

*Final Report*

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# Mosquito net Coverage and Utilisation for Malaria Control in Tanzania



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## EXECUTIVE SUMMARY

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**Background:** In recent years malaria parasites have developed resistance to the most commonly used antimalarial drugs in Tanzania, posing a major challenge for its control. This has led to frequent changes of malaria treatment guidelines, more recently to expensive, yet more effective arthemether/lumefantrine. The use of insecticide treated mosquito nets (ITNs) and long lasting nets (LLINs) in Tanzania has increased slowly over the past few years. Despite the introduction of a voucher scheme to the vulnerable groups, the proportion of households with at least an ITN/LLIN in the country has not been able to achieve the Abuja Declaration of 60% net coverage. Statistics available on the utilisation of nets do not provide a good estimate of the coverage, because of the different study design used to collect the information.

**Objective:** This survey was carried out in 21 districts of Tanzania to determine the coverage and utilisation of insecticide treated nets to provide baseline information of the net requirement to cover every sleeping bed in the country. Specifically, this study aimed to (i) determine the ITN coverage by and its distribution in the country; and (ii) determine knowledge, attitudes and practice of the householders as regards to malaria prevention and control

**Methods:** Twenty one districts (one from each region) of Mainland Tanzania were selected for the survey. Selection of the district was random. In each district, two wards were selected, one urban (within the district capital) and one rural or sub-urban. Households were selected randomly using a table of random numbers. At household level, the head or any adult who represented the head of household was interviewed. A structured pre-tested questionnaire was used to collect information on knowledge, attitude and practices in malaria control, with emphasis on mosquito net ownership and utilisation.

**Results:** Of the 9549 targeted households, 9166 (96%) participated in the survey. Majority of the respondents (76.8%) were from rural district. The mean household size was 3.9 persons. On average, children <5 years old accounted for 39.3% of the members of the households. Respondents with no formal education accounted for 15.8-37.4% of the interviewees. Most of them were from Mkuranga (55%), Kigoma-Ujiji (44.2%) and Newala (37.9%). High literate rates were observed in Arumeru and Moshi districts. The majority of the respondents knew that the mosquito is the vector of the malaria parasite (92.6-99.4%) and infection is through a mosquito bite (92.7-99.8%). The knowledge of respondents on malaria transmission was generally high (94.0-99.0%).

The majority of the respondents (95.2%) considered the use of mosquito nets as the most effective way of malaria prevention. However, of these, only 66.7% said to have actually used nets in their life time. Knowledge on the use of mosquito nets in the control of malaria was highest and lowest in Eastern and Central zones, respectively.

Seventy-seven percent (4457/8933) agreed to have the investigator entry into their houses and verify the number of nets owned. On average, 62.9% (5,785/8933) of the households had at least a mosquito net. Majority of the respondents in Northern (76.5%) and Southern (76.5%) zones owned at least a mosquito net. The lowest mosquito net ownership was observed among respondents in Western Zone (39.6%). District-wise, net ownership was highest in Lindi (94.5%), Kyela (91.3%) Arumeru (86.1%), Ilala (83.1%) and Nyamagana (80.0%). Ownership of net was very low in Kilolo (34.8%), Kigoma (36.5%) and Musoma Rural (41.3%). Of the households with nets, 74.4% were using nets all year round. A larger proportion of respondents in Kilolo (68.5%), Mpwapwa (51.9%), Songea Rural (49.2%) and Shinyanga Rural (46.3%) were only using the nets during the rainy season.

Out of 9,166 households visited, 3,610 (39.3%) had at least one under five child. Of these, in 1,939 (53.7%) of the households the child slept under a mosquito net during the previous night. Use of nets in children <5 years was most common in northern zone (74%); followed by eastern (66.9%) and southern zone (61.1%). Districts with the largest proportion of <5 year children sleeping under a mosquito nets were Lindi (90.0%), Kyela (85.2%), Ilala (83.2%) and Arumeru (78.2%). Only about a quarter (27%) of the children <5% in western zone were sleeping under a mosquito net. Lowest net coverage for <5 year was in Kigoma (22.7%), Kilolo (25%) and Bukoba Rural (31.2%). A total of 5,785 (62.9%) owned at least a mosquito net. Of these, 4,219 and 1,566 were from the rural and urban districts, respectively. More households in the urban districts (73.4%) than rural districts (59.7%) owned at least a mosquito net. Likewise, there were more households (64.9%) in the urban districts with <5years children sleeping under mosquito nets than in the rural districts (50.4%). More households in urban (32.8%) than in rural districts (25.1%) had at least one insecticide treated net.

The number of households with mosquito nets enough for all members of the households ranged from 18.9% (in Urambo) to 37.4% (in Hanang). Households with at least 50% or more occupants using mosquito nets ranged from 16.4% (in Urambo) to 42.8% (in Arumeru). Districts with the largest proportion of  $\geq 50\%$  of the household members sleeping under mosquito nets were Arumeru (46.9%) and Lindi (46.7%). In Manyoni and Lindi, 3.1% and 5% of the households were found to have more nets than the number of household occupants. Only 9% (801/9196) of the households had all occupants sleeping under a mosquito net. Kyela district had about a quarter (23.9%) of the households with all occupants sleeping under nets.

Only 29% of the households had at least one insecticide treated mosquito nets. All nets in 51.4% of the households surveyed were ITNs. The largest proportion of households with ITN was observed in northern zone (40.2%), with Arumeru (46%) and Hanang (44.1%) districts having the highest ITN coverage. The lowest proportion (15.5%) of households with ITN was found in the Western Zone. Districts which had the lowest ITN coverage were Musoma Rural (12.6%), Kigoma-Ujiji (13.2%), and Shinyanga Rural (14.4%). On average, 90.7% (8,123/8,953) of the respondents would prefer using ITN than having their house sprayed with long lasting residual insecticide. More households in urban (32.8%) than in rural districts (25.1%) had at least an ITN

A total of 1939 children underfives were sleeping under mosquito net (any type). Of these, 1140 (58.8%) were using insecticide treated nets (ITN). Overall, 31.6% of the underfives slept under an insecticide treated net during the previous night. Highest coverage was reported in Kyela (47.7%), Nyamagana (47.7%) and Arumeru (46.4%). Lowest ITN in underfives was reported in Kigoma-Ujiji (16.0%), Musoma (17.2%) and Urambo (17.7%). In Songea more underfives children were sleeping under ITN (43.6%) than in untreated nets (40.9%).

Control of bedbugs, lice, fleas, mites and cockroaches was the major added advantage of using insecticide treated nets. On average, 30.8% and 19.6% of the respondents mentioned cockroach and bedbug control as the main advantage of using ITN, respectively. The majority (52.9%) preferred blue coloured net (Northern=45.6%; Central=59.2%; Eastern=56.4%; Lake= 54.4%; Southern= 60.3%, Western= 58.5%) and Southern Highlands= 49.1%). Other colour preferences were white (29.6%), green (14.1%), black (2.1%) and pink (1.2%). A strong preference for blue mosquito nets was observed among respondents in Musoma (77.3%) and Newala (75.5%) districts. On the other hand, the weakest preference (24.7%) for blue nets was observed among respondents in Arumeru district. The majority of the respondents (82%) preferred rectangular shaped net. A larger percent (61.8%) the respondents preferred to have the map of Tanzania as a national logo to identify nets distributed in the country.

