ETHIOPIA

BEDNET UTILIZATION STUDY:

WHY SOME NETS OWNED ARE NOT USED

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Background

Bednets (mosquito nets) are relatively new to most of Ethiopia. In the year 2000, very few households in Ethiopia owned them[1], and many had not even heard of them[2]. Concerted interventions to promote insecticide-treated nets (ITNs) began in 2004 and focused on making affordable nets available through the commercial sector, both at commercial prices and subsidized prices via direct subsidy or vouchers/coupons to vulnerable groups. In the past two years, there has been massive distribution of free ITNs, particularly in rural areas, in an attempt to make a rapid impact on morbidity and mortality associated with malaria. As a result, net ownership in Ethiopia has risen dramatically. The task at hand now is to ensure that nets in the household are used, and used correctly and consistently. Although nightly use is optimal, sometimes people use their nets sporadically or do not ever use them. This study looks at household net ownership and use in the Oromia and Amhara Regions since ITNs have been made widely available, in order to determine levels of ownership and use, and to understand reasons for non-use or sporadic use. This information is essential for refining ITN distribution programs and for developing effective communication for optimal net use and public health impact.

The main objectives of this study were to:

- Ascertain levels of net ownership
- Determine the extent to which nets that are owned are being used
- Identify the reasons for non-use of nets that are owned
- Develop implications for program and communication strategies for improving ITN utilization

This study complements the Ethiopia Malaria Indicator Survey (MIS)[3], a large-scale nationally representative survey on various aspects of malaria control carried out at approximately the same time as this study. The MIS, with a larger sample, is likely to yield more precise point estimates of variables amenable to survey measurement. This study was meant to focus particularly on net utilization and, through the incorporation of observation and open-ended questions, provide an in-depth understanding of the issue so that effective program and communication strategies for increasing utilization can be developed.

This study was carried out by the NetMark Project at AED, and sponsored by the United States Agency for International Development (USAID). The data collection team consisted of graduate students and alumni from Addis Ababa University.

Methodology and Sampling

The study used both quantitative and qualitative methods. The survey instrument included close ended pre-coded questions as well as four open-ended questions to allow more in-depth investigation of key net use issues. The study also included observation of nets in homes, in addition to market visits in the towns of Nazreth, Bahar Dar, and Jimma to assess commercial availability of nets, current prices, and leakage. The combined quantitative and qualitative methodologies yielded both statistical results and insights on the issues that influence net utilization.

The study took place in Oromia and Amhara regions; both are focus areas for NetMark activities and Oromia is also a focus region for the US President's Malaria Initiative (PMI). A total of 857 households were surveyed: 531 in Oromia and 326 in Amhara. The sample was selected so as to be able to compare:

- urban, small urban, and rural areas
- areas that received free nets and those that did not
- areas that received indoor residual spraying (IRS) and those that did not

East Amhara, north Amhara, west Amhara; and east Oromia, central and south Oromia, and west Oromia sub-regions were first selected in order to cover a range of geographical areas within Amhara and Oromia. The main urban areas in malaria-prone locales were included (Addis Ababa, the capital, and Dessie town were excluded since malaria is not a problem there.) Then, the malarious woredas and the communities/kebeles[1] in each of the above sub-regions were listed, along with their characteristics: urban/small urban/rural; recipient of free nets or not; recipient of indoor residual spraying (IRS) or not. Communities were purposively selected so as to include combinations of characteristics, such as "received free nets and got IRS" and "received free nets but did not get IRS." Kebeles that required a long time to reach or were difficult to access were not included for reasons of time and logistics. Purely pastoral areas were also excluded because pastoralists account for only about 10-12% of the population and their net use issues are likely to be distinct from majority groups, requiring a much greater sample size and challenging logistics.

Upon arrival in the selected community, the team of six interviewers dispersed in different directions. In densely settled areas, roughly every 4th house was selected and in sparsely settled areas, approximately every other household was selected until approximately 30 households per community were interviewed. Table 1 lists the study areas and their characteristics.

The respondent could be either the husband or wife, but was most often (80% of the time) the wife or female head of household. Having a child under five was not a selection criterion since free net programs did not apply those criteria and we wanted to look at the whole range of household configurations to look at net ownership and use.

[1] Woreda is a an administrative district and is made up of kebeles, which are communities that form the smallest unit of government in Ethiopia.

The data was collected during October 2007, at the end of the rainy season when mosquito density and malaria transmission is high. In February 2008, rapid follow-up qualitative visits were made in selected kebeles in the Nazareth, Bahar Dar, and Jimma areas, enabling a seasonal comparison of net use.

