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Regression Analysis of Determinants of Bed Net Use in Southeast Nigeria following  
Mass Distribution of LLINs: Implications for Social Behavior Change Interventions

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By

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B.Sc, McMaster University, 2008

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## Abstract

### Regression Analysis of Determinants of Bed Net Use in Southeast Nigeria following Mass Distribution of LLINs: Implications for Social Behavior Change Interventions

By Cheryl Lynn Moore

**Background:** Millions of long-lasting insecticide treated nets (LLINs) have been distributed as part of the global malaria control strategy. LLIN ownership, however, does not necessarily guarantee LLIN use. Thus, even in the ideal setting in which universal coverage with LLINs has been achieved, maximal malaria protection will only be achieved if LLINs are used both correctly and consistently. This study aims to investigate the factors associated with net use, independent of net ownership.

**Methods and Findings:** A secondary data analysis was performed using data collected from a household survey conducted in southeastern Nigeria in November 2011 following a statewide mass LLIN distribution campaign and, in select locations, a community-based behavior change communications (BCC) intervention. Multivariable logistic regression analyses, controlling for household bed net ownership, were employed to examine the association between individual net use and various demographic, environmental, behavioral and social factors. Our findings indicate that the odds of net use increase among individuals who were exposed to tailored behavior change communications (BCC) in the context of a home visit (OR=17.11; 95% CI 4.45-65.79) or who receive a greater degree of social support from friends and family ( $p$ trend < 0.001). Factors that decrease the odds of net use include: increasing education level ( $p$ trend = 0.020), increasing malaria knowledge level ( $p$ trend = 0.022), and reporting any disadvantage of bed nets (OR=0.39; 95% CI 0.23-0.78).

**Conclusion:** This study suggests that LLIN use is significantly influenced by social support and exposure to a malaria-related BCC home visit. The malaria community should thus further consider the importance of interpersonal communication and social influences on adoption of net use behaviors when designing future research and interventions.

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## CHAPTER 1: Introduction

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### Background of the Problem

Malaria remains a significant public health issue globally, with an estimated 3.3 billion people at risk in 2011[1]. It is a parasitic vector-borne disease that is both preventable and treatable. However, in 2010 malaria was responsible for an estimated 220 million infections and 600,000 deaths [1]. Of these deaths, more than 90% occurred on the African continent – most of them in children less than age of five [1].

Nigeria accounts for 25% of the African malarial disease burden [2]. Approximately 97% of the country's more than 160 million people are at risk for this disease. With an estimated 110 million clinical cases and 300,000 childhood deaths annually, malaria is Nigeria's most significant public health issue [3]. The public health impact of malaria in Nigeria is staggering, accounting for 25% of infant mortality, 30% of deaths in children under age five and 11% of maternal mortality [3,4]. Not only is malaria a significant public health concern, it also places tremendous burden on the country's health system contributing up to 60% of outpatient visits and 30% of hospital admissions [3,4]. Furthermore, malaria places a heavy social and economic burden on the country, with the combined financial losses due malaria treatment/prevention costs and loss of productive work time estimated at 132 billion Naira annually [5].

In the past two decades, insecticide treated nets have been one of the key components of the global malaria control strategy. Conventional insecticide treated nets (ITNs) were developed in the 1980s and have been shown to reduce malaria episodes by up to 50% in endemic areas [6]. Unfortunately, ITNs must be re-treated with a synthetic



pyrethroid insecticide every six months to maintain optimal effectiveness. The introduction of long-lasting insecticidal nets (LLINs) represents an important advance, since the insecticide on these nets should last three to seven years in the field without the need for insecticide re-treatment [6-8], though recent studies suggest that nets may physically wear out more rapidly than that in actual field settings. Recent research indicates that when LLIN use in a population is high, they effectively reduce vector prevalence in the community and thus provide increased protection not only for the individual user but the community as a whole [9,10]. This added community protective effect of LLINs combined with evidence of the greater benefits conferred by universal coverage strategies compared to those that target vulnerable groups [11], prompted the WHO to shift its recommendations from a focus on ITN coverage of vulnerable groups (pregnant women and children under age five) to one of universal LLIN coverage targeting all populations at risk for malaria [12,13]. Many countries, including Nigeria, have thus incorporated this strategy into their national malaria control plans. The World Health Organization currently recommends that 1.8 LLINs should be distributed for free or at highly subsidized prices for every 2 persons in malaria affected areas.

The most recent Nigerian Malaria Control Program Strategic Plan (2009-2013) set the ambitious net-related targets of: 80% of households owning at least two ITNs/LLINs by 2010; and 80% of children less than age five and currently pregnant women sleeping under an LLIN by 2010. To address these targets, a countrywide scale up of LLIN coverage was initiated in 2009. Attaining these ambitious goals, however, has proven to be a difficult task. In 2010 only 42% of households in Nigeria owned at least *one* LLIN,

29% of children less than age five and 35.4% of pregnant women were sleeping under an LLIN [3]. Although these figures indicate significant improvement from previous years, significant work remains to reach national coverage targets. However, more than 51 million LLINs have been distributed so far, a major accomplishment, and with completion of the national mass distribution campaign currently scheduled for May 2013, significant improvements in coverage are expected. [14].

Many challenges remain as Nigeria continues to scale up LLIN coverage, including those related to ensuring appropriate net distribution, use and adherence [5]. Recent studies suggest that distribution alone may not be sufficient to guarantee net use [15,16]. For example, one study conducted in Rivers State, Nigeria found that Only one third of those that owned a net slept under them the night prior to the survey [17]. This research is concerning as potential reductions in malaria morbidity and mortality due to LLIN distribution will only be fully realized if the nets owned are correctly and consistently used. Developing a deeper understanding of the factors that influence net use can assist in informing future malaria control programming to ensure that this valuable tool in malaria control provides optimal protective results to at-risk populations.

### **Statement of the Problem**

As countries, like Nigeria, move closer to reaching LLIN coverage targets, ensuring correct and consistent net use should become a more prominent goal of malaria control efforts. Currently there is no recognized best practice for encouraging net use in a net owning population. However, there is a growing body of research exploring the

factors influencing net use behaviors in a population so as to inform future behavior change interventions aimed at increasing correct and consistent net use in a population.

There is a growing list of potential determinants of net use described in the current scientific literature. However, for several reasons, programmatic implications of these findings are not always obvious. For one, the direction and magnitude of associations reported in the literature vary significantly by analysis method, geographic location and epidemiological setting. Additionally, many studies have not adequately controlled for net ownership levels in the population they are studying, and since ownership is likely the strongest predictor of net use, the associations reported are likely confounded. Finally, very few studies have adequately examined the social environment in which net use behaviors are adopted, focusing mostly on environmental, demographic, and individual characteristics, while ignoring potentially important social factors that may influence net use behaviors such as the support and encouragement of us from friends and family members, the complexities of power dynamics within the household and influence of culture and community norms. A more complete picture of the factors that influence net use and the relationships that exist between these factors would provide valuable direction for the design of future malaria control efforts aimed at increasing appropriate and consistent net use among malaria affected populations.

### **Purpose of the Study**

This study aims to investigate the determinants of net use, independent of net ownership, in a population of influential adult household members living in a malaria

endemic region of Nigeria, following the completion of a mass LLIN distribution campaign and a behavior change communications intervention.

### **Significance Statement**

There is an apparent gap between net ownership and appropriate net use. Elucidation of the factors that influence LLIN use among bed net owners will provide an evidence-base that can be drawn upon in the development of tailored intervention programs aimed at increasing net use in Nigeria thus maximizing the potential benefits LLINs have in reducing the heavy burden of malaria morbidity and mortality.

## Definition of Terms

BCC	Behavior change communications
CHP	Community health promoters
EA	Census enumeration area utilized to select clusters
FMOH	Nigerian Federal Ministry of Health
ITN	Insecticide-treated net
LF	Lymphatic filariasis
LF knowledge	Score presented in tertiles (high, medium, low) measuring respondents' correct biomedical knowledge of LF causes, prevention and treatment
LGA	Local government area
LLIN	Long lasting insecticide-treated net
Malaria knowledge	Score presented in tertiles (high, medium, low) measuring a respondents' correct biomedical knowledge of malaria causes, prevention and treatment
Net care knowledge	Score presented in tertiles (high, medium, low) assessing respondents' correct knowledge of appropriate net care practices
Net density	Number of nets per household member
Net skills and self-efficacy	Score presented in tertiles (high, medium, low) assessing respondents' self-reported confidence in performing net hanging and care activities
NMCP	National Malaria Control Program
SES	Socio-economic status
Social support	Score presented in tertiles (high, medium, low) comprised of survey questions measuring the frequency (always, often, sometimes, rarely, never) of physical assistance and encouragement respondents receive from their spouse, children and friends
SV	Sentinel village
Wealth index	Score presented in quintiles developed using household characteristics

## **CHAPTER 2: Review of the Literature**

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Malaria is a parasitic vector-borne infectious disease that, despite its entirely preventable and treatable nature, is one of the most significant public health issues worldwide. Nearly half of the world's population is at risk for malaria and the disease infects greater than 200 million annually [1]. In 2010, malaria was responsible for more than 600,000 deaths, mostly in children less than five years of age [1]. Malaria disproportionately affects sub-Saharan African populations with 6 countries (Nigeria, Democratic Republic of the Congo, United Republic of Tanzania, Uganda, Mozambique and Cote d'Ivoire) accounting for nearly half of all malaria cases [1]. In addition to the public health burden of malaria, the economic burden on the African continent is staggering, resulting in annual direct economic costs of USD 12 billion and an estimated 1.3% loss in African GDP growth [1].

In the previous two decades, insecticide treated nets (ITNs) have become a central component of the global malaria control strategy. The evidence of their effectiveness in reducing malaria-related morbidity and mortality has been well established: correct and consistent net use can reduce episodes of malaria by 50% in endemic areas [6]; household ownership of at least one ITN is associated with 23% reduction in mortality for children less than five years of age [18]; and an estimated 635 lives are saved for every one million ITNs distributed [19]. In addition to the benefits experienced by individual net users, it has also been demonstrated that high ITN coverage in a population can have a community-wide effect where even those community members who are not sleeping under an ITN experience increased protection from malaria due to a reduction in local vector prevalence [9,10]. Accordingly, LLIN distribution has been substantially scaled-up

leading to significant increases in ITN ownership in many malaria-endemic countries in the course of the last decade [20-23].

In the case of Nigeria, a country with a population of more than 160 million persons (nearly all at risk for malaria) and limited resources, national scale up of ITN coverage has been challenging. A national mass LLIN distribution campaign was not initiated until 2009 and continues currently with an anticipated completion date of May 2013. Nonetheless, Nigeria has made great achievements in national ITN coverage rates in the last decade. Between 2000 and 2010, the percent of households owning any type of mosquito net increased from 10% to 44% [3]. In 2000 there was no measureable possession of ITNs in the population, but by 2008 more than 70% of all nets were ITNs or LLINs [24]. At the last measurement, in 2010, 42% of the population owned at least one ITN [3]. This number is expected to be higher today as millions of LLINs have been distributed nationally since then. Regardless, there remains significant work ahead in order to achieve the national target of 80% of households owning at least two LLINs [5].

Simply owning an ITN is not sufficient to protect against malaria. To provide maximum benefit to the owner a net must be used correctly and consistently. In recent years, several studies have suggested that a 'gap' may exist between net ownership and use where the proportion of individuals correctly utilizing ITNs is significantly less than the proportion of households owning nets [15-17,25-28]. For example, a 2008 study published by Thwing *et al.* indicated that, in Niger, as few as 33% of the available nets in net-owning households were utilized the night before the survey. This discrepancy highlights the importance of understanding underlying issues affecting net use and serves

as a reminder that one must ask whether individuals are unable or unwilling to use the nets they have or rather is net use low simply because there are no nets available.

If a 'gap' does exist between net ownership and use, closing it will require a better understanding of the underlying reasons for a population's lack of appropriate net use. It becomes important to know not only who is least likely to sleep under an ITN, but also why they are not doing so. This knowledge can then be applied to malaria control programming in the form of tailored intervention strategies aimed at increasing a population's ability and willingness to use nets. Nigeria is currently addressing the issue of lack of access to LLINs through a mass distribution campaign and by finalizing plans to implement continuous routine distributions through childhood vaccination clinics, antenatal care clinics, community-based systems and schools in the future. Ensuring a high level of consistent and appropriate net use in the population after LLIN coverage targets are met may present a substantially more complex task.

The factors that influence an individual's decision to consistently sleep under an ITN, when one is available, have been examined in malaria control and prevention research in numerous geographic and epidemiological settings. This chapter presents a summary of the existing literature exploring the potential determinants of net use that will be used to inform an analysis of the determinants of net use in a Nigerian population that recently participated in a mass LLIN distribution campaign. In the discussion of the literature presented below, potential determinants of net use have been categorized into levels based on ecological models of health behavior [29].



### **Intrapersonal Level**

At the center of the proposed model are the intrapersonal level factors influencing net use. These factors are representative of an individual's personal characteristics and can be further categorized into: (1) Demographic factors including: age, sex, socio-economic status (SES) and education level; and (2) Psychological factors including: malaria knowledge and perceived malaria risk.

*Demographic factors: age, sex, SES, and education level*

#### *Age*

Numerous studies have reported an association between age and level of net use [25,30-33], however, the degree and direction of association varies significantly between geographic region and other population demographics. One study examining survey data from six sub-Saharan African nations found that children less than age five were more likely to sleep under nets compared to other age groups [25]. Another analysis of data from 15 African countries found that infants were most likely to sleep under ITNs [31]. Interestingly, a more focused analysis of a population in western Kenya found that children less than age five were the least likely age group to sleep under ITNs [30]. Other age groups reported to be less likely to sleep under a net included school-age children and adult males [25,32]. It is also important to note that the methods used to examine the association between age and net use differ substantially between studies, which may account for some of the discrepancies in results. For example, of the five studies referenced above, three employed regression analysis to conclude that age is independently associated with net use [30-32] and two compared the proportion of net use among various age groups to conclude that age is associated with net use [30,33].

### *Sex*

Multiple studies have suggested that an individual's sex is associated with ITN use [25,32,33]. Frequently, females are reported to be more likely to sleep under a bed net compared to males [25,32,33]. Occasionally this difference between the sexes is more pronounced in specific age brackets. Baume *et al* analyzed data from national surveys conducted in six sub-Saharan African countries and found that adult males were among the least likely age-gender groups to sleep under an ITN [25]. Alternatively, Eisele *et al* studied the national surveys of 15 countries in sub-Saharan Africa and found no statistically significant association between a child's sex and his/her net use [31].

### *Socio-economic status*

There is conflicting evidence regarding the association between SES and ITN use in the current literature. There is likely a logical overlap in the relationship between SES, ITN use and ITN ownership in that families without the economic means to overcome the financial barriers to purchasing a bed net would be expected to have decreased net ownership, and since net ownership is likely the strongest predictor of net use, there is likely to be a confounding effect of ownership on the relationship between SES and net use. The previously discussed analysis conducted by Eisele *et al* [31] demonstrates this logic. They reported that net ownership was associated with SES, however, once a household owned a net, SES had no further impact on net use. Conversely, there have been some studies that report an association between net use and wealth, though the direction of the association varies [34,35]. For example, Goesch *et al* [34] conducted a cross sectional study of 397 mothers and guardians of young children and found that the children of more affluent mothers were *less* likely to sleep under a bed net. Conversely,

an analysis of Ethiopia's Malaria Indicator Survey found that net use was independently associated with increasing wealth [35].

#### *Education level*

Several studies have examined the association between education and net use [31,33,36-39]. In some instances, it appears as though having some education is significantly associated with an individual's net use and educated households tend to have more net use in general [37,39]. Additionally, some studies have shown that the children of educated caregivers are more likely to sleep under a bed net than children of non-educated families [38,39]. Alternatively, there have been studies indicating that education is not a significant predictor of ITN use among individuals or their children [31,36]. This discrepancy in findings may be indicative of the challenge in separating determinants of net use from determinants of net ownership. The qualitative study by Ng'ang'a *et al* [33], for example, reports a statistically different proportion of net use among educated and non-educated individuals however it is unclear whether the assessment was conducted among all study participants or only among those who have access to a bed net.

#### *Occupation*

Literature suggesting an association between an individual's occupation and his or her ITN use is limited, however what exists provides insight into some of the social and logistical factors affecting net use. Most recently Biadgilign *et al* [40] published results of a multivariable logistic regression analysis of data from 335 households in eastern Ethiopia indicating that farmers (aOR 0.137; 95% CI:0 .04-0.5) and housewives (OR 0.26; 95% CI: 0.08-0.82) were less likely to use ITNs than individuals of other

occupations. A qualitative study conducted by Dunn *et al* [41] provides insight into why farmers may be less likely to use ITNs in some regions. The authors conducted interviews with members of a community in southern Tanzania and found that, in order to carry out their farming activities, many adults were required to be away from their households for an extended period of time due to the substantial distance between the farming site and their residence. Study participants reported that the time spent away from home negatively impacted their ability to sleep under an ITN. The study also found that children are less likely to sleep under a net when their parents have occupations requiring them to be away from the home for extended periods of time.

### *Psychological factors*

#### *Malaria risk perception and knowledge*

It is reasonable that an individual who does not perceive malaria as a serious risk may not value ITN use. It has been reported that some individuals possess significant apathy towards malaria infection due to the commonality of the disease [42,43]. A limited understanding of the biomedical characteristics of malaria, specifically in regards to its signs and symptoms, has been hypothesized to be a barrier to ITN use [44]. Ng'ang'a *et al* suggest that individuals who define malaria based on its common symptoms may have difficulty accepting that ITNs alone can offer adequate protection, especially when these symptoms do not cease after appropriate use of bed nets [33].

Many individuals lack a basic understanding of malaria and the mechanisms of transmission, prevention and treatment [33,44-46]. Numerous studies conducted in sub-Saharan Africa suggest that misconceptions about the causes of malaria may hinder ITN use [33,44,45]. In some communities, a mosquito bite is considered only one of many

mechanisms of malaria transmission [33,44-46]. In such communities, researchers have observed individuals using methods other than ITNs to prevent malaria, often reserving ITN use for protection from the nuisance of biting mosquitoes [46]. In some circumstances this not an issue – as long as an individual is sleeping under a net, his/her reason for doing so may not matter. However, when mosquito density (an environmental factor) is perceived to be low, these individuals may not use their nets even though they may still be at risk for malaria at this time.

Numerous studies identifying knowledge as a key factor associated with ITN use present descriptive data pertaining to self-reported reasons for non-net use [33,42,43,45,47]. Additionally, a large proportion of studies have taken a more quantitative approach to examining this factor [36,40,48]. The results of this research, however, demonstrate that different types of knowledge may have opposing effects on net use. One study used logistic regression analysis to examine the association between knowledge and net use in a population of pregnant women in Nigeria and found that, while knowledge that ITNs prevent malaria is positively associated with net use, knowledge of the causes of malaria, that malaria is harmful during pregnancy and of the risks associated with malaria during pregnancy are not significantly associated with net use [36]. Deressa *et al* also found that awareness that ITNs are used to kill mosquitoes was independently associated with net use [48]. Biadgilign *et al* [40] reported that knowledge of the cause of malaria is significantly associated with net ownership, but not with net use, however individuals who reported having heard malaria-related information in the previous six months are more likely to use a bed net than individuals who have not. This association with ownership and not use may be due to the fact that information is

often disseminated during ITN distribution; individuals may have the knowledge because they received a net and not the other way around. Several studies have also found that individuals who know that malaria is transmitted by mosquitoes are no more likely to use bed nets than individuals who lack this knowledge [49-51].