**Conclusion:** On average, 62.7% and 28.8% of the households in Tanzania own at least one mosquito net (any type) and insecticide treated net, respectively. Tanzania expects that ITN coverage of under fives in 2009, after the Under Five Catch-up Campaign is complete, to be at least 80%. If this is to be achieved, there is a need for concerted effort in scaling up the distribution and demand for long lasting nets throughout the country. Moreover, the planned use of IRS in malaria control, currently considered unpopular should be accompanied by rigorous community health education to avoid resistance from household members.

# CHAPTER 1: INTRODUCTION

## 1.1. Malaria burden in Tanzania

In Tanzania malaria is the leading cause of morbidity and mortality (MoH, 2006). The number of clinical malaria cases per year is estimated to be 17–20 million resulting in approximately 100,000 deaths. The population groups most vulnerable to malaria are children under five years and pregnant women, due to their particular immunity status. However, all age groups are equally susceptible in epidemic prone areas. The disease ranks number one in both outpatient and inpatient statistics. The socio-economic impact of malaria is so high that it contributes highly to poverty and underdevelopment (Sachs, 2005; Mboera et al., 2007a). Malaria is the single most significant disease in Tanzania affecting the health and welfare of its 38.4 million inhabitants. The climatic conditions are favourable for mosquito breeding almost throughout the country. The transmission is stable perennial to stable seasonal in over 80% of the country and about 20% of the population live in unstable malaria transmission areas that are prone to frequent malaria epidemics.

## 1.2. Malaria control strategies

Malaria control in Tanzania appears difficult, and prospects for a lasting solution have in the past decade diminished with the advent of widespread antimalarial drug resistance (Schönfeld et al. 2007). Antimalarial drug resistance (chloroquine and sulfadoxine pyrimethamine) in the country has led to frequent changes of malaria treatment guidelines, more recently to expensive arthemether/lumefantrine. The just ended Tanzania National Malaria Medium Term Strategic Plan (2002–2007) (MoH, 2002) aimed at reducing the level of malaria to a point where it is neither a major public health problem nor an obstacle to socio-economic development through four operational and two supportive strategies. These include malaria case management; malaria vector control using insecticide treated mosquito nets (ITN); intermittent preventive treatment of malaria in pregnant mothers; malaria epidemics prevention and control; information, education and communication; and operational research. However, with only a few months until the end of 2007, malaria cases and deaths have been increasing in the country. For instance, deaths attributable to malaria increased from 34.3% in 2003 to 37.3% in 2004 (Mboera et al., 2007a). At the end of 2007, community access to prompt antimalarial treatment within 24 hours was very low and less than one third of the total clinical cases of malaria were confirmed by laboratory tests. An evaluation of the previous strategic plan has also indicated that coverage of ITN was below 60%; coverage for intermittent preventive treatment of malaria in pregnancy (IPTp) was only 31% for IPTp2; early detection and response to malaria epidemic is weak and malaria communication strategy was never implemented.

In its current Medium Term Strategic Plan (2008-2013), the National Malaria Control Programme goal is to reduce malaria by 80%, by the end of 2013 from the current morbidity (18 million cases) and mortality (80,000 deaths) levels. The goal is to be attained through the implementation of five strategies which include (i) malaria diagnosis and treatment; (ii) malaria prevention; (iii) monitoring, evaluation and surveillance; (iv) behavioural change communication and community based malaria control; and (v) regional/district support and capacity building (MoH, 2008).

### 1.2.1. Mosquito nets

The armies of Russia, Germany and United States were the first to use insecticide impregnated nets in the protection against mosquito bites during the World War II. Later, researches carried on the use of various insecticide treated nets (ITNs) in Burkina Faso during the mid 1970s. Pyrethroid insecticides were later



employed in treating nets during the 1980s under experimental conditions. In 1984, the first community-based experiments on the use of insecticide treated nets were initiated in Mali, and later in 1986 in Tanzania. The critical path of ITN research and implementation in Tanzania is summarised in Table 1.1.

**Table 1.1: Critical path of insecticide treated mosquito nets research and implementation in Tanzania**

1983-1995	1985-1995	1992-2000	1997-2000	2000-2008	
<i>Efficacy studies</i>		<i>Effectiveness studies</i>	<i>Policy developments</i>	<i>Going to scale</i>	
Reducing malaria vector exposure (including net and insecticide developments)	Reducing malaria morbidity and mortality	Impact (morbidity and mortality) and cost assessment in pilot programmes	National strategies and partnerships for an enabling environment	National ITN strategy and policy NATNETS	Re-thinking of ITN national policy on possible free net coverage of all sleeping beds?

Source: Modified after Magesa et al. 2005

Since mid 1980s, much work has taken place on ITNs in Tanzania. A number of research institutions, donor agencies, non-governmental organizations, net manufacturers, the private and public agencies have been closely involved in the improvement of this tool and preparing ground for national scale expansion. Initially, a number of studies on ITNs focused on its entomological efficacy. This was followed by initial work on a number of small scale trials to demonstrate epidemiological impact under controlled conditions (efficacy trials) (Lines et al., 1987; Magesa et al., 1991; Curtis et al., 1996; Maxwell et al. 1999) . Subsequently, the emphasis was put on larger trials and exploring community-wide benefits of ITNs on both morbidity and mortality (Schellenberg et al. 2001; Abdulla et al., 2001; Marchant et al., 2002).

Accessibility and distribution of net occupied much of the researches activities during the late 1990s (Njunwa et al., 1991; Makemba et al., 1996; Fraser-Hurt & Lyimo, 1998). Studies on community-based net distribution and socio-marketing formed the largest part of the studies during this period. Other studies included the design and testing of insecticide home treatment kits (Miller et al., 1999a,b) and factors influencing net re-treatment among Tanzania communities. In recent years, most work concentrated on the efficacy and introduction of long-lasting insecticide treated nets (Tami et al., 2004; Malima et al., 2008).

Insecticide-treated nets (ITNs) are a powerful public health tool in the fight against malaria. Regular use by young children can reduce their overall risk of mortality by over 20% and the number of clinical malaria episodes by 50%. An ITN consists of an untreated net and an insecticide treatment kit. This type of net requires regular re-treatment. However, retreatment rate in Tanzania has remained low over the years. Long-lasting insecticidal nets (LLINs) have been developed in response to the low re-treatment rates of conventional insecticide-treated nets. A long-lasting net is a ready-to-use pre-treated mosquito net, which requires no further treatment during its expected life span.

Tanzania has advanced considerably in the implementation of social marketing of insecticide treated nets. This strategy has been developed through various studies and is currently being implemented at a nation-wide scale. To scale up ITN, the government is currently, spearheading the so-called voucher scheme strategy, which harnesses the strength of the private sector to distribute highly subsidised ITNs/LLINs throughout the country (Magesa *et al.*, 2005). However, the programme specifically targets pregnant women and their infants while ensuring long-term and widespread commercial availability. Unfortunately, the coverage of the population with this scheme is likely to be very low. To-date, the programme has not reached the whole country and ITN coverage therefore, remains very low. The approach is yet facing some a number of challenges including the fact that the targeted pregnant women

have little decision whether to purchase a net or not in a patriarchal cultural structure that is common in Tanzania. Other obstacles within this approach include the fact that women attend antenatal care clinics (ANC) too late (week 20 on average) to achieve the desired target. The 60% coverage of pregnant women will not be achieved unless women can be persuaded to attend ANC much earlier in their pregnancy.