TABLE 1: Study Sites and Characteristics

REGION	SITE AND KEBELE/COMMUNITY	URBAN-RURAL	INTERVENTION	N
Oromia				**531**
	Nazreth			**115**
	Nazreth Town	Urban	(commercial only)	55
	Wolencheti	Small Urban	Free	19
	Mermersa	Rural	Free + IRS	14
	Dongore Tiyae	Rural	Free + IRS	12
	Kuriftu Furda	Rural	Free + IRS	15
	Harrar			**121**
	Babile town	Small Urban	Free	20
	Kombolcha: Bilisuma Kebele	Rural	Free	60
	Erer Guda Kebele	Rural	Free +IRS	41
	Arsi Negele-Meki			**130**
	Arsi Negele Town	Urban	Free	24
	Arsi Negele: Kersa Kebele	Rural	Free	36
	Meki Town	Small Urban	Free	22
	Gusa Kebele	Rural	Free	48
	Jimma - East Wollega			**165**
	Jimma Town	Urban	(commercial only)	48
	Seka	Small Urban	Free	30
	Serbo	Rural	Free + IRS	27
	Arjo	Rural	Free	30
	Degaga Dedesa	Rural	Free + IRS	30
Amhara				**326**
	Bahar Dar			**205**
	Bahar Dar Town	Urban	(commercial only)	64
	Yinesa	Rural	Free	36
	Andasa	Rural	Free	37
	Lemba	Rural	Free + IRS	33
	Zengaj	Rural	Free	35
	Dessie			**121**
	(Dessie Town excluded; not malarious)			
	Bati	Small Urban	Free	59
	Hayik: Gobeya Kebele	Rural	Free+IRS	62
TOTAL				**857**

Findings

Net Ownership

Overall net ownership was very high, with 91% of households owning at least one net, and most owning more than one. The total number of nets owned by households, as reported by respondents in the sample, was 1405 – an average of 1.8 nets per net-owning household. Interviewers obtained information on 99% of the reported nets (1391) and examined 93% personally.

Ownership of at least one net was higher in Amhara than Oromia (96% vs. 88%). In both regions, the more rural the area, the more likely the household was to own a net. In Amhara, the percentage of households owning at least one net was 89% in urban areas, 97% in small urban areas, and 98% in rural areas. The comparable figures for Oromia were 69%, 86%, and 96%. Households owning two or more nets were also most likely to be found in rural and small urban areas (64% vs 47% in urban areas). This pattern reflects the focus of free or highly subsidized net distribution in rural areas. Given that virtually no household owned a net in 2000, these are remarkably high rates of ownership, especially in urban areas where nets had to be purchased.

Nets owned were classified as free or purchased. Any net for which money was paid was classified as a purchased net. These include nets sold at subsidized prices, those bought with vouchers, and those bought at full commercial prices. Overall, 75% of households owned a free net and 23% owned a purchased net, but there was considerable variation by region and urban-rural location. Purchased nets were more common in Amhara region, where 29% of households had a purchased net, compared with 20% of households in Oromia. Households that owned purchased nets were much more likely to be in urban areas than in rural ones (63% urban vs. 12% rural/small urban. For example 84% of households in Bahar Dar had purchased a net, as had 60% in Nazreth, and 63% in Jimma. This compares with 3%-10% of households in various rural kebeles that had bought a net.

Since most nets owned were free nets, the vast majority of nets owned (84%) were the blue rectangular long-lasting insecticide-treated nets (LLINs) PermaNet® distributed in the past two years by the government and NGOs.

Few households – 9% – did not own any nets. Respondents from those households were asked why. There was no single dominating reason. Some said they did not need nets, as malaria was not a problem for their family or community. Some said they were not aware of the free distribution, or were not able to collect nets during the distribution period. Examples are a blind woman, a single mother with four children who was giving birth at the time, and those who were out of town. In areas where free nets were not distributed, some families said they were waiting for a free net to be given them, and others said they could not afford one.

TABLE 2: Percent of households owning at least one net

		CURRENT NET OWNERSHIP			N house holds
		% of HH owning 1+ nets (any)	% of HH owning 1+ free nets	% of HH owning 1+ purchased nets	
	TOTAL	91	75	23	857
	Amhara	96	76	29	326
	Oromia	88	74	20	531
Amhara	Rural	97	93	10	203
	Small urban	97	88	36	59
	Urban	89	8	84	64
Oromia	Rural	96	93	7	313
	Small urban	87	84	18	91
	Urban	71	21	53	127