#### *Skills and self-efficacy*

Individuals who experience difficulties hanging or taking down an ITN often have reduced net use [30,33,46]. Several additional studies have suggested that a lack of net care practices and net hanging skills may also contribute to decreased net use [43,47,49,52,53]. This finding may be the result of a lack of knowledge of appropriate methods of net hanging and use practices or may be indicative of issues with the design of the net itself or with housing structures that make it difficult to hang a net every night. This highlights interconnectedness of the different levels of factors influencing net use and highlights the importance of targeting multiple levels with future interventions.

### **Interpersonal Level**

#### *Household size and composition*

At the interpersonal level, the most commonly reported predictors of net use in the literature are household size and composition [31,32,35,39,41,53]. Studies demonstrate that as the number of individuals in a household increases, a reduction in net use is observed. This result is likely due to inadequate household access to ITNs rather than issues specifically related to net non-use. Elsewhere, it has been demonstrated that household net use increases as the number of children under five in the household increases [38]. This finding may be indicative of confounding by net ownership since

many ITN distribution campaigns have targeted households with children under age five – thus households with multiple children under five will have comparatively more ITNs.

#### *Sleeping arrangements*

It has also been reported that the number, arrangement and type of sleeping spaces in a household are associated with net use [25,33,53,54]. For example, a study conducted in Western Kenya found that the net use of household members who slept on a bed in a designated bedroom was significantly higher than those without beds sleeping in non-bedrooms [54]. Using regression modeling, the same study reported that, although there was no association between net use and bed availability in the overall sample, when they limited their analysis to only those households with enough nets to cover all household members, bed availability and numbers of rooms were significantly associated with net use. This result suggests that a lack of access to a bed and the requirement to use non-designated sleeping spaces may significantly impact net use

#### *Social support*

Rickard *et al* hypothesized that ITN use could be improved in a community by increasing social pressure and support [49]. Self-evaluation of their intervention suggests that their hypothesis may be correct. Beyond this study, the evidence in the malaria literature indicating an association between social support and ITN use is scanty. The relationship between social support and overall health and wellbeing, however, has been described in theory [55,56] and there is substantial empirical evidence showing its influence in the adoption of other health behaviors requiring consistent maintenance such as: smoking cessation [57], weight loss [58], and medical regimen adherence [59].

Therefore, it is probable that social support impacts ITN use behaviors and should be considered in future studies on the determinants of net use.

### **Net level**

#### *Physical characteristics of nets*

Physical characteristics of ITNs can influence an individual's decision or ability to use them regularly and appropriately. Preferences for certain net type, color and shape may be an important factor determining net use behaviors [24,33,60,61]. For example: results from an ethnographic household survey conducted in Central Kenya found that 63% of the population preferred rectangular-shaped over conical-shaped nets because they accommodate comparatively more people [33]. This preference likely reflects the fact that, in many contexts, social, structural and environmental factors make it necessary for multiple household members to share same sleeping space. In this same study, it was found that 51% of respondents preferred green colored nets reportedly because this color of net was less likely to look dirty. Many of the households in the sample used firewood for cooking and lighting which was said to produce a lot of smoke that made 'bright colored' nets appear dirty. In another study conducted in Burkina Faso [46], individuals living in smaller homes where sleeping spaces are converted for alternate use in the daytime found large and bulky nets undesirable, not only because of the difficulty associated with set-up and take down, but also because of concerns that these nets present a fire risk in households where open flames are used for cooking indoors.

#### *Condition of ITNs*

The condition of a net has also been shown to be associated with its use [15,30,62,63]. In one qualitative study, participants commonly reported that they did not



use ITNs due a belief that the ITN is no longer effective or that it is in poor condition (i.e. has holes or looks dirty) [43]. Similarly, Ngondi *et al*'s analysis of Ethiopian MIS data found that net age and damage level were independent predictors of non-use [35]. A net with fewer holes is more likely to be used (not to mention more effective) and households with a greater proportion of older nets have less overall net use compared to households with a greater proportion of new nets [32].

### **Physical Environment Level**

#### *Household structure and construction materials*

Housing characteristics have also been found to influence a family's mosquito control efforts. Keating *et al* [64] reported that, in a coastal community in Kenya, household wall type was associated with a household's mosquito control methods (including ITN use). Household living in structures with 'mud-wood-coral walls' (aOR 0.394; 95% CI: 0.236-0.659) or walls made of mud blocks with plaster (aOR 0.466; 95% CI: 0.250-0.867) were less likely to use multiple mosquito control measures than households living in dwellings with cement walls. It is difficult, however, to interpret these results with respect to net use alone as the authors used a scored value as their dependent variable that was equal to 1 if the household reported ITN use and at least one additional mosquito control measure and 0 if not. Furthermore, this result is likely highly reflective of SES where households with cement walls generally have more disposable income and may be more able to afford these additional methods.

## Community Level

### *Cultural beliefs and practices*

Cultural beliefs and practices can have a substantial impact on a community's acceptance of ITN practices [41,62,65-67]. A focus group discussion among men in Kenya revealed that, in at least one community, "a white net symbolises [*sic*] death" and thus when individuals in the community were presented with a free white ITN, many had the belief that sleeping under it 'invites death in the family' [62]. Certain 'special events' and ceremonies – funerals in particular – have an impact on net use as well [41]. In-depth interviews of individuals in a Tanzanian community discovered that during funeral ceremonies individuals will sleep outside and the cultural norm forbids the use of bed nets out of reverence for the deceased [41]. Populations of Vanuatu were described to have decreased net use due to all night dancing rituals that were held out of doors [65]. Additionally, the women in this community slept in separate huts when menstruating and a net was not always available for them to use [65].

### *Social norms*

Some routine daily activities such as socializing, queuing for water, collecting fuel and watching television, commonly take place outside at dawn and dusk and place individuals at risk during these times [41]. Interestingly, some of these activities were closely linked to sex, which may explain some of the previously described relationship observed between sex and net use [41]. Temporary, periodic or infrequent conditions have been found to inhibit even frequent users from sleeping under nets [41,64,68-70]. Net use can be disrupted when individuals return home from work or socializing late at night and do not wish to disturb other family members by setting up their bed net [30] or

when individuals must sleep in the fields during planting or harvest season [41]. Other conditions resulting in disruption of regular net use include traveling, disruption of the usual sleeping arrangements, net unavailability due to washing, extreme fatigue, labor pains, illness and forgetfulness [41,64,68-70].

### **Environment Level**

#### *Season/climate*

It has been demonstrated by several studies that nets are used more often during the rainy season [28,37], likely due to the increased mosquito density and malaria prevalence that accompanies this season. Nocturnal temperatures have also been demonstrated to have an effect on ITN use. In some regions, individuals report that heat discomfort is a significant barrier to consistent net use [33,47,53]. Interestingly the reverse has also been reported where individuals value the warmth a net provides and are thus motivated to use nets during cooler seasons [30,33].

#### *Perceived mosquito density*

Perceived mosquito density and nuisance biting are also frequently reported reasons for increased net use and conversely, perceived low mosquito density has been shown to be associated with decreases in net use [33,37,43,44,53,71].

#### *Urban/rural residence*

When location of residence is found to be significantly associated with net use, residing in an urban setting is more commonly associated with increased net use compared to residing in rural areas [32,36,38,39]. For example, this has been observed in populations in Ethiopia where women in urban areas are more likely to sleep under a net [39], Equatorial Guinea where there is higher net use among children under age five if

they live in urban areas [38] and in Nigeria where urban residence is independently associated with net use among pregnant women [36]. Not all literature examined found an association between urban/rural residence and net use. The aforementioned study by Eisele *et al* reported that urban/rural residency is not significantly associated in any of the 15 African countries they investigated [31].

### **Concluding summary**

As outlined here, there are numerous inter-connected factors that potentially influence net use on a variety of levels including: intrapersonal level factors such as: age, sex, SES, education level, occupation, knowledge, beliefs and risk perceptions of malaria and net use/care skills and self-efficacy; interpersonal factors such as: family size and composition, intra-household sleeping arrangements and social support; net level factors such as: the physical characteristics of the nets themselves including their size, shape, color, cost, and the perceived and actual condition of nets; physical environment level factors such as: household structure and construction materials; community level factors such as: cultural beliefs and practices and social norms; and environmental level factors such as: season, climate and urban/rural residence.

Historically, the majority of research on determinants of net use has focused on interpersonal and environmental level factors and it is only in more recent years that the malaria research community has begun to investigate the more nuanced interpersonal and community level factors discussed here. The vast majority of studies employed qualitative methods or descriptive statistics that compare proportions of net use between population groups, and relatively few studies have utilized statistical regression modeling to investigate the association between these potential factors and net use. The direction

and magnitude of reported associations can vary significantly between studies, depending on analysis method, geographic location and epidemiological setting utilized.

### **Relevance to the proposed study**

The proposed analysis will focus on furthering the understanding of the relationship between net use and some of the more commonly studied intrapersonal level demographic and psychological factors as well as a variety of less studied determinants including net use self-efficacy, social support and social norms. The analysis will employ regression modeling as this is a method that has not been frequently utilized in previous research. A net ownership control variable will be included in the multivariable model to address the need for differentiating between net use and net ownership highlighted in the literature presented.

## CHAPTER 3: Manuscript (for submission to PLoS ONE)

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### **Regression Analysis of Determinants of Bed Net Use in Southeast Nigeria following Mass Distribution of LLINs: Implications for Social Behavior Change Interventions**

#### **Contribution of Student**

For this manuscript, the student conducted all statistical analyses presented, created all figures and tables and wrote the manuscript with editorial assistance from Amy E. Patterson and Deborah A. McFarland.

#### **Abstract**

**Background:** Millions of long-lasting insecticide treated nets (LLINs) have been distributed as part of the global malaria control strategy. LLIN ownership, however, does not necessarily guarantee LLIN use. Thus, even in the ideal setting in which universal coverage with LLINs has been achieved, maximal malaria protection will only be achieved if LLINs are used both correctly and consistently. This study aims to investigate the factors associated with net use, independent of net ownership.

**Methods and Findings:** A secondary data analysis was performed using data collected from a household survey conducted in southeastern Nigeria in November 2011 following a statewide mass LLIN distribution campaign and, in select locations, a community-based behavior change communications (BCC) intervention. Multivariable logistic regression analyses, controlling for household bed net ownership, were employed to examine the association between individual net use and various demographic, environmental, behavioral and social factors. Our findings indicate that the odds of net use increase among individuals who were exposed to tailored behavior change communications

(BCC) in the context of a home visit (OR=17.11; 95% CI 4.45-65.79) or who receive a greater degree of social support from friends and family ( $p_{trend} < 0.001$ ). Factors that decrease the odds of net use include: increasing education level ( $p_{trend} = 0.020$ ), increasing malaria knowledge level ( $p_{trend} = 0.022$ ), and reporting any disadvantage of bed nets (OR=0.39; 95% CI 0.23-0.78).

**Conclusion:** This study suggests that LLIN use is significantly influenced by social support and exposure to a malaria-related BCC home visit. The malaria community should thus further consider the importance of interpersonal communication and social influences on adoption of net use behaviors when designing future research and interventions.

### **Introduction**

In 2010, malaria was responsible for approximately 220 million infections and 600,000 deaths, greater than 90% of which occurred on the African continent – mostly in children less than five years of age [1]. Insecticide-treated nets (ITNs) have been shown to reduce the incidence of malaria episodes by 50% in endemic areas [2] and have accordingly become one of the key strategies employed in the global malaria response [3]. Millions of free and highly subsidized ITNs and long-lasting insecticide treated nets (LLINs) have been distributed in the last decade [4-8] resulting in substantial increases in ITN ownership in many malaria-endemic countries [9-12]. Several studies have suggested that ITN ownership is not necessarily equivalent to ITN use [5,13-18]. This presents a significant obstacle to realizing the maximum potential benefits of ITNs for malaria-related morbidity and mortality since ITNs are maximally protective only when utilized correctly and consistently [7,9,19-21].

Previous studies have explored this apparent difference between net ownership and use. The list of potential determinants of ITN use identified in the current literature includes: demographic characteristics [12,13,19,22-28]; an individual's knowledge, beliefs and risk perceptions related to malaria and bed nets [19,29-38]; dwelling construction, family size/composition and sleeping arrangements [13,19,25,28,30,34,39-41]; physical characteristics of bed nets [25,30,31]; environmental factors [25,30,34,42]; and community and cultural characteristics [28,31,37,39]. However, programmatic implications of these findings are not always obvious given that the direction and magnitude of reported associations vary significantly by analysis method, geographic location and epidemiological setting. This paper will explore the determinants of net use through analysis of a household survey conducted in the specific context of southeastern Nigeria and discuss their implications for programmatic interventions to increase LLIN use.

Nigeria alone contributes 25% of the African malaria burden [43]. With nearly all of the country's 160 million people at risk, and an estimated 110 million cases a year, malaria is Nigeria's most significant public health issue [44]. Since the first national strategic plan for malaria control was introduced in 2006, ITNs, and more recently LLINs, have comprised the central component of the national malaria control efforts [45-47]. In 2000, only 10% of households owned any type of mosquito net. However by 2010, this figure increased to 44% [48]. At the national level significant work remains to achieve the target of 80% household LLIN coverage [47].

There is no standard method in the literature to control for variations in net possession levels when investigating determinants of net use. Various studies have



addressed this issue by limiting their analysis to households owning at least one net. A limitation to this approach is that it does not account for household size – one net may be sufficient for a household of two but inadequate for a family of five. Perhaps a more rigorous approach to this issue is to also control for household net density (number of nets per household member).

The analysis presented here contributes to the growing body of work on determinants of net use by exploring which characteristics are most strongly associated with net use among an adult population in a malaria-endemic region that has recently completed a statewide mass LLIN distribution campaign, while controlling for the confounding effects of household net density.

### **Methods**

The Carter Center, in collaboration with the Nigerian Federal Ministry of Health (FMOH), conducted annual malaria cluster surveys in four local government areas (LGAs) of Ebonyi and Imo states (Figure 1) from 2007 to 2011 in the context of a Bill and Melinda Gates Foundation (BMGF)-funded study examining the use of community-wide LLIN distributions to interrupt lymphatic filariasis (LF) transmission [49]. This paper presents the results from a secondary analysis of the 2011 survey data collected in Ebonyi state in order to examine determinants of net use following a mass LLIN distribution campaign and, in select areas, a behavior change communication intervention. Imo State did not complete its mass campaign prior to the 2011 survey and thus was excluded from these analyses.

### *Survey area*

Ebonyi occupies an area of approximately 5,935 square kilometers and nearly all of its 1.7 million inhabitants are at risk of malaria. *Anopheles* mosquitoes belonging to the *Anopheles gambiae* complex are the most commonly reported malaria and LF vector species in the area [50], which allows for simultaneous targeting of malaria and LF transmission through LLIN distribution. The region has two distinct seasons – rainy from April to October and dry from November to March. The dominant species of malaria parasite, *Plasmodium falciparum*, is transmitted perennially, although malaria episodes usually peak towards the end of the rainy season [50]. The majority of the region lies below 200 meters above sea level thus elevation is likely to have little effect on malaria transmission. The people of Ebonyi are predominantly Christian, of Igbo ethnicity and participate in agricultural-based livelihood activities [44].

### *LLIN distribution*

Between January and March 2011 a total of 997,492 LLINs were distributed in Ebonyi state by the National Malaria Control Program (NMCP) and its partners, including The Carter Center, through a statewide mass LLIN distribution campaign that employed a two-nets-per-household strategy. Prior to this, The Carter Center, in collaboration with the Ebonyi State Ministry of Health, distributed 250,000 LLINs in the LGAs included in the BMGF-funded LF study between 2008 and 2010.

### *Behavior change communication intervention*

A community-based behavior change communications (BCC) intervention to increase the correct and consistent use of LLINs was designed by The Carter Center and implemented through partnership with the Ebonyi State MOH. The intervention was

piloted from July to November 2011 within six sentinel villages (SVs) where monthly entomological monitoring was conducted as part of the larger LF study. Community health promoters (CHPs), selected by their community leaders, carried out the intervention at the household and community level. BCC intervention activities included: 1) monthly home visits by CHPs to conduct tailored behavior change communication and monitor LLIN use and care; 2) mobilization of community and religious leaders to support and promote malaria control interventions; and 3) organization of community events including: net washing and mending days; workshops to build portable net hanging frames; and malaria-related performances and demonstrations.

#### *Household sample selection*

A complete list of census enumeration areas (EAs) was utilized to systematically select 14 clusters from each study LGA in Ebonyi State. An additional 30 clusters were systematically selected from the six sentinel villages where the BCC intervention was conducted to allow for comparative analysis. It was assumed *a priori* that all EAs were of approximately equal size. If an EA contained too many households to survey in one day, it was segmented using an algorithm based on the number of households in the EA described in UNICEF MICS sampling protocol [51]. The survey team visited all 955 households in 58 selected clusters.

#### *Survey instrument*

The survey instrument (Appendix I), developed by The Carter Center, included questions on malaria and anemia prevalence, net ownership and net use, as well as household and sleeping space characteristics, and demographics. In addition, a more extensive knowledge, attitudes and practices module than is generally included in

standard Malaria Indicator Survey and Multiple Indicator Cluster Survey questionnaires (henceforth referred to as ‘extended KAP module’) was administered to a selection of adult household members. This module was informed by social behavioral theory [52-55] and, in addition to questions concerning knowledge and attitudes, examined malaria-related social support, social norms, self-efficacy, exposure to information and communications, and temporal/seasonal variation in net use (data not presented). Data were collected from heads of households and their spouses to obtain the perspective of those who likely have the greatest influence over household net use, as well as to capture both male and female perspectives. After obtaining consent, trained survey staff interviewed either the head of household or his spouse (in male-headed households), alternating from one dwelling to the next. In every third household visited, the extended KAP module was administered to both the head of household and his spouse. In cases where neither the head of household nor his spouse was available, an alternate adult male or female family member was selected. In households in which there were multiple wives, each wife was considered the head of her household.

#### *Data entry*

Household survey data were collected in paper format, double entered by trained data entry staff using Access and subsequently converted to Epi Info 7 [56] to check data for entry accuracy using the Data Compare procedures. Data were cleaned in Access and then converted for analysis in SAS 9.3 (SAS Institute Inc.).

#### *Statistical analysis*

Relevant descriptive statistics were calculated to examine the characteristics of the sample population. Proportions and means of population characteristics were

estimated, adjusting for clustering effects and sampling weights. A net density variable was calculated by dividing the total number of nets in a household by the number of resident household members. Principal components analyses, conducted using the methods of Der and Everitt [57], were utilized in the development of several variables including: household wealth index [58]; net care knowledge score; net use skills and self-efficacy score; malaria-related social norms and rumors score; LF knowledge score; malaria knowledge score created using five variables examining respondents' correct knowledge of causes, symptoms and prevention methods; social support score created from six survey questions investigating the frequency (never, rarely, sometimes, often, always) of net hanging assistance and encouragement respondents received from their spouse, children and friends.

