

## The use of Insecticide-Treated bed Net in a semi-urban community in south-south, Nigeria.

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### Abstract

**Background:** Insecticide-treated bed net (ITN) is currently being rigorously promoted as a tool for malaria control. This study was to find out whether the buyers of the ITN sold by a social marketing programme in a semi-urban community in south-south Nigeria, did so because they wanted to prevent malaria or control the nuisance of mosquito.

**Methods:** A cross-sectional study design was used to assess adherence. The proper deployment of the nets was directly observed in the houses of the buyers just before dawn, between March and April, 2004, when the night-time temperature is hottest and the nuisance of mosquito is at the lowest in the community. Study participants were also asked, in an unstructured interview, possible means why the ITN might not be deployed.

**Results:** Out of the 268 ITNs bought by the households visited, only 49 (18.28%) of the nets were found to be properly deployed during the monitoring visit. Most of these nets (53.06%) were occupied by under-five children that slept with their parents on bed. The probability of proper deployment of the net was poorer when users slept on mat, than when they slept on bed ( $P < 0.05$ ). The reasons given why under-five children might not use the net include: hot night time temperature (63%), no mosquitoes (43%) and "forgot to put up the net" (33%).

**Conclusion:** This study showed that despite the rigorous promotion of ITN for malaria control, its use is still determined mostly by the abundance of mosquitoes and night-time temperature.

**Keywords:** Insecticide-Treated bed Net, social marketing programme, proper deployment.

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### INTRODUCTION

The effectiveness of Insecticide-Treated bed Net as a tool for malaria control has been proved even in areas with high, year round transmission<sup>1</sup>. A meta-analysis of published studies carried out in 1995, indicated that ITN might reduce the incidence of *plasmodium falciparum* infection by 50%.<sup>2</sup> Presently, ITN is believed to be the most efficacious of all the currently feasible interventions

for malaria control in Africa<sup>3</sup>. Its cost-effectiveness in preventing morbidity and mortality is comparable to that of measles vaccination;<sup>4</sup> and is generally found to be easier to implement and better accepted by the local communities than most other control measures<sup>5</sup>.

The ITN is most effective as a tool for malaria control when it is properly deployed every night by users<sup>6</sup>. The net is said to have been properly deployed when it is tucked under the sleeping mat (or mattress) or made to touch the ground all round. Proper deployment maximizes the contact between host-seeking mosquitoes and the insecticide-treated fabric; and minimizes the contact between mosquitoes and potentially infective hosts. The result of a parallel analysis modeling the numbers of blood-fed indoor-resting mosquitoes showed that the houses with ITN deployed had significantly fewer fed mosquitoes than houses with no ITN deployed<sup>6</sup>.

However, several studies have shown that the use of ITN in several communities in Africa is driven mainly by the need to control the nuisance of mosquitoes<sup>7,8</sup>, especially as most people believe that malaria is caused by multiple factors, many of which are difficult to prevent<sup>8,9</sup>. This means that the use of the nets is likely to be reduced when the mosquito nuisance is low<sup>7,9</sup>. This is a serious concern for the use of ITN for malaria control, since most of the nuisances caused by mosquitoes are due to the activities Culex mosquitoes. The Anopheles mosquitoes the vector for malaria, especially the *A. gambiae* and *A. funestus* species that are the main vectors in Nigeria<sup>10</sup> cause little or no nuisance because they are most active between 10pm 1am when the malaria vulnerable individuals are likely to be soundly asleep<sup>10</sup>.

Social marketing projects for ITN are set up to promote the use of the nets for malaria control<sup>11</sup>, and marketing activities especially Information Education and Communication (IEC) materials are usually designed to achieve this<sup>11</sup>. It can therefore be assumed that buyers of the nets sold in these projects did so to prevent malaria. This study is to test the validity of this assumption. It is to find out whether buyers of ITN sold by a social marketing project established in 2003 in Egbema a semi-urban community in Rivers State, south-south

Nigeria, did so because they wanted to prevent malaria or control the nuisance of mosquito.