Although net ownership was very high, a substantial but unknown number of nets obtained for free have been sold ("leaked"). During market visits, a team member would walk up and down the lines of small shops and stalls to get an idea of the number of traders, and stop to ask prices and numbers of nets in stock. Traders in all three urban markets visited – Bahar Dar, Nazreth, Jimma – said that there are people who go to communities following free distribution, pay the family a small amount for the net – typically 5-10 birr, or about $.50 - $1.00 dollar – and sell nets by the hundreds or thousands to market-sellers or other vendors. In Nazreth and Jimma, there were few nets of any kind in the town market, as several vendors reported that the nets had been collected from rural areas and taken elsewhere by truck shortly following distribution. They also said that they could get some 2000 nets within the next two days if someone wanted to purchase them. In Bahar Dar market, the situation was different. There is continuing demand for nets in that area, and there were numerous vendors and large quantities of the blue NGO nets being sold openly in the market, with stock levels for individual vendors ranging from 100-500 nets. The vendors buy the nets from "wholesalers" for 6-10 birr, and sell them for 16-18 birr. This price favorably compares to commercial nets that typically sell for 50-58 birr and the highly-subsidized nets distributed by Population Services International that sell for 20 birr.

In Bahar Dar there were also systems in place to get much larger quantities if a buyer wanted. There are people situated in the villages who become wholesalers, buying nets from families and keeping them for vendors when they need to re-stock their shops.

In an effort to avoid free nets being sold, some kebeles had opened the package before giving it to families. However, these opened packages were also found the market.

Net Use

Proportion of nets used

Respondents were asked, for each net currently in the household, whether it had been used "last night." Given that the objective is to have everyone in the household sleep under a net, for households where all family members were covered, we did not consider any additional nets owned to be unused (in the sense of "should have been used"), and took them out of the net use analysis. During malaria season (October) in 2007, 65% of nets owned reportedly had someone sleeping under them the prior night. The percent of nets used the prior night was higher in the Amhara region than the Oromia region (73% vs 60%) and was marginally higher in urban areas compared to rural and small urban areas (71% vs 64%). The highest rate of net utilization was in urban Amhara – Bahar Dar town, at 81%.

TABLE 3: Percent of nets used, among nets currently in the household

	% all nets used last night	% free nets used last night	% purchased nets used last night	% nets never used
TOTAL	**65**	**63**	**76**	**16**
AMHARA	**73**	**71**	**79**	**11**
Urban	81	50	85	2
Small urban	73	78	50	18
Rural	70	70	82	12
OROMIA	**60**	**59**	**72**	**20**
Urban	63	53	71	15
Small urban	50	48	73	25
Rural	61	62	72	20
IRS HH	70	70	91	13
Non-IRS HH	62	59	74	18
N (nets)	1342	1061	232	1342

Nets that were paid for were more likely to be used than free nets (76% vs 63%). In Amhara, 79% of nets that were paid for were used, compared with 71% of free nets used; in Oromia, 72% of nets paid for were used, compared with 59% of free nets used the prior night.

Some (16%) nets currently in households had never been used: 11% in Amhara and 20% in Oromia. Most unused nets were still in the blue package. Reasons for not using nets are discussed in the next section.

Two very different kebeles, both in the Nazreth area

Perceptions, ownership, and use of nets tended to cluster within kebele. Even kebeles within the same woreda can differ considerably in their ownership and use of nets.

In the morning the team visited a kebele outside of Nazreth town, where free nets have been distributed for the past two years and many households have multiple nets. However, few households were using their nets. There was no perceived risk of malaria; respondents said that no one in their family, and no one they know, had gotten malaria in the past year. A family of six – with three children under five – had one net and said they "gave away the others." The mother said she and her husband used the net when she was pregnant, when it was rainy and there were mosquitoes, and she used the net for privacy when she delivered. She also liked the fact that the net protected from dirt dropping from the roof. The net was very dirty; it was taken down to be washed and never put up again. Most people said they had used the nets when there were mosquitoes. The nets we saw were extremely dirty and in poor condition, and were bunched under beds or in corners.

In the afternoon, we visited another kebele outside of Nazreth town. Again, households had multiple free nets, but here, households visited were using at least one of their nets and sometimes all of them. Residents said that malaria was a serious problem there and the nets have given them relief. Residents recited information given to them when they got their nets, all of which was correct: net should be aired out for at least a day when first opened; net is to be stretched out over the bed; net is treated and treatment lasts for years; nets can be washed when they get dirty. Residents said the nets were difficult to hang in their houses and it was easy to see why. Extra rope was needed to reach some walls, and nails did not stay in walls. Houses were small, and the nets took up living space needed during the day, so some were taken down and put up again daily. In spite of these obstacles, people saw the value of nets in preventing malaria and had made it a habit to use them.