Only respondents to the extended KAP module residing in Ebonyi State and living in households owning at least one net were included in the analysis of determinants of net use. Figure 2 presents a flow chart depicting the male and female modified KAP survey module respondents (henceforth referred to as 'respondents') included in this analysis. To assess determinants of net use among respondents, potential explanatory factors with a bivariate association with net use (as measured by self-reported net use last night) at significance  $p < 0.25$ , according to the procedures of Heeringa *et al* [59], were selected as candidates for main effects in a multivariable logistic regression model. Regression analysis, assuming missing values were not missing completely at random, was employed to provide more conservative variance estimates. Explanatory factors were removed individually from the model in order of least significance. Independently associated factors at significance  $p < 0.05$  ( $p_{trend} < 0.05$  for categorical variables with

multiple levels) were retained in the final model. To control for the potential confounding effects of differences in net ownership, the continuous net density variable was retained in the final multivariable model. Odds ratios, 95% confidence intervals and their corresponding *p*-values were calculated adjusting for the cluster survey design and sampling strategy.

#### *Ethical approval*

The Imo and Ebonyi State Ministries of Health, Imo State University and the Emory University Institutional Review Board approved the comprehensive protocol, including consent forms (Emory IRB Protocol # 5533).

### **Results**

#### *Household net ownership and use*

Table 1 presents weighted estimates of net ownership and use indicators. An estimated 72.19% (95% confidence interval [CI] 60.30%-84.09%) of households in Ebonyi own at least one bed net and 60.38% (95% CI 48.44%-72.31%) own at least two. An average household owns 1.52 (95% CI 1.24-1.81) nets, equating to a net density of approximately 0.57 (95% CI 0.52-0.62) nets per person. Greater than 99% (95% CI 99.26%-100%) of all bed nets owned are LLINs and 80.08% (95% CI 74.65%-85.51%) were used the night prior to the survey. Among households owning at least one net, 74.10% (95% CI 68.57%-79.63%) of individuals slept under an LLIN the night prior to the survey. Children less than five years of age in these households had the highest proportion of net use (79.92%; 95% CI 72.87%-86.97%) and adolescents 15-19 years of age had the lowest (63.64%; 95% CI 53.90%-73.39%).

*Association between potential determinants and LLIN use*

Bivariate logistic regression analysis of associations between explanatory factors and net use, among respondents residing in households owning at least one LLIN is presented in Table 2. At the 95% significance level, net use is associated with several factors including: female sex (OR = 1.77; 95% CI 1.16-2.71), behavior change communication intervention (OR=4.43; 95% CI 2.64-7.44), receipt of a malaria-related home visit (OR=16.55; 95% CI 6.02-45.50), increasing net hanging skills and self-efficacy ( $p_{trend} = 0.040$ ), increasing social support ( $p_{trend} = 0.0298$ ) and decreasing malaria knowledge ( $p_{trend} = 0.0079$ ).

Factors with significance between  $p = 0.05$  and  $p = 0.25$  utilized in the multivariable model included: net density ( $p_{trend} = 0.112$ ), education level ( $p_{trend} = 0.1062$ ), describing any disadvantages of bed nets ( $p = 0.064$ ) and opinion on whether it is safe to hang a net where food is stored ( $p_{trend} = 0.236$ ). Several additional factors were investigated in the bivariate analysis and found not to be significant at the  $p < 0.25$  level and were therefore excluded from the multivariable analysis including: age; wealth index; occupation; knowledge of appropriate net use, care and hanging; and net-related stereotypes, rumors and perceived social norms.

The multivariable logistic regression analysis results are presented in Table 3. Controlling for household net density, net use among respondents in households owning at least one net is associated with two explanatory factors: receiving a malaria related BCC home visit recently (OR=17.11; 95% CI 4.45-65.79) and increasing social support score ( $p_{trend} < 0.001$ ), where individuals with moderate and high social support are, respectively, 4.01 (95% CI 1.97-8.16) and 2.22 (95% CI 1.34-3.70) times as likely to

sleep under an LLIN as individuals with low social support. Additionally, two factors are associated decreased odds of net use including: reporting any disadvantage of mosquito nets (OR=0.39; 95% CI 0.23-0.78) and increasing education level ( $p$ trend = 0.020), where individuals with primary and secondary or greater education levels were, respectively, 0.43 (95% CI 0.19-0.95) and 0.42 (0.23-0.78) times as likely to use an LLIN as individuals with no education. Level of malaria-related knowledge was also significantly associated with net use ( $p$ trend = 0.022). Individuals with a moderate level of malaria knowledge were less likely (OR = 0.40; 95% CI 0.19-0.95) to sleep under an LLIN as individuals with low malarial knowledge, however, individuals with high levels of malaria knowledge were similarly likely to sleep under an LLIN (OR = 0.88; 95% CI 0.39-2.02) as those with low knowledge.

### **Discussion**

This study aimed to investigate the factors associated with LLIN use in male and female heads of household, and wives of male heads of household, living in two LGAs in Ebonyi, Nigeria following the completion of a mass LLIN distribution campaign and BCC intervention. Findings indicate that exposure to a malaria-related home visit (a component of The Carter Center's BCC intervention), level of social support from friends and family, reporting any disadvantage of nets, education level and degree of malaria-related knowledge are significantly associated with LLIN use in this population.

The findings presented here highlight several areas that should be investigated further. It is perhaps unsurprising that report of LLIN disadvantages is significantly associated with net non-use. However, elucidation of the specific disadvantages most strongly associated with net non-use may highlight areas of improvement for LLIN



design, distributions and communication messages. Previous studies present conflicting evidence of the association between education level and net use [26,33,60-62]. Our results suggest that individuals with higher education are less likely to sleep under a net. While occupation and wealth index were not significantly associated with net use, it is possible that education level is, in some way, demonstrating the effect that socioeconomic status (SES) has on net use in this population. SES may be associated with improved housing conditions, indoor occupational setting and reduced risk perception of malaria due to the decreased financial barriers to other malaria prevention and treatment tools. A more sensitive survey instrument designed to examine this relationship may be able to shed light on the underlying factors of this association. The relationship between malaria knowledge and net use in this population also requires further investigation since the direction of the effect of malaria knowledge on net use is unclear in our results. The variables included in the knowledge score measured a respondent's possession of medically correct knowledge of malaria causes, prevention and treatment. Further investigation into whether individuals believe the facts they report or possess local disease knowledge that runs contrary to the medically correct knowledge measured may assist in understanding this relationship more fully.

This study demonstrates the influence of social support on net use behavior. To our knowledge, this is the first time that such a relationship has been explored in regression analyses of determinants of net use. The relationship between social support and overall health and wellbeing has been described in theory [63,64], and supported by empirical evidence describing its influence on the adoption of other health behaviors that, like LLIN use, require continuous maintenance: smoking cessation [65], weight loss [66],

and medical regimen adherence [67]. The relationship between net use and social support suggests new focus for messages employed in future BCC interventions, though its importance in other contexts should be confirmed. The data suggest that tailored behavior change interventions that include home visits, as described here, or some other form of interpersonal communication, may be more effective than mass communication campaigns that focus on increasing malaria knowledge. Exposure to BCC home visits was the most significantly associated determinant of net use in this study population. Although intervention process data (not presented) indicates that greater than 90% of households in intervention villages received a home visit, only approximately half of respondents in these villages reported receiving such a visit. While over-reporting of performance by CHPs is certainly possible, this may mean that the individuals who participated in the extended KAP module during the survey were not at home at the time of the visit. This information, combined with the lack of observed association between residence in an intervention village and net use, suggests that the influence of the intervention might be limited to those individuals directly exposed, and that there may be limited diffusion of information between household members. Further investigations to better understand why this is could inform modifications to future social behavior change interventions increasing the effect of the intervention on all household members, not only those home during the visit.

### **Conclusion**

Results presented here, specifically in regards to the novel description of the influence of social support and BCC home visits on net use, can be used to inform future interventions and research on determinants of LLIN use in Nigeria and should be

examined in other contexts as well. Additional exploration of the social environment in which net use behaviors are adopted and encouraged should be the focus of future studies and should inform behavior change communication strategies aimed at increasing appropriate and consistent net use in a population once barriers to net ownership have been reduced.

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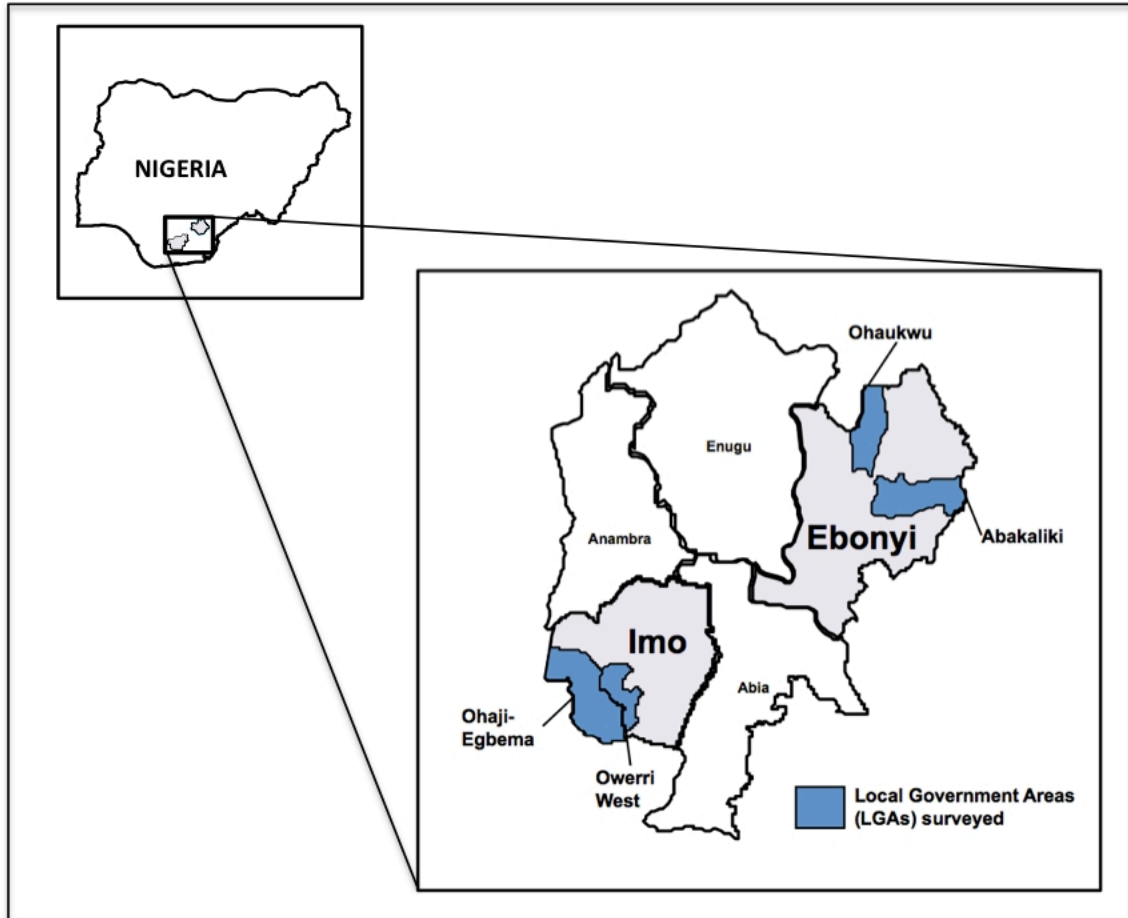
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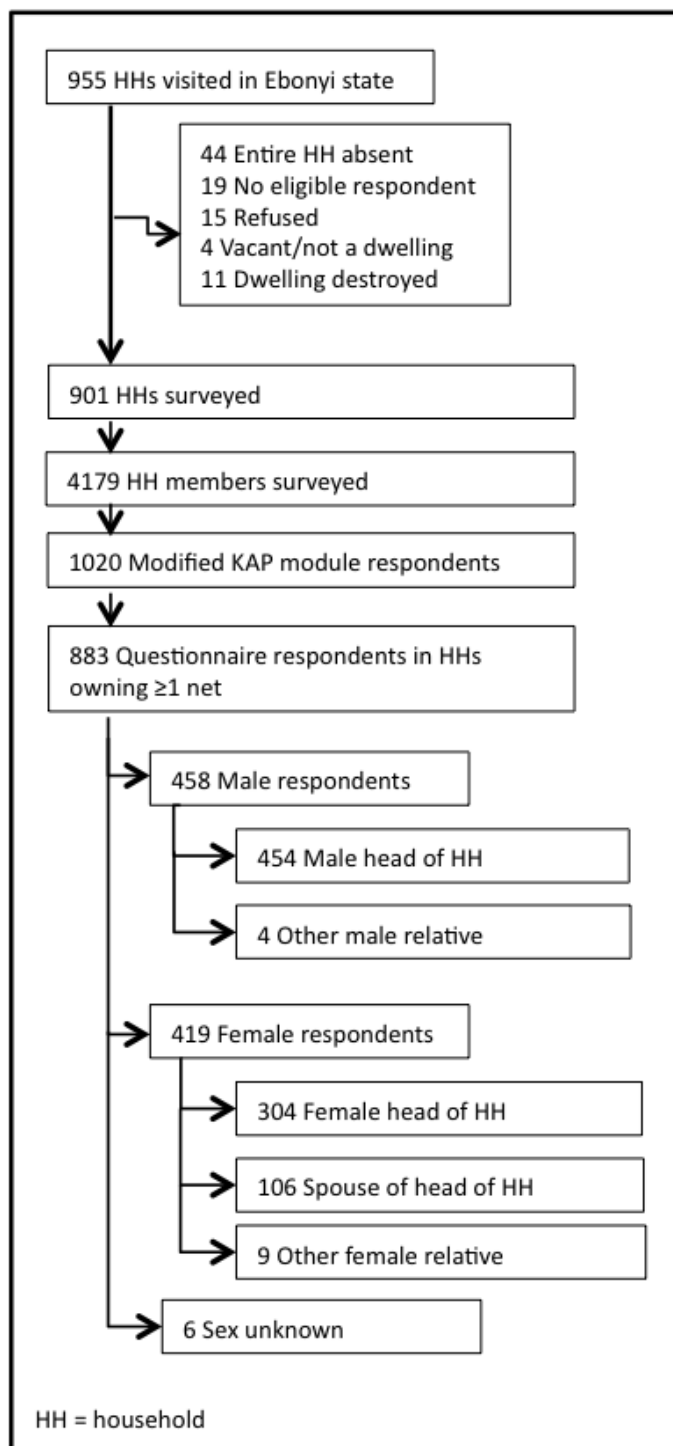
### Figures and Tables

Figure 1. Map of the survey area





**Figure 1. Flow chart of KAP survey module analysis sample**



**Table 1. Weighted estimates of LLIN ownership and use in Ebonyi**

<b>Characteristic</b>	<b>n(%) or mean(SD)</b>	<b>Weighted % or mean</b>	<b>95% CI</b>	
<b>Household LLIN ownership</b>				
Proportion of HH with at least one bed net	773(85.79)	72.19	60.30	84.09
Proportion of HH with at least two bed nets	683(75.80)	60.38	48.44	72.31
Mean number of nets per HH	1.88(1.06)	1.52	1.24	1.81
Mean HH net density (nets per person)* †	0.59(0.40)	0.57	0.52	0.62
<b>Net characteristics</b>				
Proportion of nets that were LLIN(%)	1661(99.94)	99.75	99.26	100.00
Proportion of nets used last night (%)	1318(81.86)	80.08	74.65	85.51
<b>Proportion of individuals using net last night*</b>				
All ages	2934(80.98)	74.10	68.57	79.63
Children under age 5	606(83.59)	79.92	72.87	86.97
Children age 5-9 years	548(82.28)	75.51	67.99	83.03
Children age 10-14 years	352(77.19)	69.52	60.98	78.07
Adolescents age 15-19 years	255(70.83)	63.64	53.90	73.39
Adults 20-59 years	1001(82.73)	75.23	69.90	80.57
Persons age ≥60 years	164(84.54)	78.50	65.37	91.63

HH: Household; LLINs: Long-lasting insecticide treated nets; SE: Standard error;

SD: Standard deviation

\*Among households owning ≥1 net

†Does not include baby nets

**Table 2. Univariable logistic regression analysis of the association between individual net use and explanatory factors among respondents living in households owning at least one net.**

Factors	Total (n)	Net used last night % (SE)	OR	95% CI	p-value	p-value test for trend
<b>Net density</b>						
<0.05	378	71.11(4.41)	1.00	-	-	0.11
≥0.5 < 1.0	366	80.27(3.75)	1.65	1.03-2.66	0.038	
≥1.0	133	71.90(8.18)	1.04	0.42-2.57	0.93	
<b>Sex</b>						
Male	458	69.64(4.82)	1.00	-	-	
Female	419	80.24(2.73)	1.77	1.16-2.71	0.008	
<b>Education level</b>						
None	414	81.75(3.69)	1.00	-	-	0.11
Primary	284	69.78(5.46)	0.52	0.24-1.09	0.082	
Secondary +*	171	69.15(6.18)	0.50	0.26-0.95	0.036	
<b>BCC Intervention</b>						
No	383	74.70(3.25)	1.00	-	-	
Yes	500	92.90(1.33)	4.43	2.64-7.44	<0.0001	
<b>BCC home visit</b>						
No	563	76.47(3.46)	1.00	-	-	
Yes	250	98.18(0.86)	16.55	6.02-45.50	<0.0001	
<b>Malaria knowledge</b>						
Low	310	81.63(3.35)	1.00	-	-	0.008
Moderate	220	63.32(6.26)	0.39	0.21-0.71	0.002	
High	323	77.04(3.94)	0.76	0.43-1.34	0.34	
<b>Skills and self-efficacy</b>						
Low	162	74.62(7.17)	1.00	-	-	0.040
Moderate	77	89.11(4.42)	2.78	0.86-8.99	0.09	
High	630	72.35(3.71)	0.89	0.42-1.90	0.76	
<b>Social support</b>						
Low	114	63.88(5.88)	1.00	-	-	0.030
Moderate	294	82.90(3.72)	2.74	1.28-5.86	0.009	
High	466	74.82(4.44)	1.68	0.89-3.17	0.109	
<b>Provide any disadvantage of nets</b>						
No	703	78.10(3.35)	1.00	-	-	
Yes	180	65.44(6.62)	0.53	0.27-1.04	0.06	
<b>It is safe to hang a net where food is stored</b>						
Agree	227	73.71(6.19)	1.00	-	-	0.24
Neutral	325	79.80(3.88)	1.41	0.77-2.59	0.25	
Disagree	327	70.89(4.01)	0.87	0.43-1.76	0.42	

CI: confidence interval; SE: standard error; Net density: number of nets per household member; BCC: Behavior change communications

\*Secondary education or higher

**Table 3. Multivariable logistic regression analysis of association between individual net use and explanatory factors among respondents living in households owning at least one net and controlling for net density.**

Factors	OR	95% CI	<i>p</i> -value	<i>p</i> -value test for trend
<b>BCC home visit</b>				
No	1.00	-	-	
Yes	17.11	4.45-65.79	<0.0001	
<b>Social support score</b>				
Low	1.00	-	-	<0.001
Moderate	4.01	1.97-8.16	0.0001	
High	2.22	1.34-3.70	0.002	
<b>Reporting any disadvantage of nets</b>				
No	1.00	-	-	
Yes	0.39	0.23-0.78	0.003	
<b>Education level</b>				
None	1.00	-	-	0.020
Primary	0.43	0.19-0.95	0.036	
Secondary or more	0.42	0.23-0.78	0.006	
<b>Malaria knowledge score</b>				
Low	1.00	-	-	0.022
Moderate	0.40	0.19-0.85	0.017	
High	0.88	0.39-2.02	0.77	

BCC: Behavior change communications

## CHAPTER 4: Extended Methods

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Due to word restrictions of a manuscript, some details of the methods utilized in this study were excluded from the methods section of Chapter 3. Additional detail on these analyses is provided in this chapter.