The scaling up of net distribution in Tanzania has been enhanced by public-private partnership policy. A close collaboration among the public, private and non-governmental organization (NGO) was advocated around the issue of demand creation and increased supply and use of ITNs. In this scenario, the public sector role is focusing on consumer protection, policy and regulatory issues, as well as generic demand creation, in order to create an ITN-enabling environment. The NGO role focuses on more local, grass-root demand creation and support for specific niche supply. The commercial sector role focuses on supply and distribution, product development, and brand-specific demand creation (Magesa et al., 2005). All these are supported by the research community (public and private) in product development, operations research, market research, and monitoring and evaluation.

Public-private partnership has played a great role in the promotion and distribution of mosquito nets in Tanzania. For instance, the National Insecticide Treated Nets (NATNETS) was formed in July 2002 as a steering committee to implement the scaling up of ITN strategies through promotion of ITN use by making nets available, accessible and acceptable. This body is made up of Tanzanian Government Departments, Non-governmental organizations and development partners.

Despite the rigorous social marketing and voucher scheme strategies that have been highly publicized in Tanzania, the ITN coverage in most rural areas remain extremely low. The use of ITNs/LLINs in Tanzania has increased markedly over the past few years. Statistics indicate that the proportion of households with at least one untreated net has increased from 14% in 2001 to 57% in 2006. On the other hand, the proportion of households with at least an ITN has increased from 14% in 2001 to 28.9% in 2006. However, the use of ITN in the underfives has remained lower in rural areas (14%), than in the peri-urban (25%) or urban areas (28%) (Mboera et al., 2007a). The low ITN coverage has mostly been attributed to low re-treatment rates. With this kind of scenario, the targeted 60% ITN coverage of the population in malaria endemic areas of the country is unlikely to be reached in the foreseeable future.

While the socio-marketing and voucher scheme strategies have increased the coverage substantially, there is concern that they may not result into substantial impact on the malaria morbidity and mortality. Currently, data coming from studies elsewhere in Africa have shown that a high level of ITN coverage and use can easily be achieved and sustained by sequential community based campaigns through mass, free distribution (catch-up) and keep-up strategies, accompanied by strong IEC/BCC to beneficiary communities. The Government of Tanzania needs to review its strategy in malaria control through the distribution modalities of ITN/LLIN. The goal of the proposed NMCP strategic plan (2008-2013) is to reduce the burden of Malaria by 80% by the end of 2012 from current levels.

In order to fill the gaps in the requirements of ITN/LLIN, this study was proposed in order to determine net coverage and utilization in selected districts of Tanzania. It is important therefore to determine the actual ITN/LLIN coverage and utilisation to provide adequate baseline data for a proposed scaling-up exercise. The objective of this study was to determine mosquito net coverage and utilisation in Tanzania. Specifically, to determine the mosquito net coverage in selected 21 districts spread out in 21 regions of the country; and to explore knowledge, attitudes and practice of the household as regards to malaria prevention and control.

Despite all these efforts, the current (2008) net coverage in the country is still well below the Abuja target of 60% by 2005 (Table 1.2.). Lack of resources and equity in the access of preventive measures hamper the efforts to scale-up insecticide treated mosquito net coverage in the country. Tanzania is challenged with the need to cover all the population at risk of malaria infection with insecticide treated nets. Currently, some opportunities to support the local initiative to provide free nets to populations at risk of malaria are available through various global initiatives.

Following the current high advocacy for scaling up LLINs, there is evidence of dramatic impact where such strategy has been implemented in countries like Eritrea, Ethiopia, Togo, Zanzibar and Kenya. Tanzania is in therefore in the process of approving a change of strategy from targeted Insecticide Treated Nets to cover children under the age of five years and pregnant women to full universal coverage of the whole population due to the fact that: (i) Although many deaths occur in these vulnerable groups, 90% of the whole population of Tanzanians are at risk; (ii) Public health impact of rapid reduction of malaria transmission and deaths will only occur with universal high coverage; (iii) Global advocacy for malaria control is high and financial support is promising. Substantial pledges have been made and donors are willing to fund scaling up to universal coverage of the population with LLINs.

**Table 1.2: Coverage (%) of net use in Tanzania 2005-2007**

Target group	2005		2006		2007	
	Any net	ITN	Any net	ITN	Any net	ITN
All household members	23.4	9.8	31.8	15.6	38.4	20.5
Pregnant women	25.2	10.5	33.9	17.6	38.9	23.2
< 5 years	27.5	15.3	40.9	21.1	46.5	25.7
< 1 years	31.1	12.0	45.4	27.0	55.6	34.2

Source: Hanson et al. 2007

The fact that the Tanzanian social marketing and vouchers scheme have only achieved 34.2% and 23.2% coverage of all Tanzanian children under 1 year and pregnant women, respectively, can be translated as a failure of the strategy. Coverage is considerably worse in rural areas, where the main burden of malaria exists. The rationale for targeting the most vulnerable group of the population has already been overtaken by events, especially the availability of funds from several development partners and global organizations (Kitua et al., 2008)

It has been emphasized that that the higher the percentage of coverage of a population with insecticide-treated nets, the more mosquitoes will be killed and the greater the reduction in the infective mosquito population, leading to low malaria transmission (Magesa et al., 1991; Killeen et al., 2007). Coverage targeted only at children and pregnant women achieves good, but not perfect, personal protection even for the targeted categories since it has little impact on the vector population infectiousness. Thus there is an on-going plea from many quarters for introducing universal coverage of all sleeping places with ITNs/LLINs (Teklehaimanot et al., 2007) in all endemic countries.

## CHAPTER 2: METHODOLOGY

### 2.0. Study area

Tanzania mainland has 21 regions and 123 districts. Each district is divided into 4-5 divisions, which in turn are composed of 3-4 wards and 5-7 villages form a ward. There are a total of 10,045 villages. The country has an estimated population of 38.4 million with an annual growth rate of 2.8%. Seventy-six percent of the people live in rural communities. Twenty percent of the population are children under five years of age, 27% are 5-15 years olds, and 20% are women of reproductive age (between 15 to 49 years).

The study districts were divided in seven zones, namely, Lake Victoria, Western, Northern, Central, Eastern, Southern and Southern Highlands. Twenty-one districts were selected for the survey.

### 2.1. Zones

#### 2.1.1. Southern Highlands

This zone included Iringa, Ruvuma, Mbeya and Rukwa regions. From each region, one district was surveyed and these were Songea Rural, Kilolo, Kyela and Sumbawanga Urban. From each district, two wards were randomly selected (one ward within 5 km and the other one beyond 25 but within 30 km) from the district capital. In each ward, two villages were selected. A total of sixteen villages and 1794 households were surveyed in eight wards (Table 2.1.1).