Net use by family members

Among all households in the sample, the percent of household members who had slept under a net the prior night was 47%; the percent of children under five who had slept under a net the prior night was 60%; and the percent of pregnant women under a net was 57%. (Since RBM indicators are based on all households – not just net-owning ones – we include analyses based on all households for comparability.) Among *net-owning* households, the comparable figures were 51% of all household members, 64% of children under five, and 66% of pregnant women who had slept under a net the prior night. In one-third (33%) of net-owning households, respondents reported that all family members had slept under a net the prior night.

TABLE 4: Percent of family members under a net, among net-owning households

	% family members under a net last night	% children under 5 under a net last night	% pregnant women under a net last night
TOTAL	**51**	**64**	**66**
AMHARA	**58**	**75**	**80**
Urban	59	86	67
Small urban	60	96	100
Rural	57	69	81
OROMIA	**47**	**59**	**59**
Urban	40	72	50
Small urban	41	44	50
Rural	50	61	59
N	4,171	610	61

The most common net users were parents, usually along with the youngest child or children if less than four years of age. The rest of the children usually did not sleep under a net, even if there were nets in the household. Often there is only one bed in the home; if so, the parents use it and the children sleep on the floor, usually on mats. It is much easier to hang a net over a bed than to hang it over an open area where there is no structure underneath to keep the net open and spread and/or tucked in. Even if the household was given 2-3 nets, often only one net is used because of lack of space for hanging additional nets, or because the parents wanted to save the other nets.

Nets are used for protection against mosquitoes, but people highly value the fact that treated nets kill bedbugs. For some, that is an important motivating factor for using the net. (Unfortunately, that leads some to put the net directly on the mattress instead of hanging it over the bed.) Although bedbugs do not transmit disease, they cause itchy and sometimes painful bites. Treated nets are also valued for their ability to kills fleas and flies.

Reasons for not using nets owned

After obtaining information on nets owned and usage patterns, interviewers explored reasons for inconsistent or non-use of nets. Open-ended questioning was used, and common themes emerged from the responses, described below. Often, there was no single reason for not using a net, and reasons overlapped or were interrelated. For example, a net could be dirty and taken down to be washed, but there could be little motivation to put it back up quickly since the family had not gotten malaria and there were few mosquitoes this year. Because answers were qualitative, we do not have percentages associated with them. All of the following are barriers to optimal net use. Program and communication implications are outlined after each barrier.

Perception that malaria is not a problem

In some communities, respondents claim that their family rarely or never experiences malaria. Overall, 44% of respondents said that someone in the household had had malaria in the past year, but those respondents tended to be clustered geographically. For example, only 13% of respondents in Nazreth town said someone in the household had gotten malaria in the past year, compared to over 70% of respondents in Meki town and Erer Guda kebele. Because malaria is so localized, it is possible that malaria is not a serious problem for some communities. When asked how one knows if an illness is malaria, 94% of respondents gave accurate descriptors, so recognition of the illness does not appear to be at issue.

Many said that "malaria used to be rampant" but it is not much of a problem these days. In parts of Ethiopia, malaria is epidemic – rather than seasonal or endemic – meaning that every five to eight years, periods of low to moderate transmission will be punctuated by numerous epidemic outbreaks of malaria resulting in high incidence of morbidity and mortality. The last major "epidemic year" was in 2003. After a few years without epidemic outbreaks, malaria recedes as a critical problem in the mind of the public. Even when family members get malaria, they can be treated, so perceived risk of severe disease is low.

There is a general belief that nets are needed only after the rains when there are many mosquitoes. Knowing that mosquitoes cause malaria (77% did) may inadvertently discourage net use in areas of seasonal transmission.

→ Data (such as that from Mapping Malaria Risk in Africa, or MARA) on the risk of malaria in specific areas could be used to guide net distribution and accompanying community information. If indeed, mosquitoes and malaria are not present in particular areas, nets can be re-directed to areas in greater need. If risk is low but still present, that needs to be communicated. If a particular area is epidemic-prone, and nets are to be in place should another epidemic arise, that should be explained. However, net use needs to become the norm, so that people do not depend on external cues such as mosquitoes to use the net.

Perception – and possibly reality – that ITNs have lost their effectiveness

Because ITNs initially show dramatic and visible results in the form of dead mosquitoes, flies, and bedbugs, their diminishing knock-down rate over time is perceived as a sign of ineffectiveness. Further, prior messages about the importance of re-treating nets have buttressed the idea that effectiveness of nets is temporary. "No longer effective" was a recurrent theme almost everywhere, especially in the February follow-up visits.

In kebeles that received pre-treated nets (not LLINs) from health centers two years ago, nets may indeed be no longer effective. Even if the long-lasting KO-Tab 1-2-3® was used, the nets treated with it will be at or near expiration. Families have told health personnel that their nets need re-treatment but staff tell them that the treatment lasts four years.