## MATERIALS AND METHODS

**Study population:** Egbema is a community of about 47,000 inhabitants<sup>12</sup>. Though, it is one of the leading oil-bearing communities in Nigeria, most of her populace are still subsistence farmers and fishermen. The most common type of house in the area is built with cement blocks and corrugated iron sheets. Most of the houses have sealed eaves, and have windows with insect screens, though the screens are often poorly maintained. Most people in the community live in family houses; and an average household with under-five children resides in one room. Sleeping accommodation differs by age. Children less than three years, sleep with their parents often on a bed, while older children usually sleep on the floor with mat.

Like most communities in south-south Nigeria, malaria is holoendemic in the study area. Transmission occurs through out the year with seasonal peaks corresponding to the rainy season in the area<sup>10</sup>. This in recent years, starts from April and ends in October. Annual rainfall averages 2200mm and daily temperature ranges from 19 °c and 33 °c. Most transmissions are due to *Anopheles gambiae*, *Anopheles funestus*, and *Anopheles melas*<sup>10</sup>. The formative research of the social marketing project revealed that the use of bed net in the community was common up to the 1980s; now bed nets are seen as old fashion, rarely used except in the farm settlements and over baby cots, where they serve for mosquito nuisance control. However, none of these nets was treated with insecticide.

**The educational activities of the social marketing project:** The social marketing project was established to provide affordable ITN for malaria control to members of the community. The specific objectives of the social marketing project were to increase awareness and use of ITN for malaria control, encourage the re-treatment of the nets; and promote the year-round use of the net especially amongst under-five children and pregnant women. Therefore, all the IEC materials designed for the project bear messages that emphasize the ITN as a tool for malaria control. The key messages in the IEC materials were: (1) A clarification of the link between mosquito and malaria, (2) The peak biting period of malaria-causing mosquitoes, (3) The effectiveness and safety of the insecticide-treated bed net compared to other malaria and mosquito control measures, (4) Sleep under the insecticide-treated net at all times, and tuck in the nets to keep mosquitoes from entering, and (5) Correct and consistent use of the insecticide-treated bed net to prevent malaria and its complications.

The strategy used for the social marketing emphasized face-to-face interactions. Mothers attending the family health clinics in the public health facilities that serve the community were spoken to, and the product demonstrated to them. Mass communication campaigns were also organized using door-to-door marketers, posters, informational leaflets, displays of mounted bed nets, recorded messages from influential members of the community, and the town crier.

**Data collection method:** The social marketing project kept a list containing the names and addresses of all buyers of the nets. At the time of the purchase, buyers were told that the project was interested in finding out if the nets were effective, and would be visiting them to collect information. They were also told that some of the visits might be at night, but were not given prior information of the specific date of visit. Only those that gave consent were visited. The presence and use of the ITN were monitored through direct observation by field staff during the early morning hours (5.00 6.00am). The monitoring was carried out between March and April 2004 (just before the commencement of the rainy season), when the temperature is hottest, and the nuisance of mosquitoes is lowest. The timing of the monitoring visit was deliberate, because it is assumed that all those that properly deploy the net during this period would have done so mainly for malaria control<sup>17,8</sup>. The visit was carried out in clusters, and in a random fashion to ensure that the users won't predict the day of the visit. During each visit, the field staff notes:

- The number of ITN bought by the household
- The number of the nets properly deployed during the visit
- The age-group of the people using the nets
- The sleeping arrangement of the household
- The house type and level of ventilation in the room; and
- Why under-five children might not use the net. This last question is a hypothetical question asked even when the children in the household were seen sleeping under the net.

**Data analysis:** The data collected were manually checked for consistency and completeness; and then analyzed using a pocket calculator. Summary measures were calculated for each outcome of interest. Differences are tested for statistical significance using Chi-square test, with the appropriate continuity correction, and P-value of 0.05 or less considered as significant. The percentage of users with properly deployed nets was calculated for two age groups:

Under-five children, and all other individuals that are above five years of age.