**Table 2.1.1: Distribution of households by village, ward, district and region in the Southern Highland Zone**

Region	District	Ward	Village	Number of Households
Iringa	Kilolo	Ilula	Masukanzi, Itungi	252
		Mahenge	Mahenge, Iringi	218
		<i>Sub-total</i>		<b>470</b>
Mbeya	Kyela	Kyela Urban	Mbugani, Itunge	220
		Makwale	Bwato, Mpunguti	228
		<i>Sub-total</i>		<b>448</b>
Rukwa	Sumbawanga Urban	Katandala	Mtakuja, Majengo	230
		Pito	Malagano, Tamasenga	206
		<i>Sub-total</i>		<b>436</b>
Ruvuma	Songea Rural	Tanga	Tanga, Mpandangindo	148
		Maposeni	Maposeni, Mduduwalo	292
		<i>Sub-total</i>		<b>440</b>
			<b>Total</b>	<b>1,794</b>

#### 2.1.2. Northern Zone

The northern zone included Arusha (Arumeru), Manyara (Hanang), Kilimanjaro (Moshi Urban) and Tanga (Handeni) Regions (Table 2.1.2).

**Table 2.1.2: Distribution households by village, ward, district and region in the Northern Zone**

Region	District	Ward	Village	No. of respondents
Manyara	Hanang	Balangidalalu	Balangidalalu, Mulelu	191
		Endasak	Endasak, Endasiwald	183
Tanga	Handeni	Chanika	Kwa Mdoe, Muungano	153
		Kwaluguru	Misima, Masamba	207
Arusha	Arumeru	Maji ya Chai	Embaseni, Ngurudoto	312
		Usa River	Kisambare, Ngarasero	221
Kilimanjaro	Moshi Urban	Majengo	Kwa Mtei, Miembeni	202
		Mji Mpya	Kwa Komba, Sokoni	214
			<b>Total</b>	<b>1683</b>

### 2.1.3. Western Zone

In this zone, Tabora and Kigoma regions were involved and the assessment covered Kigoma-Ujiji and Urambo districts (Table 2.1.3).

**Table 2.1.3: Distribution of households by village, ward, district and region in the Western Zone**

Region	District	Ward	Village/Sub-village	No. of respondents
Kigoma	Kigoma-Ujiji	Kagera	Mwembe, Mkaratusi, Butekele, Butambwe, Kaswa	239
		Rusimbi	Jumbe , Taifa, Mwandiga, Nahodha, Ngamiani, Swahili	208
Tabora	Urambo	Urambo	Urambo West	244
		Muungano	Kalemela	226
			<b>Total</b>	<b>917</b>

### 2.1.4. Lake Victoria Zone

The survey covered four regions namely Kagera, Mwanza, Mara and Shinyanga. In each Region, one district was randomly selected and this included Bukoba (R), Musoma (R), Shinyanga (R) and Nyamagana districts (Table 2.1.4).

**Table 2.1.4: Distribution of households by village, ward, district and region in Lake Zone**

District	District	Wards	Villages/Streets	No. of respondents
Kagera	Bukoba	Kabaragaine	Ibaraizibu, Itahwa	311
		Bujugo	Katoju, Buganguzi	344
Shinyanga	Shinyanga	Mwamala	Mwamala B, Bugogo	206
		Usanda	Singita, Nzagaluba	168
Mara	Musoma	Etaro	Mkirira, Etaro	220
		Mugango	Mugango, Kwibara	201
Mwanza	Nyamagana	Mirongo	Usmau, Rufiji, Uhuru	194
		Butimba	Ziwani, Kanisani	187
			<b>Total</b>	<b>1343</b>

### 2.1.5. Eastern Zone

This zone included Dar es Salaam (Ilala), Coast (Mkuranga) and Morogoro (Mvomero). A total of 1343 households were visited (Table 2.1.5).

**Table 2.1.5: Distribution of households by village, ward, district and region in Eastern Zone**

Region	District	Ward	Village/Street	Number of Households
Coast	Mkuranga	Mkuranga	Kiparang'anda, Hoyoyo	200
		Vikindu	Vianzi, Vikindu	235
			<b>Sub-Total</b>	<b>435</b>
Dar es Salaam	Ilala	Buguruni	Mnyamani, Kisiwani	303
		Kiwalani	Minazi Mirefu, Yombo	205
			<b>Sub-Total</b>	<b>508</b>
Morogoro	Mvomero	Mzumbe	Changarawe, Lubingo	197
		Mlali	Mpera, Vitonga	203
			<b>Sub Total</b>	<b>400</b>
			<b>Total</b>	<b>1343</b>

### 2.1.6. Central Zone

In the central zone, Dodoma (Mpwapwa) and Singida (Manyoni) Regions were covered (Table 2.1.6). Selected wards were Manyoni and Chikuyu (Manyoni) and Mpwapwa and Kibakwe (Mpwapwa). A total of 1009 households were visited.

**Table 2.1.6: Distribution of households by village, ward, district and region in the Central Zone**

Region	District	Ward	Village	Number of households
Singida	Manyoni	Manyoni	Mjini Kati	213
		Chikuyu	Chikuyu	210
			<b>Sub total</b>	<b>423</b>
Dodoma	Mpwapwa	Mpwapwa	Igovu	212
		Kibakwe	Mwanakyanga, Iyenge	228
			<b>Sub total</b>	<b>440</b>
			<b>Total</b>	<b>863</b>

### 2.1.7. Southern Zone

In this zone, Newala in Mtwara and Lindi Urban district in Lindi were involved and a total of 770 households were visited (Table 2.1.7).

**Table 2.1.7: Distribution of households covered by village, ward, district and region in Southern Zone**

Region	District	Ward	Village/Street	Number of Households
Mtwara	Newala	Malatu	Malatu Juu	217
			Malatu Shuleni	6
			Nanguruwe	104
		Samora	61	
			<b>Sub-Total</b>	<b>388</b>
Lindi	Lindi	Makonde	Sheikh Badi, Amani	170
		Ndoro	Ndoro	212
			<b>Sub-Total</b>	<b>382</b>
			<b>Total</b>	<b>770</b>

## 2.2. Study design

Twenty one districts (one from each region) of Tanzania were selected for household surveys. Selection of the district was random. In each district, two wards were selected, one urban (within the district capital) and one rural. For the urban districts, study sites involved urban and semi-urban wards. Six urban districts were included in the study. In each selected ward a list of all households was prepared at village

level. Households were selected randomly using a table of random numbers. The household head or in his/her absence, any other adult in the household who could be relied upon was interviewed using a structured pre-tested questionnaire. The data collectors were trained beforehand.

In each district, a member or two of the Council Health Management Team participated in the survey. After a courtesy call to respective district, ward and village authorities, each member of the research team was accompanied by the Sub-Village (*Kitongoji*) leader. A house to house visit was made whereby the Sub-villager leader introduced the researcher to the householders.

### **2.3. Data collection**

A structured pre-tested questionnaire was used to collect information on knowledge, attitudes and practices in malaria control. The geographic location of the household, health facility and village centre was determined using a hand held Geographical Positioning System. Information sought from the households included sex, marital status and education of the respondent and family size. Household knowledge, attitudes and practices as regards to malaria transmission and control were explored. Information included number of mosquito net(s), number of those who sleeps under a net, whether the net was treated or not during the last six months and what do the householders do when a net gets torn. Other information sought was on respondent's preference for shape and colour of the net, and preference of ITN versus indoor residual spraying. For each respondent who had a net, a request was made to examine the net.

### **2.4. Data entry and analysis**

Data were double entered using EPIDATA software version 3.1 (EpiData Association 2000-2008). Data cleaning including consistence and range checks were performed before the database transferred to STATA version 6 statistical package (STATA Corp 2001) for further analysis. Descriptive statistic technique was used to describe and summarize data. Specifically, a univariate analysis was employed to explore characteristics of variables of interest. These included exploring the central tendency (frequencies, means, ranges, etc) to describe the pattern of response of values.

