impression that something has been overlooked

Response: The resilience of bed nets encompasses a range of factors, including user practices, material composition, community involvement, the bioavailability of insecticides, and their implications for the national malaria vector control efforts. These elements have been thoroughly examined in the introduction section. We also look bio-efficacy of these net in semi-field trial but this is different paper. see pre-print for bioefficacy in the link “ doi: <https://doi.org/10.1101/2023.10.21.23297289>” but also bioefficacy using colony mosquitoes exposed in cone and tunnel test has been done as separate paper.

1. World Health O, Scheme WHOPE. Guidelines for laboratory and field-testing of long-lasting insecticidal nets. Geneva: World Health Organization; 2013 2013.