

The challenge of using and misusing insecticide-treated bed nets

Where economic benefit can be gained—bed nets will be reassigned to alternative uses. William R Brieger looks at the effect of dysfunction

Insecticide-treated bed nets (ITNs), especially of the long-lasting variety (LLINs) are one of the major interventions to prevent malaria. Major donors like the Global Fund, the World Bank, the US President's Malaria Initiative and UKAID/the Department of International Development, have been assisting malaria endemic with LLIN supplies for over 16 years. These net supplies have been supplemented through national, corporate and Non-Government Organisation (NGO) efforts. Once received in country, LLINs are shipped out to districts where they are most often distributed through mass campaigns, while some are reserved for distribution through routine services like antenatal care.

The challenge is that LLINs are only useful in preventing malaria if they are hung properly and people sleep under them. An actual survey of nets in households after one of the first mass distribution campaigns in Kano State, Nigeria is indicative of these challenges.¹ A household survey in the state between three to five months after the distribution campaign found that 97% of households received at least one LLIN. At the time of the survey, only 69% of these households currently had a net.

Although there was equitable distribution across all income levels in Kano State, the poorest households were less likely to have retained a net at the follow-up survey (58%) compared to the four higher income quintiles (between 70–73%). Many of the missing nets had been given away mostly because the recipient felt that it was not needed at the time (note that the survey was done in the dry season, November, when people perceive fewer mosquitoes are about), or that it was needed more by others. The interviewers found that even among households that kept their nets 27% had hung none or only some of the nets, they received.

A similar experience was reported in Akwa Ibom State, Nigeria after their 2014 mass net distribution campaign.² Among households visited, there was good retention (97.1%), but the hanging rate was 71.8%. Overall 69.6% of household members reported that they slept under a net the previous night.

Only seven cases of alternative use were identified in Kano, and these were all for curtains. While it is true that some studies have tested the use of alternative insecticide-treated materials such as curtains,³ the Nigerian LLIN campaign was not designed for that purpose. Reasons for these problems ranged from inability or lack

of materials to hang the nets, feeling hot sleeping under a net and fear of the insecticide. The forgoing experiences in Kano and Akwa Ibom are not insurmountable, and although there were behaviour change communications activities associated with all Nigerian net campaigns, these apparently did not deal with the issues that net recipients feel are important.

People have sometimes questioned whether something provided for free is valued by the recipients. Although this is not usually a specific question in surveys, researchers found in a review of 14 national household surveys that free nets received through a campaign were six times more likely to be given away than nets obtained through other avenues such as routine healthcare or purchased from shops.⁴

Giving nets away to other potential users, not hanging nets or not sleeping under nets at least imply that the nets could potentially be used for their intended purpose. What concerns many is that nets may be used for unintended and inappropriate reasons. Often the evidence is anecdotal, but photos from Nigeria and Burkina Faso (shown in this article) document cases where nets were found to cover kiosks, make football goalposts, protect vegetable seedlings, and fence in livestock.

Newspapers tend to quote horrified health or academic staff when reporting this, such as this statement from Mozambique, 'The nets go straight out of the bag into the sea'.⁵ *The Times* said that net misuse



Nets are being used in various ways. Pictured above, a kiosk being protected from pests and children in Nigeria

William R Brieger is a Professor for the Department of International Health, the Johns Hopkins Bloomberg School of Public Health, and Senior Malaria Specialist, Jhpiego, an affiliate of Johns Hopkins University.

squandered money and lives when they observed that ‘Malaria nets distributed by the Global Fund have ended up being used for fishing, protecting livestock and to make wedding dresses’.⁶

Two years ago the *New York Times* reported that, ‘Across Africa, from the mud flats of Nigeria to the coral reefs off Mozambique, mosquito-net fishing is a growing problem, an unintended consequence of one of the biggest and most celebrated public health campaigns in recent years’.⁵ Not only were people not being protected from malaria, but the pesticide in these ‘fishing nets’ was causing environmental damage. The article explains that the problem of such misuse may be small, but that survey respondents are very unlikely to admit to alternative uses to interviewers.