### *Larger LF Study design*

The data used for this analysis were collected during the final annual malaria cluster survey conducted in the context of a multi-year longitudinal study that began in January 2007 and was completed in November 2011. The study aimed to demonstrate that LLINs could be used to simultaneously interrupt the transmission of LF and improve malaria control. Both Ebonyi and Imo states were included in the study due to the regional endemicity of malaria, LF and the human filarial parasite *Loa loa*, the presence of which renders the usual LF intervention of ivermectin mass drug administration undesirable due to the risk of serious adverse effects in *Loa loa* infected individuals [72]. LGAs from Ebonyi (Ohaukwu and Abakaliki) and Imo (Ohaji-Egbema and Owerri West) were selected for the study because they had the highest LF prevalence in their respective states. Three sentinel villages within each LGA were selected for monthly entomological monitoring for the duration of the study based on the following criteria: having high baseline LF antigen rates, good road access throughout the year, good security and community willingness to participate in a multi-year longitudinal study.

### *Principal components analyses*

Principal components analyses were conducted using the methods of Der and Everitt [73] and were utilized in the development of seven composite variables including:

1. Household wealth index – informed by Vyas and Kumaranayake [74], and developed using the following household characteristics: household construction materials, type of sanitation facilities, household water sources, household asset ownership, household fuel materials, number of rooms in the household and the number of household members sharing a sleeping room (Appendix I: Questions Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q19);
2. Malaria knowledge tertiles (high, moderate and low) measuring respondents' correct biomedical knowledge of malaria causes, prevention and treatment (Appendix I: Questions M3, M4, M5, M6, M23);
3. LF knowledge tertiles (high, moderate and low) measuring respondents correct biomedical knowledge of LF causes, prevention and treatment (Appendix I: Questions F1, F2, F3, F4, F5, F6);
4. Net care knowledge tertiles (high, moderate and low) assessing respondents' correct knowledge of appropriate net care practices (Appendix I: Question M8, M9, M10);
5. Net skills and self-efficacy tertiles (high, moderate and low) developed using variables capturing a respondents self-reported confidence in performing net hanging and care activities (Appendix I: Questions SSE1, SSE2, SSE3, SSE4, SSE5, SSE6);
6. Social support tertiles comprised of questions investigating the frequency of physical assistance and encouragement respondents receive from their spouse, children and friends in regards to net hanging and use (Appendix I: Questions SS1, SS2, SS3, SS4, SS5); and

7. Social norms tertile (positive, neutral, negative) assessing the malaria-related positive and negative social norms (Appendix I: Questions SN1, SN2, SN3, SN4).

In each principal components analysis, variables with very low frequencies (<1%) were excluded due to their limited differentiation capacity. Variables with a high proportion of missing data (>10%) were eliminated to reduce introduction of bias.

#### *BCC Intervention Assessment*

In addition to the investigation into determinants of net use described in Chapter 3, a preliminary assessment of the behavior change communications intervention conducted by The Carter Center was performed to evaluate the BCC intervention by comparing areas that did and did not receive it. Descriptive statistics and a two groups comparison were calculated to examine and compare population characteristics between intervention (sentinel) villages and non-intervention villages in Ebonyi state. Differences were assessed at the 5% significance level using either the Rao-Scott Chi-Square test (for categorical variables) or the difference of least squares means (for continuous variables). Additionally, descriptive statistics for the activities that comprised a BCC home visit were compiled in order to assess the extent to which the intervention was implemented as intended. All estimates presented were calculated accounting for sampling design by adjusting for clustering effects and sampling weights.

## CHAPTER 5: Extended Results

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All results pertaining to the investigation of determinants of net use are presented in Chapter 3. Provided here are the results of the preliminary assessment of the BCC intervention.

### *BCC comparison descriptive statistics*

Table 4 presents the sample characteristics of the BCC intervention and non-intervention sample populations. Demographic and net use data were collected on 2033 individuals from 501 households in the BCC intervention group and 2052 individuals from 494 households in the non-intervention group. The questionnaire was administered to 1020 heads of households and/or their wives; 525 from villages that received the BCC intervention and 495 from non-intervention villages in Ebonyi state.

Table 5 presents a comparison of weighted demographic characteristics between BCC intervention villages and non-intervention villages in Ebonyi state. General demographic and household data including sex, wealth quintile, age, education level of heads of household, household location altitude, and household size did not differ significantly between BCC intervention and non-intervention populations. Statistical evaluation of the differences between the proportions of individuals who identified with specific religions and ethnicities was not possible given the limited variation in responses, however, in both the intervention and non-intervention populations, the vast majority of individuals identified as Christians of Igbo ethnicity. Farming was the predominant occupation in both groups however this proportion was significantly higher ( $p_{trend} < 0.001$ ) among the BCC intervention population (74.63%, 95% CI 69.35%-



79.91%) compared to the non-intervention population (58.38%, 95% CI 51.05%-65.72%).

#### *Net ownership and use*

Significant differences were found between the intervention and non-intervention populations when comparing net ownership variables (Table 6). The proportion of households owning at least one net was significantly higher ( $p < 0.0001$ ) in the BCC intervention population (94.16%, 95% CI 90.76%-97.55%) compared to the control population (72.03%, 95% CI 59.75%-84.30%). Similarly, the average number of nets per household in the intervention population (2.14, 95% CI 2.02-2.26) was significantly higher ( $p < 0.0001$ ) than the non-intervention population (1.51, 95% CI 1.22-1.81). Average net density in the intervention population was 0.61 (95% CI 0.56-0.67) which is significantly higher ( $p < 0.0001$ ) than the 0.41 (95% CI 0.33-0.50) nets per household member in the non-intervention population.

Among all age groups, the proportion of individuals who slept under a net the night before the survey, was significantly higher in the BCC intervention population (89.15%, 95% CI 85.21%-93.09%) compared to non-intervention population (73.79%, 95% CI 68.05%-79.54%). The age group with the lowest proportion of individual's sleeping under nets was adolescents aged 15-19 in both the intervention population (81.37%, 95% CI 73.07%-89.68%) and the non-intervention population (63.27%, 95% CI 53.19%-73.34%). All other age groups in the intervention population had approximately 90% net use the night before the survey, however, in the non-intervention group, the highest proportion of net use was in children less than five (79.75%, 95% CI 72.47%-87.03%). No statistical difference was found between BCC intervention and non-

intervention populations in any of the measured net level use indicators including: proportion of nets used last night ( $p = 0.14$ ), percent of nets used the night before the survey ( $p = 0.24$ ) and the proportion of nets that were hanging at the appropriate height ( $p = 0.44$ ).

Table 7 presents the difference in malaria-related knowledge, beliefs, social norms and messaging between BCC intervention and non-intervention populations. No significant difference was observed between the intervention and non-intervention populations in any of the knowledge scores measured (LF, malaria and net care) or in the score measuring positive and negative malaria-related social norms. Both populations also provided similar responses when asked to state malaria prevention methods with the most popular response being use of nets or ITNs, followed by other mosquito prevention techniques such as wearing insect repellent and clearing the yard by trimming bushes and cutting the grass. Least popular responses in both groups included use of preventive medicine and responses that are medically inappropriate actions for malaria prevention such as avoiding certain foods and dirty water.

Net hanging skills and self-efficacy differed significantly ( $p = 0.03$ ) between the two groups with 69.10% (95% CI 62.50%-75.70%) of heads of household in the intervention population reporting high skills and self-efficacy compared 57.46% (95% CI 48.65%-66.27%) in the non-intervention population. Social support was also significantly higher among the BCC intervention population with 44.48% (95% CI 32.61%-56.36%) of household heads experiencing high social support from friends and family compared to 30.09% (95% CI 16.62%-43.57%) of heads of households in the non-intervention population experiencing high social support.

A greater proportion ( $p < 0.0001$ ) of the BCC intervention household heads (46.71%, 95% CI 39.46%-53.97%) reported having heard or seen malaria information in the past few weeks compared to the non-intervention group (9.83%, 95% CI 5.78%-13.89%). The three messages heard most often by BCC respondents included: the importance of sleeping under an ITN (81.31%; 95% CI 74.06%-88.57%), the causes of malaria (41.06%; 95% CI 33.38%-48.73%) and malaria prevention methods (37.64%; 95% CI 28.80%-46.48%). Comparatively, the three messages heard most often by non-intervention respondents included: importance of sleeping under an ITN (71.30%; 95% CI 62.10%-78.90%), the causes of malaria (62.39%; 95% CI 46.12%-78.66%) and cutting the bushes and grass around the house (38.89%; 95% CI 22.72%-55.23%).

Tables 8 and 9 present weighted statistics reflecting the fidelity of implementation of the BCC intervention. Knowledge of receipt of a malaria-related home visit was reported by 53.86% (95% CI 44.47%-63.26%) of heads of households residing in the BCC intervention area. For the majority of households, these visits reportedly occurred less than one month prior to the survey (75.15%, 95% CI 64.23%-86.08%). Of the respondents that reported having a visit, 78.79% (95% CI 69.13%-88.45%) of the heads of households report that home visits were conducted by a peer educator or community volunteer, 21.34% (95% CI 10.97%-31.70%) report they were conducted by a community health officer and less than 4% reported that they were conducted by other individuals such as a doctor, friends, family member, employer or religious leader. Most commonly received information during these visits included: the importance of sleeping under an ITN (58.42%, 95% CI 47.27%-69.57%); the need to hang a net so that it can be

tucked in completely on all sides (53.59%, 95% CI 42.49%-64.68%); and causes of malaria (39.24%, 95% CI 29.43%-49.04%).

Greater than 90% of respondents reported that the person who visited the home: asked to see bed nets; showed them pictures about malaria; demonstrated how to hang a net properly; watched them hang their net; and demonstrated how to wash and mend their nets. A majority of heads of household (86.69%; 95% CI 80.55%-92.84%) reported that the person who visited their home spoke with them about the things that make using a bed net difficult for them and provided suggestions of ways to make it less difficult.

Approximately 60% of household respondents reported that there had been an event in their community where they could: learn how to hang their nets; get together with others to wash or mend their nets; or learned how to make moveable posts to hang their nets with. Existence of a recent malaria-related drama performance in the community was reported by 58.60% (95%CI 52.82%-64.38%) of respondents, 54.60% (95% CI 45.33%-63.88%) reported that their community leaders had talked about the importance of LLINs and just over 50% (50.20%, 95% CI 41.87%-58.53%) reported that their religious leaders had done the same.

## Extended Tables

**Table 4. Characteristics of sampled households stratified by BCC intervention**

Characteristics	BCC Intervention	Non- intervention
Number of clusters	30	28
Number of HHs surveyed	501	494
Number of HHs owning $\geq 1$ net	432	342
Number of participants	2033	2052
Sex of participants (%female)	54.82	56.39
Number of participants in HHs owning $\geq 1$ net	1968	1655
Total number of nets surveyed	964	734
Number of modified KAP survey module	525	495
Sex of KAP module respondents (%female)	45.38	52.34
Number of KAP module respondents in HH owning $\geq 1$ net	500	383

**Table 5. Comparison of weighted population demographic estimate between BCC intervention and non-intervention groups**

Characteristic	BCC Intervention Group							<i>p-value</i>	
	Intervention			Non-intervention					
	Total (n)	Weighted % or mean	95% CI	Total (n)	Weighted % or mean	95% CI			
Sex (% female)	2012	55.35	52.11	58.58	2036	57.33	54.47	60.19	0.35
Altitude									
<100m	2078	63.69	47.30	80.08	2101	49.96	31.03	68.88	0.26
>100m		36.31	19.92	52.70		50.04	31.12	68.97	
Wealth quintile									
Poorest		33.94	26.61	41.27		28.73	18.36	39.10	0.35
Second		25.34	20.41	30.27		24.65	18.58	30.71	
Middle	1727	28.44	21.73	35.15	1874	24.16	16.91	31.41	
Fourth		8.11	4.82	11.41		15.67	9.90	21.44	
Richest		4.17	0.94	7.40		6.79	1.68	11.90	
Age									
<5		18.58	16.87	20.30		20.47	18.37	22.57	0.23
5-9		17.76	16.19	19.33		18.75	16.92	20.57	
10-14	2030	12.71	11.14	14.29	2036	12.20	10.90	13.51	
15-19		9.78	8.33	11.22		9.88	7.94	11.81	
20-59		34.16	32.31	36.01		33.43	31.62	35.24	
60+		7.02	5.74	8.30		5.27	4.00	6.54	
Religion of respondents									
Christianity		80.17	72.66	87.68		86.89	80.93	92.84	*
Islam	509	-	-	-	482	2.27	0.00	5.06	
Traditional		15.80	8.39	23.20		7.33	2.37	12.30	
No religion		4.04	0.84	7.23		3.51	0.34	6.68	
Ethnicity of HH respondents									
Hausa		-	-	-		1.72	0.00	5.03	*
Fulani	522	1.34	0.19	2.49		0.54	0.00	1.32	
Igbo		98.66	97.51	99.81	490	97.74	94.38	100.0	
Occupation									
Farmer		74.63	69.35	79.91		58.38	51.05	65.72	<0.001
Housewife		4.09	2.44	5.75		12.80	8.27	17.33	
Civil servant		4.47	2.60	6.34		5.96	2.73	9.18	
Hand-work (self-employed)	517	7.84	4.88	10.79	491	9.31	5.97	12.65	
Trader (commerce/sales)		4.78	2.71	6.86		5.46	0.77	10.15	
Student		1.45	0.43	2.47		3.59	1.85	5.33	
Other		2.74	1.15	4.32		4.50	2.41	6.60	
Education level									
None		51.79	46.17	57.42		45.64	38.64	52.63	0.39
Primary	513	29.26	24.45	34.07	489	31.54	25.24	37.83	
Secondary		15.51	11.82	19.20		17.34	11.28	23.40	
Post-secondary		3.43	1.78	5.08		5.48	3.01	7.96	

\* Insufficient variation in the data; no test statistic calculated

**Table 6. Comparison of weighted population net ownership and net use estimates between BCC intervention and non-intervention groups**

Characteristic	BCC Intervention Group							<i>p-value</i>	
	Intervention			Non-intervention					
	Total (n)	Weighted % or $\mu$	95% CI	Total (n)	Weighted % or $\mu$	95% CI			
<b>Net ownership indicators</b>									
Average HH size	2033	5.22	4.95	5.49	2052	5.43	5.12	5.73	0.31
Proportion of HH $\geq 1$ net	456	94.16	90.76	97.55	445	72.03	59.75	84.30	<0.0001
Mean number of nets per HH	454	2.14	2.02	2.26	442	1.51	1.22	1.81	<0.001
Average net density (nets per person)	454	0.61	0.56	0.67	442	0.41	0.33	0.50	<0.001
<b>Net use indicators</b>									
% of nets used last night	932	85.07	81.62	88.51	679	79.96	74.32	85.59	0.14
% of nets in use*	957	90.15	87.05	93.25	730	86.90	82.28	91.52	0.24
% of nets hanging properly*	487	96.38	93.58	99.18	365	94.85	92.24	97.46	0.44
<b>Proportion of participants using net last night*</b>									
All ages	1968	89.15	85.21	93.09	1655	73.79	68.05	79.54	<0.001
Children under age 5	377	89.11	85.22	93.00	348	79.75	72.47	87.03	0.028
Children age 5-9 years	357	89.13	84.85	93.40	311	75.32	67.57	83.08	0.004
Children age 10-14 years	240	88.90	81.54	96.27	216	69.13	60.28	77.98	0.005
Adolescents age 15-19 years	197	81.37	73.07	89.68	163	63.27	53.19	73.34	0.010
All adults 20-59 years	673	90.98	87.42	94.54	537	73.53	68.14	78.93	<0.0001
Persons age $\geq 60$ years	122	91.72	87.54	95.90	72	78.13	64.44	91.81	0.038
Women age 15-49 years	491	90.77	86.79	94.74	386	74.78	68.13	81.42	<0.001

\*Among households owning  $\geq 1$  net

†Does not include baby nets

$\mu$  = mean; HHs = households

**Table 7. Comparison of extended KAP module responses between BCC intervention and non-intervention groups**

Survey variable	BCC Intervention Group						p-value		
	Intervention			Non-intervention					
	Total (n)	Weighted % or mean	95% CI	Total (n)	Weighted % or mean	95% CI			
<b>Malaria knowledge score</b>									
Low	510	32.23	23.56	40.89	471	39.45	32.74	46.17	0.27
Moderate		21.16	15.14	27.19		23.12	18.52	27.71	
High		46.61	35.69	57.53		37.43	29.18	45.68	
<b>LF knowledge score</b>									
None	516	70.86	62.85	78.88	481	78.14	71.95	84.34	0.17
Any		29.14	21.12	37.15		21.86	15.66	28.05	
<b>Skills and self efficacy score</b>									
Low	677	24.19	18.62	29.75	473	31.96	22.29	41.62	0.03
Moderate		6.71	4.70	8.71		10.58	5.64	15.52	
High		69.10	62.50	75.70		57.46	48.65	66.27	
<b>Positive social norms score</b>									
Low	978	44.45	33.11	55.80	469	46.89	35.51	58.28	0.72
Moderate		14.81	10.95	18.66		17.98	11.65	24.31	
High		40.74	26.47	55.02		35.13	20.62	49.63	
<b>Net Care Knowledge Score</b>									
Low	493	14.15	8.88	19.41	456	23.77	15.84	31.70	0.10
Moderate		73.61	68.24	78.99		65.47	57.70	73.23	
High		12.24	8.78	15.69		10.76	5.71	15.82	
<b>Social Support Score</b>									
Low	519	14.39	9.71	19.06	478	42.70	31.27	54.13	<0.001
Moderate		41.13	31.56	50.69		27.21	18.31	36.11	
High		44.48	32.61	56.36		30.09	16.62	43.57	
<b>Malaria prevention method</b>									
Net/ITN	525	67.25	58.83	75.66	495	60.27	52.88	67.67	0.23
Mosquito prevention		25.66	20.01	31.31		26.89	20.29	33.49	0.77
Preventive medicine		0.56	0.00	1.67		2.04	0.55	3.52	0.18
Clean yard		11.28	5.50	17.06		11.14	7.04	15.24	0.97
Inappropriate response		1.21	0.27	2.15		2.46	0.00	4.93	0.25
<b>Advantages of mosquito nets</b>									
Prevent malaria	525	92.47	89.63	95.31	495	79.85	73.12	86.59	<0.0001
Prevent LF		4.15	1.01	7.30		2.20	0.49	3.92	0.24
Other		7.65	4.06	11.24		9.84	5.58	14.11	0.44
None		6.54	3.59	9.49		16.92	10.70	23.14	<0.001
<b>Heard/seen malaria message recently</b>									
	520	46.71	39.46	53.97	484	9.83	5.78	13.89	<0.0001
<b>Content of malaria message</b>									
Nets/ITN/use net every night		81.31	74.06	88.57		71.30	62.10	37.90	0.066
Causes of malaria		41.06	33.38	48.73		62.39	46.12	78.66	0.003
Prevention of malaria		37.64	28.80	46.48		16.46	1.38	31.54	0.026
Net priority to pregnant women/CU5		5.76	2.00	9.52		3.53	0.00	10.24	0.62
Care for / wash nets		30.34	22.13	38.56		14.10	0.00	31.78	0.24
Seek treatment for fever		3.08	0.91	5.25		8.81	0.00	18.89	0.14
Seek treatment for fever in 24hrs	226	0.40	0.00	1.21	46	-	-	-	-
Importance of spraying		1.00	0.00	2.41		-	-	-	-
Not plaster walls after spraying		-	-	-		-	-	-	-
Environmental sanitation activisites		3.35	0.78	5.92		7.25	0.00	16.21	0.34
Cut bushes/grass		5.76	1.74	9.78		38.98	22.72	55.23	<0.0001
Bury rubbish/tires/bottles		1.41	0.00	2.97		0.93	0.00	2.84	0.72
Other		-	-	-		-	-	-	-
Don't know		1.07	0.00	2.55		5.39	0.00	13.03	0.09