**Ethical clearance:** The approval for the study was obtained from the Ethical Review Committee of the University of Port Harcourt Teaching Hospital, Port Harcourt. Informed consent was obtained from buyers of the ITNs after the study was explained in the local language.

**RESULTS**

The social marketing project sold a total of 311 ITNs, 37 (11.9%) of these nets were sold to buyers that bought more than one net. Consent for the monitoring visit could not be secured from 26 buyers, 8 buyers did not give their contact addresses, while 13 buyers could not be traced with the address they provided. A total of 227 monitoring visits were made. Out of the 268 ITNs bought by the

households visited, only 49 (18.28%) of the nets were found to be properly deployed during the monitoring visit. The users of the properly deployed nets are shown in Table 1. 39 (79.59%) of the properly deployed nets were occupied by under-five children, either alone, or with their parents; most of these nets (53.06%), were occupied by the children and their parents while they lay on a bed. The probability of proper deployment of the net was proper when users slept on mat, than when they slept on bed ( $P < 0.05$ ). 184 (81.06%) of all the households visited during the monitoring visit had their windows widely open during the period, including 46 (93.88%) of those that had their nets properly deployed. The reasons given why under-five children might not use the net include: hot night-time temperature (63%), no mosquitoes (43%) and "forgot to properly deploy the net" (33%).

**TABLE 1: Users of properly deployed nets**

Sleeping material	Buyers found with properly deployed net			Total
	Under-five children alone	Parents alone	Parents with under-five children	
Mat	2 (4.08%)	0 (0.00%)	0 (0.00%)	2 (4.08%)
Bed	11 (22.45%)	10 (20.4%)	26 (53.06%)	47 (95.92%)
Total	13 (26.53%)	10 (20.4%)	26 (53.06%)	49 (100.00%)

$X^2_c = 6.36 (P < 0.05)$

**DISCUSSION**

The result of this study showed that only about 18% of the nets were observed to be properly deployed. This is a disappointing result, considering that one of the main objectives of the social marketing project was to promote the year-round use of the nets especially by under-five children. This problem of non deployment can be due to the high night-time temperature and low activity of nuisance mosquitoes during the study period. This is supported by the reasons given by householders why under-five children might not use the net; and consistent with the studies carried out in similar setting in other parts of Africa<sup>7-9, 13,14</sup>. In northern Ghana, similar circumstances led to an 80% decrease in adherence<sup>8</sup>.

The problem of poor adherence when the nuisance of mosquito is low probably shows that most of the buyers of the nets did so to control the nuisance of mosquito, instead of the desire to prevent malaria as emphasized in the promotional activities of the project. Even the reasons given why under-five children might not use the nets add credence to this. Although the nuisance caused mainly by culex mosquito has been an important driving force for the sale of ITNs<sup>11</sup>, it will continue to pose a problem to efforts to encourage year-round use of the nets for malaria control.

The problem of using the net when the night-time temperature is high is being tackled by the development of wide-mesh nets that allows for better ventilation<sup>15</sup>. Though the net marketed by the project can claim to be

of wide mesh, it was however not enough to guarantee a good night sleep under the prevailing circumstances, neither would have sleeping without cloth done better.

The proper deployment of the net was also noted to be poorer when users had to sleep on mat, or other temporary sleeping materials. Most households in the study community, especially those with under-five children, live in one room apartment that encourage the use of mats and other temporary sleeping materials. The daily task of mounting the net as the users prepare to go to sleep, and in dismantling it at the break of dawn, is a onerous task in a small house, that require a lot of motivation to carry out<sup>13,14</sup>. To forget to mount the net for the use of the children points to the low level of motivation for ITN use once the nuisance of mosquito is low and the night-time temperature very hot<sup>13,14</sup>.

As the impetus for the implementation of ITN projects for malaria control grows, emphasis should shift from the present rush to meet coverage targets, to problems related to adherence, if the potentials of the nets are to be fully harnessed. The reasons given for non deployment of the nets need to be tackled. This would without doubt require the vital role of sustained, intelligently crafted health education programmes.

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