Similarly *El Pais* website featured an article on malaria in Angola this year with a striking lead photo of children fishing in the marshes near their village in Cubal with a LLIN.⁷ A video from the *New York Times* frames this problem in a stark choice: sleep under the nets to prevent malaria or use them to catch fish and prevent starvation.⁸

A study in 2008 of communities on Lake Victoria found that 25% of nets in the community were being used for fishing related activities, including drying fish.⁹ The villagers thought that since the nets were inexpensive or free, the alternative use made sense. In fact, it turned out that there was lack of coordination among donors and excess nets were supplied to the village. Such lack of coordination is unlikely to happen today.

Based on accounts like those above, Eisele and colleagues warned that, ‘There are a number of potentially damaging misconceptions about ITNs in Africa that have been propagated in media reports, almost all of which are based on anecdotal accounts’.¹⁰ In 2011 they could only identify two studies that reported extremely small proportions of net owners engaging in alternative uses. In addition the review of 14 national household surveys mentioned earlier found less than 1% of nets were repurposed for other uses.⁴ Of course the caveat that people may not report honestly in such surveys still stands.

More recently, researchers who examined net use data from Kenya and Vanuatu found that alternative LLIN use is likely to emerge in impoverished populations where these practices had economic benefits like alternative ITN uses such as sewing bednets together to create larger fishing nets, drying fish on nets spread along the beach, seedling crop protection, and granary protection.¹¹ The authors raise the question whether such uses are in fact rational from the perspective of poor people.

Alternative uses may not fully explain low coverage in household surveys. We know that the effectiveness of insecticides in LLINs is severely reduced after two years and that the overall ‘functional survival time’ of a net is two and a half to three years.¹² Villagers may dispose of these torn or degraded nets in the local environment. This is why mass net distribution campaigns are often planned every two to three years when possible. Disposal of dysfunctional nets may also explain low use rates when surveys are done a couple years out from the last mass distribution.



Nets are also used as goods sacks in Nigeria



Also in Nigeria, locals use nets to protect seedlings



Using nets to protect chickens from hawks in Burkina Faso

Local disposal raises environmental concerns not only because of possible residual insecticide, but also the polyester and polyethylene netting material itself. The question arises as to what to do safely with the old nets that no longer function as mosquito protection?

A pilot project in Madagascar attempted to set-up a system to collect old nets for safe and proper disposal.¹³ Aside from the costs and logistical challenges (warehouses, transportation, compactors), the organisers learned that community factors could plague these efforts. Community members who still saw their nets as useful for the designated purpose or those who were happy with an alternative use were reluctant to surrender their nets.

There was even some element of shame associated with submitting an old net that was torn, dirty or smelly, even if this net was no longer in use. People feared that surrendering their net would leave them without its perceived benefits. Some of the community challenges were overcome with good communication planning as well as ensuring that distribution of new nets was linked with the collection of old ones.

These alternative net uses in Madagascar were not documented in a quantitative way, but the report listed several, including curtains, pillows, blankets, mattress covers, and fishing nets. What is important to note in this case is that the alternative uses occurred generally when households saved the old LLINs and repurposed them for domestic use. It did not appear that there was much of diverting the original new nets to these alternatives. Thus people were actually 'recycling' the old nets, not misusing new ones.

A qualitative study in the Kilifi area of coastal Kenya put this local 'recycling' into better perspective.¹⁴ The researchers clearly found that in rural, peri-urban and urban settings, people adopted innovative and beneficial ways of re-using old, expired nets, and those that were damaged beyond repair. Fencing for livestock, seedlings and crops were the most common uses in this predominantly agricultural area. Other domestic uses were well-water container covers, window screens, and braiding into rope that could be used for making chairs, beds and clotheslines. Recreational uses such as making footballs, football goals and children's swings were reported.

Thus, the Kilifi team stressed that, 'It is important that re-use and disposal of old mosquito nets is distinguished from misuse of newly distributed mosquito nets'. They pointed out the economic value of these recycled uses. This is particularly important when compared to the fact that the Madagascar study documented that the costs of collecting up 'retired' nets was greater than those of mass distribution of new nets.

What we have learned here is that we should not jump to conclusions when we observe a LLIN that is set-up for another purpose than protecting people from

mosquito bites. Alternative uses of newly acquired nets do occur and may seem economically rational to poor communities. At the same time we must ensure that mass campaigns pay more attention to community involvement, culturally appropriate health education and onsite follow-up, especially the involvement of community health workers. Until such time as feasible, safe disposal of 'retired' nets can be established, it would be good to work with communities to help them repurpose those nets that no longer can protect people from malaria.

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