\*Among households owning ≥1 net



**Table 8. Process evaluation results of BCC home visit**

Characteristic of home visit	BCC Intervention Group			
	Total (n)	Sample	Weighted %	95% CI
Household visit about malaria	493	243	53.86	44.5 63.26
Who came to talk to household about malaria?				
Doctor/Health care worker		9	2.94	0.41 5.48
Community health officer		62	21.34	10.97 31.70
Friends		3	0.92	0.00 2.79
Family member		2	0.61	0.00 1.51
Employer		9	3.99	0.91 7.06
Peer educator/community volunteer	243	178	78.79	69.13 88.45
Religious leader		4	1.59	0.00 3.27
Government official/politician		0	-	-
Musician/performer		0	-	-
Traditional healer		0	-	-
Other		1	0.31	0.00 0.93
When did they visit the household?				
Less than 1 month ago		139	75.15	64.23 86.08
1-6 months ago	168	26	16.36	7.51 25.22
> 6 months ago		3	1.13	0.00 3.01
Not sure		12	7.36	2.90 11.82
Information received during home visit				
Causes of malaria		85	39.24	29.43 49.04
Prevention of malaria		57	26.76	17.69 35.82
Sleep under net		70	30.66	20.71 40.60
Sleep under ITN		111	58.42	47.27 69.57
Sleep under net every night		74	33.39	23.01 43.76
Only use net in rainy season		0	-	-
Give priority to pregnant women and CU5		2	1.17	0.00 2.87
Hang net so it can be tucked		96	53.59	42.49 64.68
Hang up to air before use		36	19.97	12.97 26.96
Hang outside before use		1	0.39	0.00 1.18
Hang inside before use		2	0.78	0.00 1.91
Washing nets		31	17.55	11.27 23.83
Re-treating nets	203	0	-	-
Mending/repairing nets		14	7.80	1.59 14.02
Seek treatment for fever		3	1.56	0.00 3.29
Seek treatment for fever in 24hrs		2	1.17	0.00 2.82
Free treatment for malaria		2	1.17	0.00 2.80
ACT/AQ/AA/COARTEM		1	0.78	0.00 2.32
Importance of spraying		0	-	-
Don't plaster walls after spraying		0	-	-
Cut bushes/grass		19	10.92	3.83 18.01
Bury trash/tires/bottles		3	1.56	0.00 3.41
Certain foods can cause malaria		0	-	-
Other		0	-	-
Don't know		2	1.56	0.00 4.63

**Table 9. Process evaluation results of BCC home visit (continued)**

Characteristic of home visit	BCC Intervention Group			
	Total (n)	Sample	Weighted %	95% CI
The person who visited the home:				
Asked to see bed nets		183	97.11	94.73 99.48
Showed pictures about malaria		181	95.79	92.27 99.30
Demonstrated how to hang net properly		182	96.61	94.16 99.06
Watched respondent hang their net		179	94.55	90.86 98.23
Demonstrated how to wash nets	188	172	90.83	86.55 95.10
Demonstrated how to mend nets		173	92.07	86.95 97.18
Discussed things that make it difficult to use a net and made suggestions of ways to make it easier		164	86.69	80.55 92.84
There has been an event in the community where				
People learned how to hang their nets		318	59.81	53.85 65.76
People came to wash and mend their LLINs	525	317	59.99	53.47 66.52
People learned how to make moveable posts		316	59.62	53.91 65.33
Malaria-related drama performance in last 3 months		309	58.60	52.82 64.38
Community leaders talked about importance of LLINs		303	54.60	45.33 63.88
Religious leaders talked about importance of LLINs		282	50.20	41.87 58.53

## **CHAPTER 6:**

### **Extended Discussion/Conclusion**

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#### **Discussion**

This chapter has been included for discussion of findings, limitations and recommendations that were either too detailed, too speculative or simply beyond the scope of the manuscript presented in Chapter 3.

The BCC intervention assessment described in Chapter 4 had three main aims: 1) Assess the impact of the BCC program through a comparison of intervention and non-intervention populations; 2) Investigate why the intervention had the effect it did; and 3) Determine whether the intervention was carried out as planned. All evidence suggests that the BCC intervention had a significant and positive impact on the target population.

Net ownership in the BCC intervention population was significantly higher than the non-intervention population. As a likely result of this increase in net ownership, approximately 90% of the BCC population reported having slept under an LLIN the night before the survey. The increase in net ownership in the BCC population is likely the direct result of LLIN monitoring data, collected by community health promoters (CHPs), indicating the existence of net shortages early in program implementation and prompting the Ebonyi State Roll Back Malaria Team to conduct a mop-up LLIN distribution campaign where an additional 1094 nets were provided to 554 households.

Given that increases in net ownership are likely the strongest driver of net use, the effects of the program's behavior change components on net use are less discernable in this data. Recall instead the results presented in Chapter 3 where regression analyses indicate that, when the effects of net ownership are held constant (by controlling for net

density), simply residing in a BCC village is not significantly associated with net use, whereas exposure specifically to the BCC home visit is. This result suggests that the BCC intervention had an additional impact on net use beyond generally increasing net ownership levels. The observation that social support (also significantly associated with increased odds of net use) is significantly higher among BCC households is further evidence of the program's positive effect on net use.

Programmatic data (not presented) indicates that greater than 90% of households in the intervention area received monthly home visits from CHPs, however the process evaluation data presented in Table 9 suggests that only approximately half of respondents are aware of such a visit. This discrepancy suggests that there may be inaccuracies in the BCC program record keeping or that knowledge of the intervention is not permeating through to household members not home at the time of the visit (or some combination of the two). Given that exposure to the home visit seems to increase one's odds of net use, the BCC program may be able to amplify its effects on net use in the future by ensuring all households receive the home visit and including all household members in the visit activities.

### **Conclusion**

The results of the BCC assessment are encouraging as they suggest that intervention activities have a significant and positive impact on net ownership and use in the target population. This analysis indicates that the collection and reporting of LLIN monitoring data and the interpersonal communication involved in the home visits – specifically in terms of improving social support within the households – have the greatest impact on net use. Therefore continuation and potential expansion of these

activities should be considered in order to increase the already positive and substantial improvements in net use behaviors achieved through this program thus far.

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## APPENDIX A Survey Instrument

### NIGERIA MALARIA CLUSTER SURVEY 2010 -THE CARTER CENTER HOUSEHOLD QUESTIONNAIRE

IDENTIFICATION				
STATE (1 = EBONYI; 2= IMO) .....	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>			
LOCAL GOVERNMENT AREA (1=CHAIKWU; 2=ABAKALI; 3=OWERRI WEST; 4= CHAJI/EGBEMA).....				
WARD .....				
HEALTH CENTRE .....				
LOCALITY NAME .....				
EA NAME .....				
CLUSTER NUMBER .....	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>			
HOUSEHOLD NUMBER .....	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>			
NAME OF HOUSEHOLD HEAD .....				
GPS COORDINATES OF HOUSEHOLD ELEVATION (m).....	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>			
LATITUDE (N).....	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>			
LONGITUDE (E).....	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>			
INTERVIEWER VISITS				
	1	2	3	FINAL VISIT
DATE				DAY <input style="width: 20px; height: 20px;" type="text"/> MONTH <input style="width: 20px; height: 20px;" type="text"/> YEAR <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>
INTERVIEWER'S NAME				NAME (INITIALS) <input style="width: 20px; height: 20px;" type="text"/>
RESULT (SEE CODES)*				RESULT CODE <input style="width: 20px; height: 20px;" type="text"/>
NEXT VISIT: DATE				TOTAL NO. OF VISITS <input style="width: 20px; height: 20px;" type="text"/>
TIME				
*RESULT CODES: 1 COMPLETED 2 NO HOUSEHOLD MEMBER AT HOME OR NO COMPETENT RESPONDENT AT HOME AT TIME OF VISIT 3 ENTIRE HOUSEHOLD ABSENT FOR EXTENDED PERIOD OF TIME 4 POSTPONED 5 REFUSED 6 DWELLING VACANT OR ADDRESS NOT A DWELLING 7 DWELLING DESTROYED 8 DWELLING NOT FOUND 9 OTHER _____ (SPECIFY)				
TOTAL NUMBER OF PERSONS IN HOUSEHOLD	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>		LINE NUMBER OF RESPONDENT ON HOUSEHOLD QUESTIONNAIRE	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>
	Checker	Editor	Entry person 1	Entry person 2
Name				
Date				

**HOUSEHOLD LISTING**

Now we would like some information about the people who usually live in your household or who are staying with you now.

LINE NO.	USUAL RESIDENTS AND VISITORS	RELATIONSHIP TO HEAD OF HOUSEHOLD	SEX	RESIDENCE		AGE	LLIN USE	WOMEN OF CHILD-BEARING AGE	PREGNANT NOW?	IF HOUSEHOLD NUMBER IS MULTIPLE OF 3	
				CHILDREN ELIGIBLE FOR HB TEST	DATE OF BIRTH						
	Please give me the names of the persons who usually live in your household and guests of the household who stayed here last night, starting with the head of the household.	What is the relationship of (NAME) to the head of the household?*	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)?	Choose the response that best describes how often (NAME) sleeps under an LLIN?	CIRCLE LINE NUMBER OF ALL WOMEN AGE 15-49	FOR ELIGIBLE WOMEN, ASK: Is (NAME) currently pregnant?	CIRCLE LINE NUMBER OF ALL CHILDREN UNDER 10	FOR CHILDREN UNDER TEN: ASK FOR DATE OF BIRTH
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(7a)	(8)	(9)	(10)	(11)
			M F	1-2 HD	1-2 HD	0-14 15-49	1 Always 2 Most of the time 3 Sometimes 4 Rarely 5 Never 98 DK		1-2 HD OR		DD / MM / YYYY
01		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		01	1 2	01	__/__/__
02		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		02	1 2	02	__/__/__
03		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		03	1 2	03	__/__/__
04		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		04	1 2	04	__/__/__
05		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		05	1 2	05	__/__/__
06		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		06	1 2	06	__/__/__
07		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		07	1 2	07	__/__/__
08		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		08	1 2	08	__/__/__
09		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		09	1 2	09	__/__/__
10		<input type="text"/>	1 2	1 2	1 2	<input type="text"/>		10	1 2	10	__/__/__

\* CODES FOR Q.3  
RELATIONSHIP TO HEAD OF HOUSEHOLD:  
01 = HEAD  
02 = WIFE/HUSBAND  
03 = SON OR DAUGHTER

04 = SON-IN-LAW OR DAUGHTER-IN-LAW  
05 = GRANDCHILD  
06 = PARENT  
07 = PARENT-IN-LAW

08 = BROTHER OR SISTER  
09 = OTHER RELATIVE  
10 = ADOPTED/FOSTER/STEPCHILD  
11 = NOT RELATED  
98 = DON'T KNOW



LINE NO.	USUAL RESIDENTS AND VISITORS	RELATIONSHIP TO HEAD OF HOUSEHOLD	SEX	RESIDENCE			AGE	LIN USE	WOMEN OF CHILD-BEARING AGE	PREGNANT NOW?	IF HOUSEHOLD NUMBER IS MULTIPLE OF 3	
				Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)?					Choose the response that best describes how often (NAME) sleeps under an LLIN?	CHILDREN ELIGIBLE FOR Hb TEST
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(7a)	(8)	(9)	(10)	(11)	
			M F	1+3 HD	1+3 HD	01-14KJ	1 - Always 2 Most of the time 3 Sometimes 4 Rarely 5 Never 6 DK		1+3 HD-08		DD/MM/YYYY	
11		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		01	1 2	01	__/__/__	
12		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		02	1 2	02	__/__/__	
13		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		03	1 2	03	__/__/__	
14		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		04	1 2	04	__/__/__	
15		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		05	1 2	05	__/__/__	
16		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		06	1 2	06	__/__/__	
17		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		07	1 2	07	__/__/__	
18		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		08	1 2	08	__/__/__	
19		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		09	1 2	09	__/__/__	
20		<input type="checkbox"/>	1 2	1 2	1 2	<input type="checkbox"/>		10	1 2	10	__/__/__	

\* CODES FOR Q3  
RELATIONSHIP TO HEAD OF HOUSEHOLD







- |                                    |                               |
|------------------------------------|-------------------------------|
| 01 = HEAD                          | 08 = BROTHER OR SISTER        |
| 02 = WIFE/HUSBAND                  | 09 = OTHER RELATIVE           |
| 03 = SON OR DAUGHTER               | 10 = ADOPTED/FOSTER/STEPCHILD |
| 04 = SON-IN-LAW OR DAUGHTER-IN-LAW | 11 = NOT RELATED              |
| 05 = GRANDCHILD                    | 98 = DON'T KNOW               |
| 06 = PARENT                        |                               |
| 07 = PARENT-IN-LAW                 |                               |

IF MORE THAN 20 PERSONS, TICK HERE IF CONTINUATION SHEET USED		<input type="checkbox"/> AND WRITE CLUSTER/ HOUSEHOLD NUMBER ON CONTINUATION SHEET.				
Just to make sure that I have a complete listing:						
1)	Are there any other persons such as small children or infants that we have not listed?	YES	<input type="checkbox"/> →	ENTER EACH IN TABLE	NO	<input type="checkbox"/>
2)	In addition, are there any other people who may not be members of your family, such as domestic servants, lodgers or friends who usually live here?	YES	<input type="checkbox"/> →	ENTER EACH IN TABLE	NO	<input type="checkbox"/>
3)	Are there any guests or temporary visitors staying here, or anyone else who stayed here last night, who have not been listed?	YES	<input type="checkbox"/> →	ENTER EACH IN TABLE	NO	<input type="checkbox"/>

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP																		
12	What is the main source of drinking water for members of your household?	PIPED WATER PIPED INTO DWELLING..... 11 PIPED INTO YARD/PLOT..... 12 PUBLIC TAP/STANDPIPE..... 13 TUBE WELL OR BOREHOLE..... 21 DUG WELL PROTECTED WELL..... 31 UNPROTECTED WELL..... 32 WATER FROM SPRING PROTECTED SPRING..... 41 UNPROTECTED SPRING..... 42 RAINWATER..... 51 TANKER TRUCK..... 61 CART WITH SMALL TANK..... 71 SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/ IRRIGATION CHANNEL..... 81 BOTTLED WATER..... 91 OTHER..... 96 (SPECIFY)																			
13	What kind of toilet facilities does your household use?	FLUSH OR POUR FLUSH TOILET FLUSH TO PIPED SEWER SYSTEM..... 11 FLUSH TO SEPTIC TANK..... 12 FLUSH TO PIT LATRINE..... 13 FLUSH TO SOMEWHERE ELSE..... 14 FLUSH, DON'T KNOW WHERE..... 15 PIT LATRINE VENTILATED IMPROVED PIT LATRINE (VIP)..... 21 PIT LATRINE WITH SLAB..... 22 PIT LATRINE WITHOUT SLAB/ OPEN PIT..... 23 COMPOSTING TOILET..... 31 BUCKET TOILET..... 41 HANGING TOILET/HANGING LATRINE..... 51 NO FACILITY/BUSHFIELD..... 61 OTHER..... 96 (SPECIFY)																			
14	Does your household have: Electricity? A radio? A television? A fixed telephone? A refrigerator?	<table border="0"> <thead> <tr> <th></th> <th>YES</th> <th>NO</th> </tr> </thead> <tbody> <tr> <td>ELECTRICITY.....</td> <td>1</td> <td>2</td> </tr> <tr> <td>RADIO.....</td> <td>1</td> <td>2</td> </tr> <tr> <td>TELEVISION.....</td> <td>1</td> <td>2</td> </tr> <tr> <td>TELEPHONE.....</td> <td>1</td> <td>2</td> </tr> <tr> <td>REFRIGERATOR.....</td> <td>1</td> <td>2</td> </tr> </tbody> </table>		YES	NO	ELECTRICITY.....	1	2	RADIO.....	1	2	TELEVISION.....	1	2	TELEPHONE.....	1	2	REFRIGERATOR.....	1	2	
	YES	NO																			
ELECTRICITY.....	1	2																			
RADIO.....	1	2																			
TELEVISION.....	1	2																			
TELEPHONE.....	1	2																			
REFRIGERATOR.....	1	2																			
15	What type of fuel does your household mainly use for cooking?	ELECTRICITY..... 01 LPG/NATURAL GAS..... 02 BIOGAS..... 03 KEROSENE..... 04 COAL/LIGNITE..... 05 CHARCOAL..... 06 FIREWOOD/STRAW..... 07 DUNG..... 08 OTHER..... 96 (SPECIFY)																			
16	Does any member of your household own: A bicycle? A motorcycle or motor scooter? A car or truck? A mobile phone (handset)?	<table border="0"> <thead> <tr> <th></th> <th>YES</th> <th>NO</th> </tr> </thead> <tbody> <tr> <td>BICYCLE.....</td> <td>1</td> <td>2</td> </tr> <tr> <td>MOTORCYCLE/SCOOTER.....</td> <td>1</td> <td>2</td> </tr> <tr> <td>CAR/TRUCK.....</td> <td>1</td> <td>2</td> </tr> <tr> <td>MOBILE PHONE.....</td> <td>1</td> <td>2</td> </tr> </tbody> </table>		YES	NO	BICYCLE.....	1	2	MOTORCYCLE/SCOOTER.....	1	2	CAR/TRUCK.....	1	2	MOBILE PHONE.....	1	2				
	YES	NO																			
BICYCLE.....	1	2																			
MOTORCYCLE/SCOOTER.....	1	2																			
CAR/TRUCK.....	1	2																			
MOBILE PHONE.....	1	2																			

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
17	MAIN MATERIAL OF THE FLOOR.  RECORD OBSERVATION.	NATURAL FLOOR EARTH/SAND ..... 11 DUNG ..... 12 RUDIMENTARY FLOOR WOOD PLANKS ..... 21 PALM/BAMBOO ..... 22 FINISHED FLOOR PARQUET OR POLISHED WOOD ... 31 VINYL, PLASTIC OR ASPHALT STRIPS ..... 32 CERAMIC TILES ..... 33 CEMENT ..... 34 CARPET ..... 35  OTHER ..... 96 (SPECIFY)	
18	MAIN MATERIAL OF THE WALLS  RECORD OBSERVATION.	NATURAL WALL No walls ..... 11 Cane/trunks/bamboo/reed ..... 12 RUDIMENTARY WALL Bamboo/wood with mud..... 21 Stone with mud ..... 22 Uncovered adobe..... 23 Plywood ..... 24 Carton ..... 25 FINISHED WALL Cement ..... 31 Stone with lime/cement..... 32 Burnt Bricks..... 33 Cement blocks..... 34 Covered Adobe..... 35 Wood planks/shingles ..... 36  OTHER ..... 96 (SPECIFY)	
19	MAIN MATERIAL OF THE ROOF  RECORD OBSERVATION.	NATURAL ROOF Thatch/Leaf ..... 11 Sticks and mud ..... 12 RUDIMENTARY ROOF Rustic mat/plastic sheet..... 21 Reed/bamboo ..... 22 Wood planks ..... 23 FINISHED WALL Corrugated iron..... 31 Wood..... 32 Calamine/cement fiber ..... 33 Cement/concrete..... 34 Roofing shingles ..... 35  OTHER ..... 96 (SPECIFY)	
20a	Is the doorway covered by anything when open?	WIRE SCREEN (NOT NET) ..... 1 MOSQUITO NET ..... 2 OTHER ..... 8 (SPECIFY)	
20b	How many windows does house have? RECORD OBSERVATION. IF NO WINDOWS WRITE 00		
21	For each window, mark X for what it is (or can be) covered by	Window number: 1 2 3 4 5 8 GLASS ..... SCREENS (not nets) ..... MOSQUITO NETS ..... CURTAINS ..... SHUTTERS ..... NOTHING ..... OTHER ..... 	



NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
22	How many rooms are there in this house? INCLUDE ALL ROOMS, INCLUDING KITCHEN, TOILET, SLEEPING ROOMS, SALON/LIVING ROOM, etc. IF THERE ARE COMMUNAL ROOMS SHARED BY MORE THAN ONE HOUSEHOLD (E.G. KITCHEN), ASSIGN THEM TO ONLY ONE HOUSEHOLD (THE MAIN OWNER) ONLY		
23	How many rooms are used for sleeping? INCLUDE ONLY ROOMS WHICH ARE USUALLY USED FOR SLEEPING.		
24	How many places are there where people sleep? COUNT THE SLEEPING SPACES INCLUDE THE TOTAL OF ALL SLEEPING SPACES, INCLUDING THOSE IN ALL ROOMS USED FOR SLEEPING.		
24A	How many of these sleeping spaces were used by either children under five and/or pregnant women?		
24B	How many sleeping spaces were used by either children under five and/or women aged 15 to 49?		
25	Has anyone ever sprayed the interior walls of your dwelling against mosquitoes?	YES ..... 1 NO ..... 2 DON'T KNOW ..... 8	>25
26	How many months ago was the house last sprayed? PROBE FOR EXACT MONTHS IF LESS THAN 3 YEARS AGO IF LESS THAN ONE MONTH, RECORD '00' MONTHS AGO.	MONTHS AGO .....  MORE THAN 3 YEARS AGO ..... 95 NOT SURE ..... 98	
27	Who sprayed the house?	GOVERNMENT WORKER/PROGRAM ... 1 PRIVATE COMPANY ..... 2 HOUSEHOLD MEMBER ..... 3 OTHER ..... 6 (SPECIFY) DON'T KNOW ..... 8	
28	Do you at any time use other protection against mosquitoes in your household? If so please say what you used DO NOT PROVIDE ANSWERS MULTIPLE ANSWERS POSSIBLE PROBE ONCE - "ANYTHING ELSE?"	DROPS "OTAPIPIA" .... 1 BURNING COILS ..... 2 SPRAY CANS ..... 3 PUT LEAVES on LAMP ..... 4 BURNING LEAVES ..... 5 OTHER ..... 6 (SPECIFY) OTHER ..... 7 (SPECIFY) NONE ..... 0 DON'T KNOW ..... 8 If 0 or 8, go to F1	(28A) How effective do you think this method is? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> NOT EFFECTIVE ..... 0 PARTLY EFFECTIVE ..... 1 EFFECTIVE ..... 2 VERY EFFECTIVE ..... 3 DON'T KNOW ..... 8 (28B) How often do you use this method? <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RARELY (LESS THAN ONCE A MONTH) ..... 1 1 to 3 TIMES/MONTH ..... 2 1 to 5 TIMES/WEEK ..... 3 DAILY ..... 4 DON'T KNOW ..... 8

## NET INFORMATION

NOW I WOULD LIKE TO SEE ANY NETS CURRENTLY IN THE HOUSEHOLD			
29	Does your household have any mosquito nets that can be used while sleeping?	YES ..... 1 NO ..... 2	IF NO → 43
30	How many mosquito nets or baby nets does your household have?  MAKE SURE YOU ASK ABOUT NETS NOT BEING USED	NUMBER OF NETS (not including baby nets)  NUMBER OF BABY NETS	<input type="text"/> <input type="text"/>
31	ASK RESPONDENT TO SHOW YOU THE NET(S) IN THE HOUSEHOLD.  IF MORE THAN SIX NETS, USE ADDITIONAL QUESTIONNAIRE(S).	NET #1	NET #2
		OBSERVED ..... 1 NOT OBSERVED ..... 2	OBSERVED ..... 1 NOT OBSERVED ..... 2
		NET #3	
		OBSERVED ..... 1 NOT OBSERVED ..... 2	OBSERVED ..... 1 NOT OBSERVED ..... 2
32	Is this net in use, or still in packet or cupboard?	IN USE ..... 1 IN STORAGE ..... 2 DON'T KNOW ..... 8	IN USE ..... 1 IN STORAGE ..... 2 DON'T KNOW ..... 8
33	How long ago did your household obtain the mosquito net?  PROBE FOR EXACT MONTHS IF LESS THAN 3 YEARS AGO  IF LESS THAN 1 MONTH AGO, RECORD '00' MONTHS	MONTHS AGO <input type="text"/>  MORE THAN 3 YEARS AGO ..... 95  NOT SURE ..... 98	MONTHS AGO <input type="text"/>  MORE THAN 3 YEARS AGO ..... 95  NOT SURE ..... 98
34	OBSERVE OR ASK THE BRAND OF MOSQUITO NET.  IF BRAND IS UNKNOWN, AND YOU CANNOT OBSERVE THE NET, SHOW PICTURES OF TYPICAL NET TYPES/BRANDS TO RESPONDENT.  * "Long-lasting" is a factory treated net that does not require any further treatment.  * "Pretreated" is a net that has been treated, but requires further treatment after 6-12 months.	'LONG-LASTING' NET PERMANET ..... 11 OLYSET ..... 12 COAT OF ARMS ..... 13 UNBRANDED ..... 14 (SKIP TO 38) →	'LONG-LASTING' NET PERMANET ..... 11 OLYSET ..... 12 COAT OF ARMS ..... 13 UNBRANDED ..... 14 (SKIP TO 38) →
		'PRETREATED' NET NETMARK ..... 21 UNBRANDED ..... 22 (SKIP TO 38) →	'PRETREATED' NET NETMARK ..... 21 UNBRANDED ..... 22 (SKIP TO 38) →
		OTHER ..... 31 DON'T KNOW TYPE ..... 98	OTHER ..... 31 DON'T KNOW TYPE ..... 98
35	When you got the net, was it already factory-treated with an insecticide to kill or repel mosquitoes?	YES ..... 1 NO ..... 2 NOT SURE ..... 8	YES ..... 1 NO ..... 2 NOT SURE ..... 8
36	Since you got the mosquito net, was it ever soaked or dipped in a liquid to repel mosquitoes or bugs?	YES ..... 1 NO ..... 2 (SKIP TO 38) → NOT SURE ..... 8	YES ..... 1 NO ..... 2 (SKIP TO 38) → NOT SURE ..... 8
37	How long ago was the net last soaked or dipped?  IF LESS THAN 1 MONTH AGO, RECORD '00' MONTHS.  IF LESS THAN 2 YEARS AGO, RECORD MONTHS AGO.  IF '12 MONTHS AGO' OR '1 YEAR AGO,' PROBE FOR EXACT NO. OF MONTHS.	MONTHS AGO <input type="text"/>  > 2 YEARS AGO ..... 95  NOT SURE ..... 98	MONTHS AGO <input type="text"/>  > 2 YEARS AGO ..... 95  NOT SURE ..... 98
38	PLEASE RECORD OR ASK THE GENERAL CONDITION OF THE NET.  1 NO NETS 2 NO NETS IN USE 3 NO NETS IN STORAGE 4 NO NETS IN USE OR STORAGE 5 NO NETS IN USE OR STORAGE 6 NO NETS IN USE OR STORAGE	GOOD ..... 1 FAIR ..... 2 POOR ..... 3 UNSAFE ..... 4 UNUSED ..... 5 NOT SEEN ..... 8	GOOD ..... 1 FAIR ..... 2 POOR ..... 3 UNSAFE ..... 4 UNUSED ..... 5 NOT SEEN ..... 8
		GOOD ..... 1 FAIR ..... 2 POOR ..... 3 UNSAFE ..... 4 UNUSED ..... 5 NOT SEEN ..... 8	GOOD ..... 1 FAIR ..... 2 POOR ..... 3 UNSAFE ..... 4 UNUSED ..... 5 NOT SEEN ..... 8

		NET #1	NET #2	NET #3
38A	Has this net ever been washed since you got it?	YES >5 TIMES .....11 1-5 TIMES .....12 NO, NEVER.....22 (SKIP TO 39) ← NOT SURE .....99	YES >5 TIMES .....11 1-5 TIMES .....12 NO, NEVER.....22 (SKIP TO 39) ← NOT SURE .....99	YES >5 TIMES.....11 1-5 TIMES .....12 NO, NEVER.....22 (SKIP TO 39) ← NOT SURE .....99
38B	How many months ago did you last wash it? IF LESS THAN 1 MONTH AGO, RECORD '00' MONTHS. IF LESS THAN 2 YEARS AGO, RECORD MONTHS AGO. IF '12 MONTHS AGO' OR '1 YEAR AGO,' PROBE FOR EXACT NO. OF MONTHS.	<input type="text"/> <input type="text"/> > 2 YEARS AGO ....95 NOT SURE ..... 98	<input type="text"/> <input type="text"/> > 2 YEARS AGO ....95 NOT SURE ..... 98	<input type="text"/> <input type="text"/> > 2 YEARS AGO ....95 NOT SURE ..... 98
39	Did anyone sleep under this mosquito net last night?	YES.....1 NO.....2 (SKIP TO 41) ← NOT SURE.....8	YES.....1 NO.....2 (SKIP TO 41) ← NOT SURE.....8	YES.....1 NO.....2 (SKIP TO 41) ← NOT SURE.....8
40	Who slept under this mosquito net last night?  RECORD THE RESPECTIVE LINE NUMBER FROM THE HOUSEHOLD SCHEDULE PAGE 2.	NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>	NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>	NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>
41	ARE THERE ANY MORE NETS IN THIS HOUSEHOLD?	GO BACK TO 31 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 42.	GO BACK TO 31 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 42.	GO TO 31 IN THE FIRST COLUMN OF NEXT PAGE; OR, IF NO MORE NETS, GO TO 42 and skip next two pages.
42	WHAT IS THE HOUSEHOLD NUMBER (SEE FIRST PAGE)?	<input type="text"/> <input type="text"/>	EXAMINE LIST OF HOUSEHOLDS TO SEE IF YOU CONDUCT DEMOGRAPHIC KNOWLEDGE SOURCE QUESTIONNAIRES WITH HEAD OF HOUSEHOLD, WIFE OF HEAD OF HOUSEHOLD OR BOTH, AND TO SEE IF YOU NEED TO CONDUCT BLOOD TESTS.	

		NET #4	NET #5	NET #6
31	ASK RESPONDENT TO SHOW YOU ANY OTHER NET(S) IN THE HOUSEHOLD. IF MORE THAN SIX NETS, USE ADDITIONAL QUESTIONNAIRE(S).	OBSERVED.....1 NOT OBSERVED.....2	OBSERVED.....1 NOT OBSERVED.....2	OBSERVED.....1 NOT OBSERVED.....2
32	Is this net in use, or still in packet or cupboard?	IN USE.....1 IN STORAGE.....2 DON'T KNOW.....8	IN USE.....1 IN STORAGE.....2 DON'T KNOW.....8	IN USE.....1 IN STORAGE.....2 DON'T KNOW.....8
33	How long ago did your household obtain the mosquito net? PROBE FOR EXACT MONTHS IF LESS THAN 3 YEARS AGO IF LESS THAN 1 MONTH AGO, RECORD '00' MONTHS.	MONTHS AGO <input type="text"/> MORE THAN 3 YEARS AGO.....95 NOT SURE.....98	MONTHS AGO <input type="text"/> MORE THAN 3 YEARS AGO.....95 NOT SURE.....98	MONTHS AGO <input type="text"/> MORE THAN 3 YEARS AGO.....95 NOT SURE.....98
34	OBSERVE OR ASK THE BRAND OF MOSQUITO NET. IF BRAND IS UNKNOWN, AND YOU CANNOT OBSERVE THE NET, SHOW PICTURES OF TYPICAL NET TYPES/BRANDS TO RESPONDENT. * "Long-lasting" is a factory treated net that does not require any further treatment. * "Pretreated" is a net that has been treated, but requires further treatment after 6-12 months.	'LONG-LASTING' NET: PERMANET.....11 OLYSET.....12 COAT OF ARMS...13 UNBRANDED.....14 (SKIP TO 38)..... 'PRETREATED' NET: NETMARK.....21 UNBRANDED.....22 (SKIP TO 38)..... OTHER.....31 DON'T KNOW TYPE...98	'LONG-LASTING' NET: PERMANET.....11 OLYSET.....12 COAT OF ARMS...13 UNBRANDED.....14 (SKIP TO 38)..... 'PRETREATED' NET: NETMARK.....21 UNBRANDED.....22 (SKIP TO 38)..... OTHER.....31 DON'T KNOW TYPE...98	'LONG-LASTING' NET: PERMANET.....11 OLYSET.....12 COAT OF ARMS...13 UNBRANDED.....14 (SKIP TO 38)..... 'PRETREATED' NET: NETMARK.....21 UNBRANDED.....22 (SKIP TO 38)..... OTHER.....31 DON'T KNOW TYPE...98
35	When you got the net, was it already factory-treated with an insecticide to kill or repel mosquitoes?	YES.....1 NO.....2 NOT SURE.....8	YES.....1 NO.....2 NOT SURE.....8	YES.....1 NO.....2 NOT SURE.....8
36	Since you got the mosquito net, was it ever soaked or dipped in a liquid to repel mosquitoes or bugs?	YES.....1 NO.....2 (SKIP TO 38)..... NOT SURE.....8	YES.....1 NO.....2 (SKIP TO 38)..... NOT SURE.....8	YES.....1 NO.....2 (SKIP TO 38)..... NOT SURE.....8
37	How long ago was the net last soaked or dipped? IF LESS THAN 1 MONTH AGO, RECORD '00' MONTHS. IF LESS THAN 2 YEARS AGO, RECORD MONTHS AGO. IF '12 MONTHS AGO' OR '1 YEAR AGO,' PROBE FOR EXACT NO. OF MONTHS.	MONTHS AGO <input type="text"/> > 2 YEARS AGO.....95 NOT SURE.....98	MONTHS AGO <input type="text"/> > 2 YEARS AGO.....95 NOT SURE.....98	MONTHS AGO <input type="text"/> > 2 YEARS AGO.....95 NOT SURE.....98
38	PLEASE RECORD OR ASK THE GENERAL CONDITION OF THE NET. 1 NO NETS 2 NO NETS 'M' 'F' 'A' OR 'N' 'A' 'R' 'T' 3 '1' 'M' 'O' 'N' 'T' 'H' 'A' 'G' 'O' 'R' '1' 'Y' 'E' 'A' 'R' 'A' 'G' 'O' 4 '2' 'M' 'O' 'N' 'T' 'H' 'S' 'A' 'G' 'O' 'R' '2' 'Y' 'E' 'A' 'R' 'S' 'A' 'G' 'O' 5 '3' 'M' 'O' 'N' 'T' 'H' 'S' 'A' 'G' 'O' 'R' '3' 'Y' 'E' 'A' 'R' 'S' 'A' 'G' 'O' 6 '4' 'M' 'O' 'N' 'T' 'H' 'S' 'A' 'G' 'O' 'R' '4' 'Y' 'E' 'A' 'R' 'S' 'A' 'G' 'O' 7 '5' 'M' 'O' 'N' 'T' 'H' 'S' 'A' 'G' 'O' 'R' '5' 'Y' 'E' 'A' 'R' 'S' 'A' 'G' 'O' 8 '6' 'M' 'O' 'N' 'T' 'H' 'S' 'A' 'G' 'O' 'R' '6' 'Y' 'E' 'A' 'R' 'S' 'A' 'G' 'O' 9 '7' 'M' 'O' 'N' 'T' 'H' 'S' 'A' 'G' 'O' 'R' '7' 'Y' 'E' 'A' 'R' 'S' 'A' 'G' 'O' 0 '8' 'M' 'O' 'N' 'T' 'H' 'S' 'A' 'G' 'O' 'R' '8' 'Y' 'E' 'A' 'R' 'S' 'A' 'G' 'O'	GOOD.....1 FAIR.....2 POOR.....3 UNSAFE.....4 UNUSED.....5 NOT SEEN.....8	GOOD.....1 FAIR.....2 POOR.....3 UNSAFE.....4 UNUSED.....5 NOT SEEN.....8	GOOD.....1 FAIR.....2 POOR.....3 UNSAFE.....4 UNUSED.....5 NOT SEEN.....8



		NET #4	NET #4	NET #4
38A	Has this net ever been washed since you got it?	YES >5 TIMES .....11 1-5 TIMES .....12  NO, NEVER.....22 (SKIP TO 39) ← NOT SURE .....99	YES >5 TIMES .....11 1-5 TIMES .....12  NO, NEVER.....22 (SKIP TO 39) ← NOT SURE .....99	YES >5 TIMES .....11 1-5 TIMES .....12  NO, NEVER.....22 (SKIP TO 39) ← NOT SURE .....99
38B	How many months ago did you last wash it? IF LESS THAN 1 MONTH AGO, RECORD '00' MONTHS. IF LESS THAN 2 YEARS AGO, RECORD MONTHS AGO. IF '12 MONTHS AGO' OR '1 YEAR AGO,' PROBE FOR EXACT NO. OF MONTHS.	<input type="text"/> <input type="text"/> > 2 YEARS AGO .....95 NOT SURE .....98	<input type="text"/> <input type="text"/> > 2 YEARS AGO .....95 NOT SURE .....98	<input type="text"/> <input type="text"/> > 2 YEARS AGO .....95 NOT SURE .....98
39	Did anyone sleep under this mosquito net last night?	YES.....1 NO.....2 (SKIP TO 41) ← NOT SURE.....8	YES.....1 NO.....2 (SKIP TO 41) ← NOT SURE.....8	YES.....1 NO.....2 (SKIP TO 41) ← NOT SURE.....8
40	Who slept under this mosquito net last night?  RECORD THE RESPECTIVE LINE NUMBER FROM THE HOUSEHOLD SCHEDULE PAGE 2.	NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>	NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>	NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>  NAME _____ LINE NO <input type="text"/> <input type="text"/>
41	ARE THERE ANY MORE NETS IN THIS HOUSEHOLD?	GO BACK TO 31 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 42.	GO BACK TO 31 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 42.	GO TO 31 IN THE FIRST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE NETS, GO TO 42.
42	WHAT IS THE HOUSEHOLD NUMBER (SEE FIRST PAGE)?	<input type="text"/> <input type="text"/>	EXAMINE LIST OF HOUSEHOLDS TO SEE IF YOU CONDUCT DEMOGRAPHIC KNOWLEDGE/SOURCE QUESTIONNAIRES WITH HEAD OF HOUSEHOLD, WIFE OF HEAD OF HOUSEHOLD OR BOTH, AND TO SEE IF YOU NEED TO CONDUCT BLOOD TESTS.	