Many people said they would like their nets re-treated, but they did not know where to find the treatment. Treatment kits are not generally available. One woman who got two nets and two treatment packets treated both nets with one packet one year, and treated both nets with the second packet the second year. She would like to treat her nets again this year but cannot find any treatment packets.

Many nets were also very dirty, covered with dust and smoke. Exceedingly dirty nets can be less effective than clean nets.[4]

→ *Access to re-treatment is needed, particularly in areas that did not receive LLINs. Community-organized dipping or distribution of individual re-treatment kits should result in a big jump in usage. Ideally, treatment kits would be available commercially as well, for those outside of free distribution sites. Messages can tell people that even if their nets have small holes or tears, the nets will still be effective against mosquitoes if re-treated. Simple, specific information about how long the treatment lasts for the type of net must be communicated as part of distribution activities.*

Current treatment products could possibly be made more consumer-friendly by adapting existing chemistries to be used with flit guns or aerosol cans.

Re-treatment of LLINs may not be required to ensure personal protection, but increased effectiveness in killing mosquitoes would likely contribute to user satisfaction, increased use and improved vector control.

It would be useful to assess the field bioefficacy of LLINs in Ethiopia at six months, twelve months, and two years, so that distribution and treatment can be adjusted accordingly.

Difficulty hanging nets in Ethiopian dwellings

Rectangular nets are hard to hang in most houses visited for interviews. Such nets have four hanging points and usually require extra rope for reaching an attachment point. It is often difficult to find an attachment point, as nails easily pull out of mud and dung walls. Where walls are of durable material, people may be reluctant to damage the wall by putting a hole in it.

The traditional round houses (*tukuls*) present special problems for hanging nets. The round structure with a conical roof with a high point in the center makes it especially difficult to find four hanging points for a rectangular net. Furthermore, in most *tukuls*, there is not space for more than one net. Many *tukuls* are small to begin with, and most devote roughly 1/3 of the space for keeping animals at night. Even one net can take up most of the living space inside the house, and it is not feasible to put up and take down a rectangular net daily. Therefore some families prefer not to hang a net at all.

Even if nets are hung, often the net does not reach the sleeping place, especially if the sleeping place is a mat on the floor rather than a raised bed. The gap can be as much as 1-2 feet. Most hanging nets observed were not hung in a way that provides good protection for the users. Therefore house structures prevent some nets from being hung at all, and often inhibit effective use even when a net is hung.

→ *Programs should seek ongoing feedback from beneficiaries of ITN programs to understand their preferences for size, shape, color and type of textile. Ease of use, especially hanging, is another important factor to consider. A "one size fits all" approach will discourage use if the product is not one that beneficiaries prefer. As with any product, more people are likely to use it if they can choose what works best for them.*

Data on consumer preferences regarding size, shape, and color are available[5] *and should be used to guide choices in mass distribution to increase the likelihood that a net will be used. Conical nets are preferred by most people, and they are easier to hang than rectangular ones. Furthermore, they can be tied up during the day. Programs should consider distributing conical nets or giving people a choice of nets. Giving vouchers for nets instead of the nets themselves is a means of permitting choice.*

Where rectangular nets are distributed, extra rope or wire will need to be provided in order for some families to hang their nets. Possibly a small community committee could help people put up the nets properly.

In some rural areas the males sleep outside. Potentially this is an opportunity to gain more space for using nets, but the feasibility and efficacy of nets hung outside would need to be verified.

Given the very large numbers of nets ordered from manufacturers, it should be possible to ask for design modifications to make nets more suitable for Ethiopian houses and sleeping places. At a minimum, longer nets would be much more useful. Could a tent-like net with two hanging points be developed? Can some means of tying up the net be found, so that people can keep the net hanging for nighttime use but have living space available during the day? It would be helpful for net designers or manufacturers to make trips to the field to see the settings where nets are to be used, so that inexpensive modifications can be made that will increase use and effectiveness.

Nets in poor condition

Many nets had holes and tears, especially those in rural households. Even nets less than a year old had holes and tears because of children, animals, and wear and tear associated with having the net in the living space. Most nets in rural areas and poorer urban households were extremely dirty, covered with dust and soot. In thatched-roof homes, dirt and debris falls regularly; some people like nets for protection from falling dirt. Where cooking is done in the same space as the sleeping area, smoke and soot settle on the net daily. Nets in poor condition tended to be stashed under beds or into corners, not in good enough condition to use, but not bad enough to be thrown away, though we did see some that had been thrown outside. Respondents often said the nets were down for washing; though it appeared that some nets had been down for a while. Some people had dirty nets but were hesitant to wash them because it might remove the chemical.