## CHAPTER 3: RESULTS

### 3.1. Demographic characteristics

A total of 9, 166 individuals were interviewed. The mean family size was 3.9. On average, children <5 years old accounted for 39.3% of the members of the households (Table 3.1). Households in Western and Lake zones had the largest mean (4.2.) family sizes. Of the 21 districts, the largest family sizes were observed in Kigoma (4.9) and Sumbawanga (4.6). The smallest family sizes were in Manyoni (3.2) and Ilala (3.5). About half of the members of the households in Kigoma (50.3%) and Sumbawanga (49.7%) districts were children <5 years old. Households with the lowest proportion of children <5 years of age were Manyoni (26.7%) and Lindi (28.9%).

**Table 3.1: Demographic information in 21 districts of Tanzania**

Zone	District	No respondent	(% of	Household family size	
				Mean (Std)	Having at least one < 5 year child
Northern	Arumeru	533(31.7)		3.9(1.9)	220(41.3)
	Hanang	374(29.2)		4.3(2.0)	170(45.5)
	Handeni	360(28.1)		4.1(2.1)	141 (39.2)
	Moshi	416(32.5)		3.7 (1.7)	149(35.8)
	<b>Sub-total</b>	<b>1,683</b>		<b>4.0(1.9)</b>	<b>680(40.4)</b>
Central	Manyoni	423(49.0)		3.2(1.7)	113(26.7)
	Mpwapwa	440(51.0)		4.0(2.1)	170(38.6)
	<b>Sub-total</b>	<b>863</b>		<b>3.6(1.9)</b>	<b>283(32.8)</b>
Eastern	Ilala	508(37.8)		3.5(2.0)	178(35.0)
	Mkuranga	435(32.4)		3.9(2.1)	197(45.3)
	Mvomero	400(29.8)		3.7(1.9)	142(35.5)
	<b>Sub-total</b>	<b>1,343</b>		<b>3.7(2.0)</b>	<b>517(38.5)</b>
Lake	Bukoba	655(35.8)		4.4(2.0)	263(40.1)
	Musoma	421(23.0)		4.4(2.1)	192(45.6)
	Nyamagana	381( 20.8)		3.9(1.9)	172(45.1)
	Shinyanga	374( 20.4)		4.2(1.9)	157(42.0)
	<b>Sub-total</b>	<b>1,831</b>		<b>4.2(2.0)</b>	<b>784(42.8)</b>
Southern	Lindi	381(49.5)		3.5(1.9)	110(28.9)
	Newala	388(50.5)		3.8(1.7)	157(40.5)
	<b>Sub-total</b>	<b>769</b>		<b>3.6(1.8)</b>	<b>267(34.7)</b>
Western	Kigoma Ujji	447(48.8)		4.9(2.4)	225(50.3)
	Urambo	470(51.3)		3.6(1.8)	164(34.9)
	<b>Sub-total</b>	<b>917</b>		<b>4.2(2.2)</b>	<b>389(42.4)</b>
Southern Highlands	Kilolo	468(30.7)		3.7(1.7)	172(36.7)
	Kyela	448(25.0)		3.6(1.6)	128(39.9)
	Songea	439( 24.5)		4.0(1.8)	106(35.0)
	Sumbawanga	435(24.3)		4.6(1.9)	216(49.7)
	<b>Sub-total</b>	<b>1,790</b>		<b>4.0(1.8)</b>	<b>622(40.7)</b>
	<b>Total</b>	<b>9,196</b>		<b>3.9 (2.0)</b>	<b>3,610 (39.3%)</b>



Unmarried individuals formed the largest (56.5%; range=36.4-57.3%) proportion of the respondents. The largest number of respondents who were singles was found in Mkuranga (61.8%), Mpwapwa (61.7%) and Lindi Urban (61.1%). Married couples accounted for 35.3% (28.8-33.8%) of the respondents (Table 3.2). Others, including divorced and separated, accounted for the majority and minority of the respondents in Urambo (42.1%) and Mkuranga (5.5%) districts, respectively.

**Table 3.2: Number (%) of households and marital status by zone and district**

Zone	District	No. households	Number (%)		
			Married	Single	Others
Northern	Arumeru	2,106	647(30.7)	1,016(48.2)	443(21.0)
	Hanang	1,597	531(33.2)	849(53.2)	217(13.6)
	Handeni	1,480	444(30.0)	668(45.1)	368(24.9)
	Moshi	1,534	515(33.6)	753(49.1)	266(17.3)
	<b>Sub-total</b>	<b>6,717</b>	<b>2,137(31.8)</b>	<b>3,286(48.9)</b>	<b>1,294(19.3)</b>
Central	Manyoni	1,371	445(32.5)	532(38.8)	394(28.7)
	Mpwapwa	1,782	489(27.4)	1,100(61.7)	193(10.8)
	<b>Sub-total</b>	<b>3,153</b>	<b>934(29.6)</b>	<b>1,632(51.8)</b>	<b>587(18.6)</b>
Eastern	Ilala	1,783	626(35.1)	1,020(57.2)	137(7.7)
	Mkuranga	1,677	515(30.7)	1,037(61.8)	125(7.5)
	Mvomero	1,467	502(34.2)	745(50.8)	220(15.0)
	<b>Sub-total</b>	<b>4,927</b>	<b>1,643(33.3)</b>	<b>2,802(56.9)</b>	<b>482(9.8)</b>
Lake	Bukoba	2,854	826(28.9)	1,669(58.5)	359(12.6)
	Musoma	1,858	599(32.2)	1,089(58.6)	170(9.1)
	Nyamagana	1,470	517(35.2)	814(55.4)	139(9.5)
	Shinyanga	1,584	584(36.9)	878(55.4)	122(7.7)
	<b>Sub-total</b>	<b>7,766</b>	<b>2,526(32.5)</b>	<b>4,450(57.3)</b>	<b>790(10.2)</b>
Southern	Lindi	1,319	408(30.9)	806(61.1)	105(8.0)
	Newala	1,458	532(36.5)	707(48.5)	219(15.0)
	<b>Sub-total</b>	<b>2,777</b>	<b>940(33.8)</b>	<b>1,513(54.5)</b>	<b>324(11.7)</b>
Western	Kigoma	2,174	628(28.9)	916(42.1)	630(29.0)
	Urambo	1,689	486(28.8)	492(29.1)	711(42.1)
	<b>Sub-total</b>	<b>3,863</b>	<b>1,114(28.8)</b>	<b>1,408(36.4)</b>	<b>1,341(34.7)</b>
S. Highlands	Kilolo	1,734	537(31.0)	785(45.3)	412(23.8)
	Kyela	1,172	456(38.9)	623(53.2)	93(7.9)
	Songea	1,211	410(33.9)	669(55.2)	132(10.9)
	Sumbawanga	2,008	700(34.9)	1,198(59.7)	110(5.5)
	<b>Sub-total</b>	<b>6,125</b>	<b>2,103(34.3)</b>	<b>3,275(53.5)</b>	<b>747(12.2)</b>

Respondents with no formal education accounted for 15.8-37.4% of the interviewees. Most of them were from Mkuranga (55%), Kigoma-Ujiji (44.2%) and Newala (37.9%). High literate rates were observed in Arumeru and Moshi Urban districts. The largest proportion of respondents with at least primary school education was recorded in Bukoba (71.1%) and Musoma (69.4%); while those with secondary school education were in Moshi (21.89%) and Nyamagana (21.8%). Moshi had the largest proportion (0.8%) of respondents with university education (Table 3.3). The majority of the respondents knew that the mosquito is the vector of the malaria parasite (92.6-99.4%) and infection is through a mosquito bite (92.7-99.8%) (Table 3.4).