TICK HERE IF CONTINUATION SHEET USED

AND WRITE CLUSTER NUMBER          HOUSEHOLD NUMBER ON CONTINUATION SHEET.

CHECK BACK TO PAGE 2 HOUSEHOLD LISTING AND ASK:

"Just to make sure I have complete information, is there anyone else in your household who slept under a net last night but is not listed under a net?"

- Refer to the list of households to determine who will respond to the DEMOGRAPHIC, KNOWLEDGE, MESSAGES AND SOURCE questionnaires. (**Head** of household, **Wife** of head of household, or **Both**).
- In households where **blood tests** will be conducted, these questions will be asked of BOTH THE HEAD OF HOUSEHOLD AND HIS WIFE.
- In households where **no blood tests** will be conducted, you will ask the questions of the head of household in half of the households and the wife of the head of household in the other half, alternating from one household to the next.

**RESPONDENT #1  
DEMOGRAPHIC INFORMATION**

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP		
D1	Respondent RECORD THE RESPECTIVE LINE NUMBER FROM THE HOUSEHOLD SCHEDULE PAGE 2.	NAME _____ LINE NO <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table>			
D2	What is your main occupation?	FARMER/FISHERMAN/ANIMAL REARER ..... 1 HOUSEWIFE ..... 2 CIVIL SERVANT GOVERNMENT EMPLOYEE ..... 3 NGO ..... 4 TEACHER ..... 5 HEALTH WORKER ..... 6 HAND-WORK/SELF-EMPLOYED WELDER/ELECTRICIAN/MASON/PLUMBER/ MECHANIC/CARPENTER/TAILOR ..... 7 TAILOR ..... 8 POTTER ..... 9 BLACKSMITH ..... 10 TRADER (COMMERCE/SALES) ..... 11 COMMERCIAL DRIVER ..... 12 CASUAL WORKER/DAILY LABOURER ..... 13 DOMESTIC EMPLOYEE COOK/MAID ..... 14 GARDENER/NIGHT WATCHMAN ..... 15 UNPAID HOUSEHOLD HELP ..... 16 UNEMPLOYED ..... 17 OTHER ..... 88 Specify _____			
D3	Have you ever attended school?	YES ..... 1 NO ..... 2	→ D5		
D4	What is the highest level of school you attended?	PRIMARY ..... 1 SECONDARY ..... 2 TECHNICAL/VOCATIONAL/TRADE or STATE TEACHING CERTIFICATE ..... 3 DIPLOMA ..... 4 DEGREE ..... 5 HIGHER DEGREE ..... 6			

D5	<p>Now I would like you to read this sentence to me:</p> <p>SHOW LITERACY CARD TO RESPONDENT</p> <p>IF RESPONDENT CANNOT READ WHOLE SENTENCE, PROBE: Can you read any part of the sentence to me?</p>	<p>CANNOT READ AT ALL ..... 1</p> <p>ABLE TO READ ONLY PARTS OF SENTENCE ..... 2</p> <p>ABLE TO READ WHOLE SENTENCE ..... 3</p> <p>NO CARD WITH REQUIRED LANGUAGE ..... 4</p> <p>_____</p> <p>Specify language</p> <p>BLIND/VISUALLY IMPAIRED ..... 6</p>	
D6	<p>WHAT IS YOUR ETHNICITY? (one answer only)</p>	<p>HAUSA ..... 1</p> <p>FULANI ..... 2</p> <p>IGBO ..... 3</p> <p>YORUBA ..... 4</p> <p>NGAS ..... 5</p> <p>TAROH ..... 6</p> <p>BEROM ..... 7</p> <p>JARAWA/AFIZERE ..... 8</p> <p>ANKWAI/GOEMAI ..... 9</p> <p>EGGON ..... 10</p> <p>MADA ..... 11</p> <p>ALAGO ..... 12</p> <p>MIGILI ..... 13</p> <p>GWANDARA ..... 14</p> <p>MIXED ..... 78</p> <p>Specify</p> <p>OTHER ..... 88</p> <p>Specify</p>	
D7	<p>Which, if any, of these languages can you understand?</p> <p>(MULTIPLE ANSWERS POSSIBLE)</p>	<p>HAUSA ..... 1</p> <p>IGBO ..... 2</p> <p>YORUBA ..... 3</p> <p>PIDGIN ENGLISH ..... 4</p> <p>ENGLISH ..... 5</p> <p>OTHER ..... 88</p> <p>Specify</p>	
D8	<p>What is your religion?</p>	<p>CHRISTIANITY ..... 1</p> <p>ISLAM ..... 2</p> <p>TRADITIONAL RELIGION ..... 3</p> <p>NO RELIGION ..... 4</p> <p>OTHER ..... 88</p> <p>Specify</p>	

### BEHAVIORS AND BEHAVIORAL INTENTIONS

A1	<p>Is sleeping under an insecticide treated net:</p> <p>Beneficial</p> <p>Neither beneficial nor harmful</p> <p>Harmful</p>	<p><input type="checkbox"/> <input type="checkbox"/></p> <p>BENEFICIAL ..... 1</p> <p>NEITHER BENEFICIAL NOR HARMFUL ..... 2</p> <p>HARMFUL ..... 3</p>	
A2	<p>Is sleeping under an insecticide treated net:</p> <p>Pleasant/comfortable</p> <p>Neither pleasant nor unpleasant</p> <p>OR</p> <p>Unpleasant/uncomfortable</p>	<p><input type="checkbox"/> <input type="checkbox"/></p> <p>PLEASANT/COMFORTABLE ..... 1</p> <p>NEITHER PLEASANT NOR UNPLEASANT ..... 2</p> <p>UNPLEASANT/UNCOMFORTABLE ..... 3</p>	

A3	Is sleeping under an insecticide treated net: Very effective protection against malaria Somewhat effective protection against malaria OR ineffective protection against malaria?	<input type="checkbox"/> <input type="checkbox"/> VERY EFFECTIVE..... 1 SOMEWHAT EFFECTIVE..... 2 INEFFECTIVE..... 3	
B1	Which of the following statements best describes how often you sleep under a bed net?  <i>(Read the response options to the participant and ask him or her to choose the best one.)</i>	<input type="checkbox"/> I <b>ALWAYS</b> sleep under a bed net..... 1 → B3 I <b>OFTEN</b> sleep under a bed net ..... 2 → B3 I <b>SOMETIMES</b> sleep under a bed net..... 3 → B3 I <b>RARELY</b> sleep under a bed net ..... 4 → B3 I <b>NEVER</b> sleep under a bed net..... 5 → B2	
B2	Why don't you ever sleep under a bed net?  <i>(Do not read the response options. Choose the ONE response from the list at the right that best matches what the person says.)</i>	<input type="checkbox"/> <input type="checkbox"/> I don't own a bed net..... 1 I don't like sleeping under bed nets..... 2 I am allergic to the insecticide/ I can't breathe..... 3 Bed nets are too hot..... 4 Bed nets are too much hassle/inconvenient..... 5 I don't have a good place to hang a net where I..... 6 sleep. The person I share a bed with doesn't like nets..... 7 I don't get malaria often..... 8 I don't think malaria is a very severe illness..... 9 Other..... 88  B2.1 Specify _____	→ ND1
B3	How often do you sleep under a bed net DURING THE DRY SEASON?  <i>(Read the response options to the participant and ask him or her to choose the best one.)</i>	<input type="checkbox"/> ALWAYS..... 1 OFTEN ..... 2 SOMETIMES..... 3 RARELY ..... 4 NEVER ..... 5	
B4	How often do you sleep under a bed net DURING THE RAINY SEASON?  <i>(Read the response options to the participant and ask him or her to choose the best one.)</i>	<input type="checkbox"/> ALWAYS..... 1 OFTEN ..... 2 SOMETIMES..... 3 RARELY ..... 4 NEVER ..... 5	
B5	How often do you sleep under a bed net WHEN IT IS VERY HOT?  <i>(Read the response options to the participant and ask him or her to choose the best one.)</i>	<input type="checkbox"/> ALWAYS..... 1 OFTEN ..... 2 SOMETIMES..... 3 RARELY ..... 4 NEVER ..... 5	



B6	<p>How often do you sleep under a bed net WHEN THERE ARE MANY MOSQUITOES?</p> <p><i>(Read the response options to the participant and ask him or her to choose the best one.)</i></p>	<input type="checkbox"/> ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5	
B7	<p>How often do you sleep under a bed net WHEN THERE ARE VERY FEW MOSQUITOES?</p> <p><i>(Read the response options to the participant and ask him or her to choose the best one.)</i></p>	<input type="checkbox"/> ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5	
B8	<p>How often do you sleep under a bed net WHEN YOU ARE TRAVELING?</p> <p><i>(Read the response options to the participant and ask him or her to choose the best one.)</i></p>	<input type="checkbox"/> ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5	
B9	<p>How often do you sleep under a bed net WHEN YOU ARRIVE HOME LATE AT NIGHT?</p> <p><i>(Read the response options to the participant and ask him or her to choose the best one.)</i></p>	<input type="checkbox"/> ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5	
B10	<p>How often do you sleep under a bed net WHEN YOU ARE VERY TIRED?</p> <p><i>(Read the response options to the participant and ask him or her to choose the best one.)</i></p>	<input type="checkbox"/> ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5	
B11	<p>How often do you sleep under a bed net WHEN YOU ARE SICK?</p> <p><i>(Read the response options to the participant and ask him or her to choose the best one.)</i></p>	<input type="checkbox"/> ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5	
B12	<p>When your bed net is torn or gets a hole, how likely are you to mend it or to have a tailor mend it?</p> <p><i>(Read the response options to the participant and ask him or her to choose the best one.)</i></p>	<input type="checkbox"/> VERY LIKELY. I mend all holes in my net.....1 SOMEWHAT LIKELY. I sometimes mend holes in.....2 my net. SOMEWHAT UNLIKELY. I rarely mend holes in.....3 my net. VERY UNLIKELY. I never mend holes in my net.....4	

B13	How often do you wash your bed net? (Do not read the response options.)	<input type="checkbox"/>	When it gets dirty.....1 1 time a year.....2 2-3 times a year.....3 4-5 times a year.....4 6 or more times a year.....5	
B14	Did you sleep under a bed net last night?	<input type="checkbox"/>	YES.....1 NO.....2	→ ND1 → B15
B15	Why didn't you sleep under a bed net last night? (Choose only one response.)	<input type="checkbox"/>	There was no net available.....1 It was too hot.....2 There weren't many mosquitoes.....3 There was no way to hang it over my sleeping space.....4 I was too tired.....5 I did not sleep at home last night.....6 I got home very late.....7 I forgot.....8 I didn't have time to hang/unfold my net.....9 The person I shared a bed with doesn't like nets.....10 Other _____88 Specify	

Go to the Next Section.

#### NET DISTRIBUTION AND DURABILITY


ND1	How many nets did your household obtain during the mass bed net distribution campaign in Ebonyi State earlier this year (March-April)?	<input type="checkbox"/>		If "0", go to ND2.  If more than "0", go to ND3.
ND2	Why didn't your household get any bed nets during the campaign?	<input type="checkbox"/>	DIDN'T KNOW ABOUT THE CAMPAIGN.....1 DIDN'T GET A NET CARD.....2 DIDN'T GO TO GET NETS.....3 LOST NET CARD.....4 TRIED TO GET NET AND TOLD WE COULDN'T HAVE ONE.....5 NO WOMEN IN OUR HOUSEHOLD.....6 OTHER _____88 Specify	

ND3	<p>We have found that one year after nets have been distributed, some households that received nets no longer have nets. What might have happened to those nets?</p> <p>DO NOT PROVIDE ANSWERS</p> <p>MULTIPLE RESPONSES POSSIBLE. Place an "X" in the box next to every response mentioned.</p> <p>PROBE ONCE (Anything else?)</p>	<p>NETS WERE DAMAGED/DESTROYED..... 1</p> <p>SOLD THEIR NET ..... 2</p> <p>GAVE NET AWAY ..... 3</p> <p>NET USED FOR OTHER PURPOSES ..... 4 (OTHER THAN SLEEPING UNDER) ..... 5</p> <p>OTHER ..... 88 Specify</p> <p>DON'T KNOW ..... 99</p>			
ND4	<p>How long do bed nets last physically (before they are so damaged that they can't be used)?</p>	<table border="1" data-bbox="1122 512 1219 562"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> </table> <p>LESS THAN A YEAR..... 1</p> <p>1 TO 2 YEARS ..... 2</p> <p>3 TO 4 YEARS ..... 3</p> <p>5 OR MORE YEARS..... 4</p> <p>DON'T KNOW ..... 88</p>			

### GENERAL MALARIA AND FILARIASIS KNOWLEDGE

F1	<p>Have you heard of an illness that causes swollen legs or arms?</p>	<p>YES..... 1</p> <p>NO..... 2</p>	→ F4
F2	<p>What is the name of this illness? (NO PROMPT) IF DON'T KNOW, WRITE "DK"</p>	<p>_____</p>	
F3	<p>What causes it? (NO PROMPT) IF DON'T KNOW, WRITE "DK"</p>	<p>_____</p>	
F4	<p>Have you heard of an illness that causes swollen testicles?</p>	<p>YES..... 1</p> <p>NO..... 2</p>	→ M1
F5	<p>What is the name of this illness? (NO PROMPT) IF DON'T KNOW, WRITE "DK"</p>	<p>_____</p>	
F6	<p>What causes it? (DO NOT PROMPT) IF DON'T KNOW, WRITE "DK"</p>	<p>_____</p>	
M1	<p>What should you do when a child has a fever?</p> <p>DO NOT PROVIDE ANSWERS</p> <p>MULTIPLE RESPONSES POSSIBLE</p> <p>PROBE ONCE (Anything else?)</p>	<p>BATHE CHILD WITH TEPID/..... 1 LUKEWARM WATER</p> <p>BATHE CHILD WITH COOL WATER..... 2</p> <p>TAKE TO ROLE MODEL MOTHER/COPS ..... 3</p> <p>TAKE TO NEAREST HEALTH FACILITY ..... 4</p> <p>GIVE CHILD PARACETAMOL..... 5</p> <p>GIVE CHILD ANTIMALARIAL (CHLOROQUINE)..... 6 NIVAQUINE</p> <p>GIVE CHILD ACT/COARTEM..... 7</p> <p>WAIT AND SEE ..... 8</p> <p>TAKE CHILD TO TRADITIONAL HEALER..... 9</p> <p>NOTHING..... 10</p> <p>OTHER ..... 88 (SPECIFY)</p> <p>DON'T KNOW ..... 99</p>	

M2	<p>If a child gets sick, what signs or symptoms would make you decide to bring the child to the health center/hospital?</p> <p>DO NOT PROVIDE ANSWERS MULTIPLE RESPONSES POSSIBLE PROBE ONCE (Anything else?)</p>	<p>SEIZURE / CONVULSIONS .....1 GOES UNCONSCIOUS.....2 ANY FEVER.....3 VERY HIGH FEVER .....4 STIFF NECK.....5 WEAKNESS.....6 NOT ACTIVE/NOT PLAYING .....7 CHILLS/SHIVERING.....8 NOT ABLE TO EAT OR DRINK.....9 VOMITING .....10 FAINTING .....11 CRYING ALL THE TIME.....12 RESTLESS, WON'T STAY STILL.....13 DIARRHOEA.....14 IN NO CIRCUMSTANCE WOULD I BRING A.....15 CHILD TO THE HOSPITAL OTHER..... 88 (SPECIFY) DONT KNOW .....99</p>	
M3	<p>Have you ever heard of an illness called "malaria"? Even if you are conducting the survey in a language other than English, use the English term "malaria" when asking this question.</p>	<p>YES..... 1 NO ..... 2</p>	→M8
M4	<p>Can you tell me the main signs or symptoms of "malaria" (in English)?</p> <p>DO NOT PROVIDE ANSWERS MULTIPLE RESPONSES POSSIBLE PROBE ONCE (Anything else?)</p>	<p>SEIZURE / CONVULSIONS .....1 GOES UNCONSCIOUS.....2 ANY FEVER.....3 VERY HIGH FEVER .....4 STIFF NECK.....5 WEAKNESS.....6 NOT ACTIVE/NOT PLAYING .....7 CHILLS/SHIVERING/FEELING COLD .....8 REFUSING TO EAT OR DRINK/.....9 NAUSEA/VOMITING.....10 FAINTING .....11 CRYING ALL THE TIME .....12 RESTLESS, WON'T STAY STILL.....13 DIARRHOEA.....14 HEADACHE .....15 DIZZINESS .....16 BODY ACHE OR JOINT PAIN .....17 PALE EYES .....18 SALTY TASTING PALMS .....19 OTHER..... 88 (SPECIFY) DONT KNOW .....99</p>	
M5	<p>In your opinion, what causes "malaria" (in English)?</p> <p>DO NOT PROVIDE ANSWERS MULTIPLE RESPONSES POSSIBLE PROBE ONCE (Anything else?)</p>	<p>MOSQUITO BITES .....1 CATCH FROM OTHER PEOPLE .....2 EATING IMMATURE SUGARCANE.....3 EATING TOO MUCH OIL .....4 INHALING MAIZE POLLEN .....5 HUNGER (EMPTY STOMACH) .....6 EATING OTHER DIRTY FOOD .....7 DRINKING DIRTY WATER .....8 GETTING SOAKED WITH RAIN .....9 COLD OR CHANGING WEATHER .....10 WITCHCRAFT .....11 OTHER..... 88 (SPECIFY) DONT KNOW .....99</p>	