→ *Families should be informed that some nets with holes or tears can be made effective again if treated, as long as the holes are not bigger than a fist or tears are not too large. Net treatment should be made available for worn nets – even for LLINs – to rejuvenate the repelling effect and make the net effective in spite of holes .*

Technical experts need to provide clear guidelines on washing frequency, and those guidelines need to be communicated to the public in a simple way.

The poor condition of nets observed suggests that replacement of nets will be needed every two years.

Misinformation and lack of information

Distribution is most often kebele-based, and there was much variation in information given along with free nets. Slightly more than half of surveyed households (55%) were given any information about malaria or the net when they picked up their free net, and sometimes they were given incorrect information. The most common information given was that nets prevent malaria or that nets need re-treatment. A minority were told how to hang the net or told not to sell it. In some kebeles people claim they don't really know what the nets are for; "they just told us to come and get them." Few mentioned being told that children and pregnant women are most vulnerable to severe malaria, and no one said she was told that nets should be used even when there are few mosquitoes.

There is great confusion at every point in the system – from health providers to kebele distributors to families – as to whether the nets need to be retreated. The great majority of people know that the free nets they received were already treated. In many areas campaign workers emphasized airing the net for at least a day before using it, or said not to let their children touch the net because there was chemical on it. *However, most people also believe that their nets need to be re-treated.* In some areas they were specifically told that the net needs re-treatment in six months.

There are conflicting messages from free net distributors about whether or not nets can be washed and if so, how often. (The PermaNets® distributed should maintain sufficient effectiveness through 20 washings, though each washing does remove some of the chemical.)

In some kebeles the free nets are typically picked up by the husband. Even if he gets information about how to use the net and who should use it, the information may not always get passed on to his wife.

→ *It is imperative that a standard set of straightforward priority messages be developed to be delivered along with the nets. The fact that nets are distributed to the public from a central point presents an excellent opportunity for interpersonal communication and interaction, along with the chance to address any questions. But those distributing nets need to be well informed.*

Confusion about treating-re-treating is understandable, given the different types of nets available and prior emphasis on re-treatment before LLINs were available. But now that all free nets are LLINs, standard information can be given during distribution. Messages regarding treatment, specifically how long the treatment lasts, are key, along with a statement about maximum washing frequency.

Accurate information about potential danger of ITNs should be conveyed in a way that does not cause alarm and rejection of ITNs for vulnerable groups.

Community members also need to know how to hang the net properly. Demonstration and/or assistance with hanging should also be provided. In addition to verbal communication during distribution, tested flyers or posters with key messages should be available as back-up reference.

It is also important to communicate that as many family members as possible should sleep under a net and that the net should be used year-round.

Along with factual information, families need motivation to go to the trouble of using nets, especially in areas where there are few mosquitoes. Our objective is to get people to use nets for malaria protection, but communication strategies should use messages that resonate and are likely to change behavior by drawing on other benefits people like, such as being able to sleep peacefully, nets killing other insects besides mosquitoes, or families saving money by having to buy fewer medicines or make fewer trips to the health center.

It is also essential that information be received from a variety of channels. Having information disseminated from various sources will address situations where the husband is given the net and the information, but it will also provide reminders and reinforcement more generally.

Saving nets for the future

It was not uncommon to find one net being used, and the other(s) still in the package, even though other family members were left sleeping without protection.

Respondents said some nets were "extra" or that they were keeping the packaged net in reserve or saving it for when the first one wore out. The data shows that 16% of nets in households had never been used. (See Table 3.)

→ *If Ethiopia plans to rely on free nets for the foreseeable future, it needs to secure firm long-term commitments from donors and keep up yearly distribution to assure people that they will receive nets for years to come. Projections of nets needed must take into account new users as well as replacement nets. Observations of nets in households suggest that nets need to be replaced every two years.*

Closer monitoring of distribution to make sure that number of nets given matches the family size will help avoid extra nets being given out.

If future distributions will not be universal but targeted toward vulnerable populations, it will be beneficial to plan now for alternative outlets for those who do not receive free nets. The data show that at least 22% of households are willing to purchase a net, suggesting that the commercial market is making an important contribution to household coverage and that strengthening the commercial sector is a means of ensuring a minimum sustainable supply of nets into the future.

Nets being used for other purposes

Nets are sometimes converted to ceiling covers, bed sheets or bed covers, curtains, tablecloths, or other household items. It appears that if one person in a community starts using nets for purposes other than as a bednet, others take up the idea, as evidenced by specific unconventional uses for the nets clustered within kebeles. In one market, nets were made into curtains that were popular in local homes. (See sidebar below.) In another area, some people were using the nets to dry grain. In one kebele, some households tore the nets into strips and used them to tie cattle to a tree. Using bednets for other purposes was not a generally common problem, but it was a major problem in a few kebeles.