**Table 3.3: Number (%) of household and education status of the respondents by district**

Zone	District	Number of					
		HH members	Pre-school	No education	Primary	Secondary	Tertiary
Northern	Arumeru	2106	159(7.5)	297(14.1)	1294(61.4)	290(13.8)	66(3.1)
	Hanang	1597	65(4.1)	378(23.7)	1,000(62.6)	133(8.3)	21(1.3)
	Handeni	1480	149(10.1)	274(18.5)	942(63.6)	105(7.1)	10(0.7)
	Moshi U	1534	87(5.7)	166(10.8)	899(58.6)	336(21.9)	46(3.0)
	<b>Sub-total</b>	<b>6717</b>	<b>460(6.8)</b>	<b>1,115(16.6)</b>	<b>4135(61.6)</b>	<b>864(12.9)</b>	<b>143(2.1)</b>
Central	Manyoni	1371	201(14.7)	160(11.7)	766(55.9)	215(15.7)	29(2.1)
	Mpwapwa	1782	70(3.9)	699(39.2)	885(49.7)	142(8.0)	9(0.5)
	<b>Sub-total</b>	<b>3153</b>	<b>271(8.6)</b>	<b>859(27.2)</b>	<b>1651(52.4)</b>	<b>357(11.3)</b>	<b>38(1.2)</b>
Eastern	Ilala	1783	13(0.7)	640(35.9)	942(52.8)	174(9.8)	15(0.8)
	Mkuranga	1677	8(0.5)	928(55.3)	681(40.6)	51(3.0)	9(0.5)
	Mvomero	1467	55(3.7)	317(21.6)	999(68.1)	92(6.3)	4(0.3)
	<b>Sub-total</b>	<b>4927</b>	<b>76(1.5)</b>	<b>1,885(38.3)</b>	<b>2622(53.2)</b>	<b>317(6.4)</b>	<b>28(0.6)</b>
Lake	Bukoba R	2854	23(0.8)	491(17.2)	2029(71.1)	285(10.0)	26(0.9)
	Musoma R	1858	3(0.2)	464(25.0)	1290(69.4)	100(5.4)	1(0.1)
	Nyamagana	1470	4(0.3)	239(16.3)	890(60.5)	320(21.8)	17(1.2)
	Shinyanga U	1584	0(0.0)	538(34.0)	962(60.7)	79(5.0)	5(0.3)
	<b>Sub-total</b>	<b>7766</b>	<b>30(0.4)</b>	<b>1732(22.3)</b>	<b>5171(66.6)</b>	<b>784(10.1)</b>	<b>49(0.6)</b>
Southern	Lindi U	1319	72(5.5)	306(23.2)	735(55.7)	188(14.3)	18(1.4)
	Newala	1458	240(16.5)	574(39.4)	618(42.4)	26(1.8)	0(0.0)
	<b>Sub-total</b>	<b>2777</b>	<b>312(11.2)</b>	<b>880(31.7)</b>	<b>1353(48.7)</b>	<b>214(7.7)</b>	<b>18(0.6)</b>
Western	Kigoma U	2174	60(2.8)	969(44.6)	1017(46.8)	124(5.7)	4(0.2)
	Urambo	1689	351(20.8)	402(23.8)	830(49.1)	93(5.5)	13(0.8)
	<b>Sub-total</b>	<b>3863</b>	<b>411(10.6)</b>	<b>1371(35.5)</b>	<b>1847(47.8)</b>	<b>217(5.6)</b>	<b>17(0.4)</b>
S. Highlands	Kilolo	1734	44(2.5)	384(22.1)	1189(68.6)	108(6.2)	9(0.5)
	Kyela	1172	11(0.9)	215(18.3)	734(62.6)	189(16.1)	23(2.0)
	Songea Rural	1211	12(1.0)	231(19.1)	870(71.8)	82(6.8)	16(1.3)
	Sumbawanga	2008	52(2.6)	525(26.1)	1085(54.0)	311(15.5)	35(1.7)
	<b>Sub-total</b>	<b>6125</b>	<b>119(1.9)</b>	<b>1355(22.1)</b>	<b>3878(63.3)</b>	<b>690(11.3)</b>	<b>83(1.4)</b>

The knowledge of respondents on malaria transmission was generally high (94.0-99.0%). Although 97.0% of the respondents in Bukoba associated malaria with mosquitoes, only 88% knew it was through a mosquito bite.

### 3.2. Household knowledge on malaria transmission and control

**Table 3.4: Number of respondents (%) and their knowledge on malaria transmission by district**

Zone	District	Total respondents	Mosquito being source of malaria infection	Mosquito bite cause infection
Northern	Arumeru	533	507(95.1)	503(99.2)
	Hanang	374	370(98.9)	369(99.7)
	Handeni	360	358(99.4)	352(98.3)
	Moshi	416	407(97.8)	401(98.5)
	<b>Sub-total</b>	<b>1,280</b>	<b>1,642(97.6)</b>	<b>1,625(99.0)</b>
Central	Manyoni	423	416(98.4)	407(97.8)
	Mpwapwa	440	406(92.3)	399(98.3)
	<b>Sub-total</b>	<b>863</b>	<b>822(95.3)</b>	<b>806(98.1)</b>
Eastern	Ilala	508	475(93.5)	474(99.8)

Zone	District	Total respondents	Mosquito being source of malaria infection	Mosquito bite cause infection
	Mkuranga	435	404(92.9)	400(99.0)
	Mvomero	400	394(98.5)	378(95.9)
	<b>Sub-total</b>	<b>1,343</b>	<b>1,273(94.8)</b>	<b>1,252(98.4)</b>
Lake	Bukoba	655	635(97.0)	561(88.4)
	Musoma	421	401(95.3)	395(98.5)
	Nyamagana	381	368(96.6)	366(99.5)
	Shinyanga	374	336(89.8)	333(99.1)
	<b>Sub-total</b>	<b>1,831</b>	<b>1,740(95.0)</b>	<b>1,655(95.1)</b>
Southern	Lindi	381	352(92.4)	339(96.3)
	Newala	388	360(92.8)	330(91.7)
	<b>Sub-total</b>	<b>770</b>	<b>712(92.6)</b>	<b>669(94.0)</b>
Western	Kigoma	447	437(97.8)	430(98.4)
	Urambo	470	454(96.6)	449(98.9)
	<b>Sub-total</b>	<b>917</b>	<b>891(97.2)</b>	<b>879(98.7)</b>
S. Highlands	Kilolo	468	448(95.7)	443(98.9)
	Kyela	321	309(96.3)	303(98.1)
	Songea	303	290(95.7)	281(96.9)
	Sumbawanga	435	401(92.2)	387(96.5)
	<b>Sub-total</b>	<b>1,527</b>	<b>1,448(94.8)</b>	<b>1,414(97.7)</b>

The majority of the respondents (95.2%) said that the use of mosquito nets was the most effective way of malaria prevention. However, of these, only 66.7% said to have actually used nets in their life time. The largest proportion of respondents who mentioned to have used nets was from the Southern Zone (77.9%). Respondents from the Western Zone accounted for the lowest proportion of net users (51.3%). Other malaria control methods mentioned by a large proportion of respondents included mosquito aerosol sprays and mosquito coils. Interestingly, majority of the respondents said to be implementing environmental sanitation (88.2%) and draining of standing water (82.3%) as part of the malaria control measures (Table 3.5). When asked to rank malaria control techniques according to their effectiveness (Table 3.5), the majority considered the use of mosquito nets to be the most effective. Others methods included the use of mosquito coils, mosquito aerosol sprays, draining of stagnant water, burning cow dung, and use of antimalarial drugs.