M6	What are all the ways that people can protect themselves against "malaria" (in English)?  DO NOT PROVIDE ANSWERS MULTIPLE RESPONSES POSSIBLE PROBE ONCE (Anything else?)	SLEEP UNDER A MOSQUITO NET .....1 SLEEP UNDER A TREATED NET (ITN/ LLIN).....2 USE MOSQUITO REPELLENT .....3 AVOID MOSQUITO BITES .....4 SPRAY HOUSE WITH INSECTICIDE .....5 MOSQUITO SCREENS / NETS ON WINDOWS .....6 USE MOSQUITO COILS .....7 USE OTAPIPIA DROPS .....8 BURN LEAVES .....9 CUT THE GRASS AROUND THE HOUSE .....10 FILL IN PUDDLES (STAGNANT WATER) .....11 KEEP HOUSE SURROUNDINGS CLEAN .....12 DON'T DRINK DIRTY WATER .....13 DON'T EAT BAD FOOD (LEFTOVER FOOD) .....14 EAT GARLIC .....15 DRINK ALCOHOL .....16 DON'T GET SOAKED WITH RAIN .....17 TAKE PREVENTIVE MEDICATION .....18 OTHER ..... 88 (SPECIFY) DON'T KNOW .....99	
M8	How often do nets need to be retreated?	MORE FREQUENTLY THAN EVERY 6 MONTHS... 1 EVERY 6 TO 12 MONTHS ..... 2 LESS THAN ONCE A YEAR..... 3 NEVER/DON'T NEED TO RETREAT ..... 4 DON'T KNOW ..... 99	
M9	Can insecticide treated nets ever be washed? (Will insecticide treated nets still be effective against mosquitoes if you wash them?)	YES ..... 1 NO ..... 2 DON'T KNOW ..... 99	→M10 →M11 →M11
M10	If yes, how often should nets be washed according to the recommended practice?	ONCE A YEAR..... 1 TWICE A YEAR ..... 2 NO MORE THAN 4 TIMES A YEAR ..... 3 WHEN THEY ARE DIRTY ..... 4 DON'T KNOW ..... 99	
M11a	What is the appropriate height at which to hang a mosquito net?	 At a height that allows it to be tucked completely under the mat or mattress .....1 Other ..... 2 (Specify)	
M11	Have you ever gone to get a free net and been told that you could not have one?	YES ..... 1 NO ..... 2	→M14
M12	From what source?	MASS DISTRIBUTION CAMPAIGN .....1 ANTENATAL CLINIC (ROUTINE).....2 IMMUNIZATION CLINIC (ROUTINE) .....3 HEALTH FACILITY .....4 COMMUNITY WORKER (CDD) .....5 SCHOOL .....6 CHURCH/MOSQUE.....7 POLITICIAN .....8 OTHER ..... 88 (SPECIFY) DON'T KNOW .....99	



M13	<p>What explanation were you given for the fact that you could not have a net?</p> <p>DO NOT PROVIDE ANSWERS</p> <p>MULTIPLE RESPONSES POSSIBLE</p> <p>PROBE ONCE (Anything else?)</p>	<p>THERE WERE NO NETS AVAILABLE ..... 1</p> <p>I HAD ALREADY RECEIVED THE MAXIMUM NUMBER OF NETS ALLOWED ..... 2</p> <p>ANOTHER FAMILY MEMBER HAD ALREADY ..... 3 OBTAINED THE NET FOR OUR HOUSEHOLD</p> <p>NO EXPLANATION..... 4</p> <p>OTHER ..... 88 (SPECIFY)</p> <p>DON'T KNOW ..... 99</p>	
M14	<p>What are all the ways that you (or other people) use mosquito nets?</p> <p>DO NOT PROVIDE ANSWERS</p> <p>MULTIPLE RESPONSES POSSIBLE</p> <p>PROBE ONCE (Anything else?)</p> <p>IF THEY ONLY LIST USES RELATED TO SLEEPING UNDER NETS, ASK: What do people use nets for other than sleeping under them?</p>	<p>PROTECT FROM MOSQUITO/INSECT BITES .....1</p> <p>PREVENT MALARIA .....2</p> <p>PREVENT ANEMIA IN CHILDREN .....3</p> <p>PREVENT PROBLEMS IN PREGNANCY .....4</p> <p>PREVENT FILARIA/ELEPHANTIASIS .....5</p> <p>KEEP CHILDREN IN BED .....6</p> <p>PRIVACY .....7</p> <p>PROTECT FROM COLD .....8</p> <p>TOLD TO USE .....9</p> <p>HOUSEHOLD SCREEN .....10</p> <p>FLY REPELLANT .....11</p> <p>CLOTHING .....12</p> <p>PROTECT CROPS FROM INSECTS .....13</p> <p>PROTECT ANIMALS FROM INSECTS .....14</p> <p>ROPES .....15</p> <p>FISHING .....16</p> <p>NONE .....17</p> <p>OTHER ..... 88 (SPECIFY)</p> <p>DON'T KNOW ..... 99</p>	
M15	<p>What are all the disadvantages of nets?</p> <p>DO NOT PROVIDE ANSWERS</p> <p>MULTIPLE RESPONSES POSSIBLE</p> <p>PROBE ONCE (Anything else?)</p>	<p>TOO HOT .....1</p> <p>DIFFICULT TO BREATHE .....2</p> <p>POISONOUS .....3</p> <p>SKIN PROBLEMS .....4</p> <p>TOO EXPENSIVE .....5</p> <p>DON'T LAST LONG .....6</p> <p>SMELL .....7</p> <p>TOO SMALL/SHORT .....8</p> <p>CONFINING/RESTRICTING/HASSLE (TAKE DOWN-HANG UP, TUCK IN) .....9</p> <p>HARD TO HANG .....10</p> <p>NONE ..... 11</p> <p>OTHER ..... 88 (SPECIFY)</p> <p>DON'T KNOW ..... 99</p>	
M17	<p>If there are not enough nets for everyone in a household, who should be given priority when deciding who can sleep under a net?</p> <p>DO NOT PROVIDE ANSWERS</p> <p>MULTIPLE RESPONSES POSSIBLE</p> <p>PROBE ONCE (Anything else?)</p>	<p>ELDERLY PEOPLE ..... 1</p> <p>HEAD OF HOUSEHOLD .....2</p> <p>YOUNG CHILDREN .....3</p> <p>PREGNANT WOMEN ..... 4</p> <p>PEOPLE WHO CONTRIBUTE THE MOST MONEY TO THE HOUSEHOLD ..... 5</p> <p>PERSON WHO BOUGHT/OBTAINED THE NET ..... 6</p> <p>OTHER ..... 88 (SPECIFY)</p> <p>DON'T KNOW ..... 99</p>	
M19	<p>What is the recommended antimalarial that is being promoted by the Ministry of Health?</p>	<p>ACT/AL/AA/CO-ARTEM..... 1</p> <p>SPIFANSIDAR ..... 2</p> <p>CHLOROQUINE/NVAQUINE..... 3</p> <p>AMODIAQUINE ..... 4</p> <p>QUININE ..... 5</p> <p>OTHER ..... 88 (SPECIFY)</p> <p>DON'T KNOW ..... 99</p>	

Please give your opinion about the following statements. Say if you AGREE, ARE NEUTRAL or DISAGREE.			
M20	Treated nets are safe to sleep under.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M21	Most people in the community sleep under an insecticide-treated bed net every night.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M22	You can hang a net any place people sleep in your house.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M23	You can get malaria when a mosquito bites you.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M24	People are at risk of getting malaria only during the rainy season.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M25	People can get malaria from eating certain foods.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M26	It is safe to hang a net in a place where you store food.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M27	Cutting bushes and removing stagnant water around your house can help reduce your risk of malaria.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M28	Bed nets are old-fashioned.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M29	Every child with a fever should be treated at a clinic or hospital.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M30	You only need to sleep under a mosquito net if you see mosquitoes before you go to bed.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M31	You can get free malaria treatments at government clinics.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M32	The amount of money that a family spends to treat malaria in a year is more than the amount of money one can obtain by selling a bed net.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M33	Pregnant women can get free medicines to prevent malaria at a clinic.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M34	Bed nets are mostly for poor farmers.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M35	Sleeping under an insecticide treated bed net can protect you from the illness that causes swollen feet or legs.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M36	Bed nets are a Western plot to reduce African populations.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
M37	It is possible to hang a bed net over any kind of sleeping space	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	

M38	In order to be fully protected from mosquitoes when you are sleeping, your mosquito net must be completely tucked under your mat or mattress, on all sides.	AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
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### SKILLS AND SELF-EFFICACY

SSE1	How confident are you that you can hang a mosquito net over any type of sleeping space?	<input type="checkbox"/> <input type="checkbox"/> VERY CONFIDENT.....1 A LITTLE CONFIDENT.....2 NOT AT ALL CONFIDENT.....3	
SSE2	How confident are you that you can tuck in a mosquito net properly?	<input type="checkbox"/> <input type="checkbox"/> VERY CONFIDENT.....1 A LITTLE CONFIDENT.....2 NOT AT ALL CONFIDENT.....3	
SSE3	How confident are you that you can use a mosquito net every night?	<input type="checkbox"/> <input type="checkbox"/> VERY CONFIDENT.....1 A LITTLE CONFIDENT.....2 NOT AT ALL CONFIDENT.....3	
SSE4	How confident are you that you can wash a mosquito net correctly, the correct number of times a year, with the correct soap?	<input type="checkbox"/> <input type="checkbox"/> VERY CONFIDENT.....1 A LITTLE CONFIDENT.....2 NOT AT ALL CONFIDENT.....3	
SSE5	How confident are you that you can mend your mosquito net if it gets a hole?	<input type="checkbox"/> <input type="checkbox"/> VERY CONFIDENT.....1 A LITTLE CONFIDENT.....2 NOT AT ALL CONFIDENT.....3	
SSE6	How confident are you that you can make a moveable post for hanging your bed net over any sleeping space out of cement, metal cans and branches or poles?	<input type="checkbox"/> <input type="checkbox"/> VERY CONFIDENT.....1 A LITTLE CONFIDENT.....2 NOT AT ALL CONFIDENT.....3	

### SOCIAL NORMS AND RUMORS

<i>Please give your opinion about the following statements. Say if you AGREE, ARE NEUTRAL or DISAGREE.</i>			
SN1	Most people in the community sleep under an insecticide-treated bed net every night.	<input type="checkbox"/> <input type="checkbox"/> AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	
SN2	Most people in my community think that people SHOULD sleep under insecticide-treated bed nets every night.	<input type="checkbox"/> <input type="checkbox"/> AGREE.....1 NEUTRAL/DON'T KNOW.....2 DISAGREE.....3	



SN3	The leaders of my community want people to sleep under insecticide-treated bed nets every night.	<input type="text"/>	AGREE ..... 1 NEUTRAL/DON'T KNOW ..... 2 DISAGREE ..... 3
SN4	It is important to my family members that I sleep under a bed net every night.	<input type="text"/>	AGREE ..... 1 NEUTRAL/DON'T KNOW ..... 2 DISAGREE ..... 3

### SOCIAL SUPPORT

Please say how often each of the following events occurs.			
SS1	My spouse helps me to hang the mosquito nets for our household.	<input type="text"/>	ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5 NOT APPLICABLE ..... 99
SS2	My children help to hang the mosquito nets for our household.	<input type="text"/>	ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5 NOT APPLICABLE ..... 99
SS3	My spouse encourages me to sleep inside an LLIN.	<input type="text"/>	ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5 NOT APPLICABLE ..... 99
SS4	My children encourage me to sleep inside an LLIN.	<input type="text"/>	ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5 NOT APPLICABLE ..... 99
SS5	My friends encourage me to sleep inside an LLIN.	<input type="text"/>	ALWAYS ..... 1 OFTEN ..... 2 SOMETIMES ..... 3 RARELY ..... 4 NEVER ..... 5 NOT APPLICABLE ..... 99

## MALARIA MESSAGES

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
S1	Have you seen or heard any information about malaria in the past few weeks?	YES ..... 1 NO / DON'T REMEMBER ..... 2	→ S3
S2	What was the content of the information about malaria (What did the message talk about)?  DO NOT PROVIDE ANSWERS MULTIPLE RESPONSES POSSIBLE PROBE ONCE (Anything else?)	CAUSES OF MALARIA ..... 1 PREVENTION OF MALARIA (general) ..... 2 SLEEPING UNDER NET ..... 3 SLEEPING UNDER TREATED NET (ITN/LLIN) ..... 4 USE NET EVERY NIGHT ..... 5 GIVE PRIORITY TO PREGANT WOMEN <5 YRS ..... 6 CARING FOR / WASHING NETS ..... 7 SEEK TREATMENT FOR FEVER ..... 8 SEEK TREATMENT FOR FEVER WITHIN 24 HRS ..... 9 IMPORTANCE OF SPRAYING ..... 10 NOT PLASTERING WALLS AFTER SPRAYING ..... 11 ENVIRONMENTAL SANITATION ACTIVITIES ..... 12 CUT BUSHES/GRASS AROUND YOUR HOUSE ..... 13 BURY RUBBISH/TIRES/BOTTLES ..... 14 OTHER ..... 88 (SPECIFY) DON'T KNOW ..... 99	
S2a	Where did you get this information?  Multiple response options possible.	Radio ..... 1 Television/Films ..... 2 Flyers/Handouts/Leaflets ..... 3 Billboards/Posters ..... 4 Newspapers/Magazines ..... 5 Community Volunteers/Peer Educators/Community Health workers ..... 6 Music/Drama Groups ..... 7 Traditional Healers ..... 8 Doctors/Nurses/Health Providers ..... 9 Community or Religious Leaders ..... 10 Celebrities (athletes, musicians, actors, politicians...) ..... 11 Friends and family members ..... 12 Other ..... 88 Specify:	
S3	Did your household receive any free bed nets during a mass bed net distribution campaign?	YES ..... 1 NO ..... 2 DON'T KNOW / NOT SURE ..... 99	→ S6 → S6
S4	Were you there when the bed net was given to your household?	YES ..... 1 NO ..... 2	→ S6
S5	What information did the person who gave you the net provide you with about malaria?  Probe: What did the person tell you about using bed nets? What did the person tell you about taking care of bed nets? What did the person tell you about treatment of malaria?  MULTIPLE RESPONSES POSSIBLE. CHECK ALL THAT APPLY.	CAUSES OF MALARIA ..... <input type="checkbox"/> PREVENTION OF MALARIA (general) ..... <input type="checkbox"/> SLEEP UNDER NET ..... <input type="checkbox"/> SLEEP UNDER TREATED NET (ITN/LLIN) ..... <input type="checkbox"/> USE NET EVERY NIGHT ..... <input type="checkbox"/> YOU ONLY HAVE TO USE NET DURING RAINY SEASON ..... <input type="checkbox"/> GIVE PRIORITY TO PREGNANT WOMEN & CHILDREN <5 ..... <input type="checkbox"/> HANG YOUR NET SO IT CAN BE TUCKED ..... <input type="checkbox"/> HANG UP TO AIR BEFORE USING ..... <input type="checkbox"/> HANG OUTSIDE BEFORE USING ..... <input type="checkbox"/> HANG INSIDE BEFORE USING ..... <input type="checkbox"/> WASHING NETS ..... <input type="checkbox"/> RE-TREATING NETS ..... <input type="checkbox"/> MENDING /REPAIRING NETS ..... <input type="checkbox"/> SEEK TREATMENT FOR FEVER ..... <input type="checkbox"/> SEEK TREATMENT FOR FEVER WITHIN 24 HRS ..... <input type="checkbox"/>	



	MULTIPLE RESPONSES POSSIBLE. CHECK ALL THAT APPLY.	RE-TREATING NETS ..... <input type="checkbox"/> MENDING (REPAIRING) NETS ..... <input type="checkbox"/> SEEK TREATMENT FOR FEVER ..... <input type="checkbox"/> SEEK TREATMENT FOR FEVER WITHIN 24 HRS ..... <input type="checkbox"/> FREE TREATMENT FOR MALARIA ..... <input type="checkbox"/> ACT / AQ / AA / COARTEM ..... <input type="checkbox"/> IMPORTANCE OF SPRAYING ..... <input type="checkbox"/> DON'T PLASTER WALLS AFTER SPRAYING ..... <input type="checkbox"/> CUT BUSHES/GRASS ..... <input type="checkbox"/> BURY TRASH/TIRES/BOTTLES ..... <input type="checkbox"/> CERTAIN FOODS CAN CAUSE MALARIA ..... <input type="checkbox"/> OTHER ..... <input type="checkbox"/> (SPECIFY) ..... <input type="checkbox"/> DON'T KNOW ..... <input type="checkbox"/>	
S12	Did the person who visited your home ask to see your bed nets?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S13	Did the person who came to your home show you any pictures about malaria or bed nets?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S14	Did the person who came to your home show you how to hang a bed net properly?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S15	Did the person who came to your home watch you practice hanging your bed net at the appropriate height?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S16	Did the person who came to your home show you how to wash your LLIN properly?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S17	Did the person who came to your home show you how to mend your LLIN properly?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S18	Did the person who came to your home talk with you about the things that make it hard for you to use a bed net every night and give you suggestions of things you could do to make it easier for you to use a bed net every night?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S19	Has there been an event/gathering in your community where people learned how to hang their bed nets properly?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S20	Has there been an event/gathering in your community where people came to wash and mend their LLINs together?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S21	Has there been an event/workshop in your community where people learned how to make moveable posts, from locally available supplies, for hanging LLINs over any sleeping space?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S22	Has there been a drama group performance about malaria in your community in the past three months?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S23	Have your community leaders talked to people about the importance of sleeping under LLINs?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	

S24	Have religious leaders in your community talked to people about the importance of sleeping under LLINs?	YES ..... 1 NO ..... 2 Don't know/Don't remember ..... 3	
S25	Where or from whom do <u>most</u> people in your community get their information about malaria?  <b>Multiple Responses Possible</b>	Radio ..... 1 Television/Films ..... 2 Flyers/Handouts/Leaflets ..... 3 Billboards/Posters ..... 4 Newspapers/Magazines ..... 5 Community Volunteers/Peer Educators/Community Health workers ..... 6 Music/Drama Groups ..... 7 Traditional Healers ..... 8 Doctors/Nurses/Health Providers ..... 9 Community or Religious Leaders ..... 10 Celebrities (athletes, musicians, actors, politicians...)11 Friends and family members ..... 12 Other ..... 88 Specify: _____	
S25	What sources of information about malaria do people trust the most?  <b>Multiple Responses Possible</b>	Radio ..... 1 Television/Films ..... 2 Flyers/Handouts/Leaflets ..... 3 Billboards/Posters ..... 4 Newspapers/Magazines ..... 5 Community Volunteers/Peer Educators/Community Health workers ..... 6 Music/Drama Groups ..... 7 Traditional Healers ..... 8 Doctors/Nurses/Health Providers ..... 9 Community or Religious Leaders ..... 10 Celebrities (athletes, musicians, actors, politicians...)11 Friends and family members ..... 12 Other ..... 88 Specify: _____	
S26	What sources of information about malaria do people trust the least?  <b>Multiple Responses Possible</b>	Radio ..... 1 Television/Films ..... 2 Flyers/Handouts/Leaflets ..... 3 Billboards/Posters ..... 4 Newspapers/Magazines ..... 5 Community Volunteers/Peer Educators/Community Health workers ..... 6 Music/Drama Groups ..... 7 Traditional Healers ..... 8 Doctors/Nurses/Health Providers ..... 9 Community or Religious Leaders ..... 10 Celebrities (athletes, musicians, actors, politicians...)11 Friends and family members ..... 12 Other ..... 88 Specify: _____	