→ *These situations show the importance of ensuring that adequate information is given along with the nets – about their purpose and how to use them. If behavior imitation is so strong, it can be used to advantage by modeling correct behavior. Possibly one or two households in a community can serve as models for net hanging and as information depots for the community.*

Using nets for purposes other than mosquito protection

In one small town, virtually all households have two or three nets. However, in all houses visited, nets were being used as curtains, canopies, wall covers or mattress covers. Often, nets were torn into smaller pieces for covering different items such as radios and televisions. No nets were being hung as bed nets. Extra nets were still in the package, unopened. Respondents claimed that they were not given any information about what to do with the nets. Apparently, someone in the town started using the nets for curtains and decoration, and other families followed suit.

A similar phenomenon was found in another town in a different area. Nets were distributed free there two years ago. Someone got the idea to make the netting into curtains to cover open doorways. Such curtains were available in the market for 30 birr. Retailers said this was a better business than selling nets. Few households were using the nets as bed nets for mosquito protection.

Respondent comparisons of Indoor Residual Spraying and ITNs

Respondents were asked whether, in the past year, anyone had come to spray the interior wall of their home against mosquitoes: 33% responded affirmatively. Those who had had their walls sprayed were asked if they had plastered over those walls since, i.e. if another coat of mud and dung had been smoothed on: 22% had. Walls are plastered to keep out insects or to refresh the surface. Re-plastering is common before religious holidays or special occasions such as weddings.

All respondents, whether or not they owned nets or had their homes sprayed, were asked, "If you could EITHER have the interior walls of your home sprayed with an insecticide OR get mosquito nets, which would you choose?" A majority (57%) said that they would prefer using ITNs and 32% said they preferred to have their homes sprayed; 12% did not know. Respondents who had experienced spraying were less likely to prefer it; 27% whose house had been sprayed preferred IRS to ITNs compared to 40% of those whose house had not been sprayed preferred IRS over ITNs.

TABLE 5: Indoor Residual Spraying

	% HH preferring ITNs to IRS*	% HH preferring IRS to ITNs*	% HH sprayed in the past year	% sprayed HH that have plastered walls since spraying
TOTAL	**57**	**32**	**33**	**22**
HH sprayed	65	24		
HH not sprayed	53	35		
OROMIA	**55**	**31**	**25**	**18**
Urban	58	31	11	7
Small urban	60	20	6	20
Rural	53	34	36	19
AMHARA	**59**	**33**	**46**	**26**
Urban	69	27	8	100
Small urban	75	19	2	0
Rural	51	40	71	24
N	857	857	857	280

*Numbers in these two columns do not equal 100% because some respondents answered that they did not know their preference.

Reasons for preferring ITNs were similar in both regions. Most preferred ITNs because they felt them to be effective and gave them protection from mosquitoes around their bed where they are vulnerable to mosquito biting. ITNs were also highly valued for their ability to kill bed bugs. ITNs were said to be a long-lasting solution. Nets do not smell or ruin walls as IRS does.

Most of those preferring IRS liked its ability to protect everyone in the household whether or not they sleep under a net. They also felt that IRS kills all insects in and around the house – unlike an ITN that protects you only around the bed and is primarily for mosquitoes. IRS does not irritate the skin, as a newly-opened ITN can.

On the other hand, there were many who said IRS does not last long and is not effective. With the exception of the East Wollega area, a major complaint regarding IRS was that nowadays the insecticide is diluted with water and therefore does not give the protection it used to when adequate amounts of the chemical was used. Community members believed that sprayers sell much of the chemical and pocket the money. Net-owning households that had their house sprayed in the past year were more likely to have had at least one person sleep under a net the previous night than households that had not been sprayed. (81% vs 70%). Possibly

communities selected for spraying had a more severe mosquito problem, and families used any means at their disposal to keep mosquitoes away. However the belief that the chemical is not effective may also play a role.

Some did not like the bother of taking everything out of the house to prepare for sprayers. Some in urban areas indicated that IRS discolors the paint on the walls of their home and therefore did not want their houses sprayed.

With the exception of urban dwellers with painted walls, there were no notable differences in these perceptions by region or by urban-rural.