Knowledge on the use of mosquito nets was highest and lowest in Eastern and Central zones, respectively. More respondents in the Lake Victoria zone were knowledgeable on the use of mosquito coils, sprays, repellent plants, draining of stagnant, prophylactic drugs than their counterparts in other zones.

**Table 3.5: Percentage distribution of respondents citing the best malaria prevention methods by district**

Zone	District	Bed nets	Keeping the house and surrounding clean	Others	Total
<b>Northern</b>	Arumeru	506(94.9)	7(1.3)	20(3.8)	533
	Hanang	345(92.3)	5(1.3)	24(6.4)	374
	Handeni	348(96.7)	1(0.3)	11(3.1)	360
	Moshi	378 (90.9)	20(4.8)	18(4.3)	416
	<b>Sub-total</b>	<b>1,577(93.7)</b>	<b>33(2.0)</b>	<b>73(4.3)</b>	<b>1,683</b>
<b>Central</b>	Manyoni	373 (88.2)	10(2.4)	40(9.5)	423
	Mpwapwa	377(85.7)	15 (3.4)	48(10.9)	440
	<b>Sub-total</b>	<b>750(86.9)</b>	<b>25(2.9)</b>	<b>88(10.2)</b>	<b>863</b>

Zone	District	Bed nets	Keeping the house and surrounding clean	Others	Total
Eastern	Ilala	417(82.1)	23(4.5)	68(13.4)	508
	Mkuranga	373(85.8)	28(6.4)	34(7.8)	435
	Mvomero	385(96.3)	2(0.5)	13(3.3)	400
	<b>Sub-total</b>	<b>1,175(87.5)</b>	<b>53(4.0)</b>	<b>115(8.6)</b>	<b>1,343</b>
Lake	Bukoba	627(95.7)	5(0.8)	23(3.5)	655
	Musoma	414(98.3)	0(0.0)	7(1.7)	421
	Nyamagana	375(98.4)	1(0.3)	5(1.3)	381
	Shinyanga	355(94.9)	2(0.5)	17(4.6)	374
	<b>Sub-total</b>	<b>1,771(96.7)</b>	<b>8(0.4)</b>	<b>52(2.8)</b>	<b>1,831</b>
Southern	Lindi	313(82.2)	11(2.9)	57(15.0)	381
	Newala	313(80.7)	14(3.6)	61(15.7)	388
	<b>Sub-total</b>	<b>626(81.4)</b>	<b>25(3.3)</b>	<b>118(15.3)</b>	<b>769</b>
Western	Kigoma Ujiji	395(88.4)	24(5.4)	28(6.3)	447
	Urambo	432(91.9)	16(3.4)	22(4.7)	470
	<b>Sub-total</b>	<b>827(90.2)</b>	<b>40(4.4)</b>	<b>50(5.5)</b>	<b>917</b>
Southern Highlands	Kilolo	233(88.3)	15(5.7)	16(6.1)	264
	Kyela	242(75.4)	55(17.1)	24(7.5)	321
	Songea	278(91.8)	18(5.9)	7(2.3)	303
	Sumbawanga	269(82.8)	26(8.0)	30(9.2)	325
	<b>Sub-total</b>	<b>1,022(84.3)</b>	<b>114(9.4)</b>	<b>77(6.4)</b>	<b>1,213</b>

Cleaning up of the surroundings included cutting grass, clearing up water containers and filling in or draining of puddles of water to reduce mosquito breeding and hence malaria.

All respondents were requested for permission by study teams to enter the sleeping room to verify the physical presence of mosquito nets in their households. In some instances, it was not difficult for interviewers to enter the bed rooms and observe the bed-nets. Of the 8933 households visited, 4457 (77.0%) kindly allowed the investigators entry into their sleeping rooms to verify the number of nets owned (Table 3.6). In Mahenge village of the Kilolo district, one of the household head sent the interviewer inside the bedroom to observe the net, where the interviewer saw the bednet well set as if somebody was going to sleep and on the bed there was a big snake rolling. The most scaring thing to the interviewer was the behaviour of the household head who behaved as if he had not seen anything strange. The interviewer was scared and simply thanked his host and continued to the other households with that experience of a life time. Otherwise there wasn't any significant encounter / hindrance in the whole survey.

**Table: 3.6: Number (%) of respondents with mosquito nets and agreed to show their nets to the investigators**

Zone	District	Total respondents	Total own net	Total agreed to show
Northern	Arumeru	533	459(86.1)	392(85.4)
	Hanang	374	283(75.7)	202(71.4)
	Handeni	360	233(64.7)	170(73.0)
	Moshi	416	313(75.2)	248(79.2)
	<b>Sub-total</b>	<b>1,683</b>	<b>1,288(76.5)</b>	<b>1,012(78.6)</b>
Central	Manyoni	423	293(69.3)	239(81.6)
	Mpwapwa	440	289(65.7)	219(75.8)
	<b>Sub-total</b>	<b>863</b>	<b>582(67.4)</b>	<b>458(78.7)</b>
Eastern	Ilala	508	422(83.1)	357(84.6)

Zone	District	Total respondents	Total own net	Total agreed to show
	Mkuranga	435	282(64.8)	206 (73.1)
	Mvomero	400	272(68.0)	216 (79.4)
	<b>Sub-total</b>	<b>1,343</b>	<b>976(72.7)</b>	<b>779 (79.8)</b>
Lake	Bukoba	655	286(43.7)	202(70.6)
	Musoma	421	174(41.3)	156(89.7)
	Nyamagana	381	305(80.1)	261(85.6)
	Shinyanga	374	160(42.8)	119(74.4)
	<b>Sub-total</b>	<b>1,831</b>	<b>925(50.5)</b>	<b>738(79.8)</b>
Southern	Lindi	381	363(95.3)	308(84.9)
	Newala	388	228(58.8)	181(79.4)
	<b>Sub-total</b>	<b>769</b>	<b>591(76.9)</b>	<b>489(82.7)</b>
Western	Kigoma-Ujiji	447	163(36.5)	130(79.8)
	Urambo	470	200(42.6)	138(69.0)
	<b>Sub-total</b>	<b>917</b>	<b>363(39.6)</b>	<b>268(73.8)</b>
Southern Highlands	Kilolo	468	153(32.7)	122(79.7)
	Kyela	448	400(89.3)	235(58.8)
	Songea	439	256 (58.3)	160(62.5)
	Sumbawanga	435	251(57.7)	196(78.1)
	<b>Sub-total</b>	<b>1,790</b>	<b>1,060 (59.2)</b>	<b>713 (67.3)</b>
<b>Total average</b>		<b>8,933</b>	<b>5,785(62.9)</b>	<b>4,457 (77.0)</b>

### 3.3. Mosquito net ownership

Of the 8933 households, 4457 (77.0%) agreed to have the investigator entry into their houses and verify the number of nets owned. A total of 1328 (23%) households refused entry into their house for the investigators to verify the availability of mosquito nets. A large proportion of the respondents who denied entry into their houses were in Kigoma (31%), Bukoba (29.4%), Hanang (28.6%) and Mkuranga (26.9%). On average, 62.9% (5,785/8933) of the households had at least a mosquito net. Of the households with nets, 74.4% were using nets all year round. The average number of households with 1, 2, 3 or 4 nets was 44.2%, 29.6%, 14.3% and 9.2%, respectively.