TABLE 6: Perceived advantages and disadvantages of ITNs and IRS

	NETS	**IRS**
Ad-vantages	▪ Protects against malaria ▪ Kills bedbugs and flies ▪ Lasts long ▪ Assures protection while sleeping	▪ Kills all insects ▪ Protects whole house / protects outside too ▪ Protects whole household ▪ Does not involve hanging something in the house
Disad-vantages	▪ Kills only around the bed ▪ Protects only those under the net ▪ Protects only within the house, not outside ▪ Can irritate skin	▪ Not effective; Not strong enough ▪ Does not last long ▪ Smells ▪ Damages roof and walls ▪ Bothersome to take out things from the house for spraying

Conclusions

In recent years there has been a tremendous increase in net ownership in Ethiopia, a country where mosquito nets were virtually unknown in the year 2000. Ownership of nets is currently very high, even in urban areas where there was no free net distribution and nets had to be purchased. This suggests that a segmentation strategy targeting free nets to rural and poorest households combined with support for the commercial sector in urban and better-off areas would optimize coverage. Since nets that are paid for are more likely to be used, this strategy may also help increase utilization rates.

Now that high ownership has been attained, the critical challenge is to overcome barriers to utilization and drive up usage rates. There are a variety of barriers to be overcome. Some are structural, some involve program changes, and others require strategic communication.

The structural barriers pose special challenges. For example, the fact that small traditional houses can fit only one net, or that nets do not reach the children's sleeping mat on the floor cannot be remedied by individual or even community behavior change. Overcoming these obstacles will require product modifications and other creative remedies.

Program changes include measures such as assuring that standardized, accurate information is given out along with the nets, and providing re-treatment services in addition to net distribution.

Most of the barriers to utilization of nets owned can be addressed by well-conceived and organized communication integrated into distribution programs and supported by ongoing public communication efforts.

Yearly rapid qualitative field research will keep programs in touch with beneficiaries in order to assess how new strategies are working, identify any new barriers have arisen, and continue to modify strategies to raise rates of net utilization.

There are numerous recommendations for overcoming barriers incorporated in this report, but undoubtedly there are other solutions. It is hoped that this study provides an empirical foundation for all programs concerned with net utilization and the reduction of malaria in Ethiopia to discuss solutions and take effective action.

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Bahar Dar: A developing net culture

There is very high acceptance and use of nets in the town of Bahar Dar. The area is known as malarious and people value the protection of mosquito nets. Nets are purchased as a standard household item; remarkably, 86% of households visited in Bahar Dar had bought a net and only 9% had received a net for free. Rates of net utilization are very high at 81%. In better-off households, every family member sleeps under a net, and there are even extra nets in storage for guests. Nets are generally in good condition and used throughout the year.

Households prefer and purchase white conical nets. They were hung properly and provided good protection. Most people have beds for sleeping instead of mats, which makes it easier to hang nets over sleeping places.

Vendors stock different types of nets. Some vendors are well informed about different types of nets and their treatment status. The blue NGO nets were selling at 18-30 birr; green rectangular at about 18 birr; Safenight at 45 birr; Selamenkilf at 45 birr, and Wobalba (non-LLINs) at 45 birr. A few vendors have K-O® tabs for net re-treatment, which they sell at 3-5 birr. There are also businesses that convert the blue rectangular NGO nets to conical nets, the preferred shape. The price of a rectangular net converted to a conical shape is 35-40 birr.

There is a campus of Addis Ababa University in Bahar Dar, and students buy nets for malaria protection, especially those from non-malarious areas. At least one vendor cut the rectangular net in two and sold each half as a single, student net – cheaper for the individual student and more profitable for the vendor.

Demand for nets continues year round, so nets are sold in the Bahar Dar market all year. Even during February when there was no rain and few mosquitoes, individual vendors reported selling about 30 nets per month. Peak season is September to December, and business is very brisk during that time.

ENDNOTES

[1] According to the Ethiopia Demographic and Health Survey (DHS) of 2000, 1.1% of households nationally owned a bednet. The survey included non-malarious areas, including the large city of Addis Ababa, so ownership rates in malarious areas would be higher than 1.1%. Nonetheless, it is clear that very few households owned nets in the year 2000.

[2] The NetMark survey of 2004 found that 30% of respondents had not even heard of mosquito nets / bed nets. [Baume et al., NetMark 2004 Survey on Insecticide-Treated Nets (ITNs) in Ethiopia. AED/USAID, www.netmarkafrica.org].

[3] The Malaria Indicator Survey was carried out by Ethiopia's Ministry of Health and Central Statistics Agency, in partnership with WHO, UNICEF, MACEPA, The Carter Center, and the US President's Malaria Initiative (PMI).

[4] Etang J et al. Bioefficacy of cyfluthrin impregnated bed-nets against Anopheles gambiae in Southern Cameroon. *Journal of the American Mosquito Control Association*, 2004 (Vol. 20) 55-63.

[5] Baume et al., NetMark 2004 Survey on Insecticide-Treated Nets (ITNs) in Ethiopia. AED/USAID. www.netmarkafrica.org.