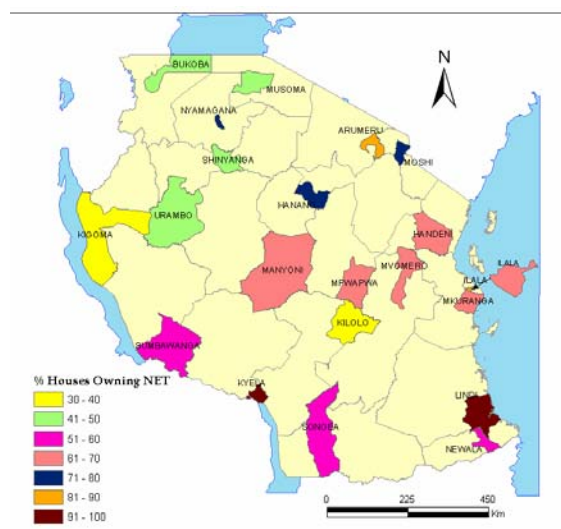


Figure 1: The proportion of households owning at least a mosquito net in Tanzania, 2008

Majority of the respondents in Northern (76.5%) and Southern (76.5%) zones owned at least one mosquito net per household. The lowest mosquito net ownership was observed among respondents in Western Zone (39.6%). District-wise, net ownership was highest in Lindi Urban (94.5%), Kyela (91.3%) Arumeru (86.1%), Ilala (83.1%) and Nyamagana (80.0%). Ownership of net was very low in Kilolo (34.8%), Kigoma (36.5%) and Musoma Rural (41.3%). A larger proportion of respondents in Kilolo (68.5%), Mpwapa (51.9%), Songea Rural (49.2%) and Shinyanga Rural (46.3%) were using the nets during the rainy season (Tables 3.7).

### 3.3.1. Mosquito net ownership in Northern Zone

**Table 3.7a: Number (%) of households owning a mosquito net and season during which nets are used in Northern Zone**

District/ Ward	Total	Own net	% of Household using net			Number of nets			
			All year	Rain season	Dry season	One	Two	Three	4+
<b>Arumeru</b>									
Maji ya Chai	312	263(84.3)	228(86.7)	25(9.5)	10(3.8)	93(35.4)	87(33.1)	44(16.7)	39(14.8)
Usa river	221	196(88.7)	180(91.8)	3(1.5)	13(6.6)	86(43.9)	52(26.5)	38(19.4)	20(10.2)
<i>Total</i>	<i>533</i>	<i>459(86.1)</i>	<i>408(88.9)</i>	<i>28(6.1)</i>	<i>23(5.0)</i>	<i>179(39.0)</i>	<i>139(30.3)</i>	<i>82(17.9)</i>	<i>59(12.9)</i>
<b>Hanang</b>									
Balangidalalu	191	155(81.2)	136(87.7)	14(9.0)	5(3.2)	50(32.3)	56(36.1)	36(23.2)	13(8.4)
Endasaki	183	128(70.0)	102(79.7)	16(12.5)	10(7.8)	56(43.8)	52(40.6)	15(11.7)	5(3.9)
<i>Total</i>	<i>374</i>	<i>283(75.7)</i>	<i>238(84.1)</i>	<i>30(10.6)</i>	<i>15(5.3)</i>	<i>106(37.5)</i>	<i>108(38.2)</i>	<i>51(18.0)</i>	<i>18(6.4)</i>
<b>Handeni</b>									
Chanika	153	111(72.6)	92(82.9)	12(10.8)	7(6.3)	51(46.0)	36(32.4)	19(17.1)	5(4.5)
Kwaluguru	207	122(58.9)	94(77.1)	22(18.0)	6(4.9)	52(42.6)	47(38.5)	20(16.4)	3(2.5)
<i>Total</i>	<i>360</i>	<i>233(64.7)</i>	<i>186(79.8)</i>	<i>34(14.6)</i>	<i>13(5.6)</i>	<i>103(44.2)</i>	<i>83(35.6)</i>	<i>39(16.7)</i>	<i>8(3.4)</i>
<b>Moshi</b>									
Majengo	202	176(87.1)	162(92.1)	7(4.0)	7(4.0)	77(43.8)	51(29.0)	24(13.6)	24(13.6)
Mji mpya	214	137(64.0)	121(88.3)	7(5.1)	9(6.6)	69(50.4)	44(32.1)	19(13.9)	5(3.7)
<i>Total</i>	<i>416</i>	<i>313(75.2)</i>	<i>283(90.4)</i>	<i>14(4.5)</i>	<i>16(5.1)</i>	<i>146(46.7)</i>	<i>95(30.4)</i>	<i>43(13.7)</i>	<i>29(9.3)</i>

In the northern zone, the largest proportion (86.1%) of households with at least a mosquito net was observed in Arumeru district. Within the same district, mosquito net ownership was similar between the wards. However, respondents in Usa River (within the district capital) had a slightly higher rate of net ownership. In Handeni, a significantly higher rate of net ownership was observed within the district capital (Chanika=72.6%) than in the rural village of Kwaluguru (58.9%). Similarly, in Moshi Municipality, the proportion of households owning at least a net was higher in Majengo (87.1%) than in the sub-urban area of Mji Mpya (64%). Contrary to the above findings, in Hanang, a largest proportion of households in Balang'idalalu (81.2%) owned nets than in Endasak (70%), which is within the district capital radius.

### 3.3.2. Mosquito net ownership in Central Zone

Table 3.7b: Number (%) of households owning a mosquito net and season during which nets are used in Central zone

District/ Ward	Total	Own net	% of Household using net			Number of nets			
			All year	Rain season	Dry season	One	Two	Three	4+
<b>Manyoni</b>									
Chikuyu	210	131(62.4)	63(48.1)	61(46.6)	7(5.3)	67(51.2)	34(26.0)	20(15.3)	10(7.6)
Manyoni	213	162(76.1)	113(69.8)	46(28.4)	3(1.9)	65(40.1)	50(30.9)	25(15.4)	22(13.6)
<i>Total</i>	<i>423</i>	<i>293(69.3)</i>	<i>176(60.1)</i>	<i>107(36.5)</i>	<i>10(3.4)</i>	<i>132(45.1)</i>	<i>84(28.7)</i>	<i>45(15.4)</i>	<i>32(10.9)</i>
<b>Mpwapwa</b>									
Kibakwe	228	155(68.0)	53(34.2)	100(64.5)	2(1.3)	79(51.0)	45(29.0)	18(11.6)	13(8.4)
Mpwapwa	212	134(63.2)	83(61.9)	50(37.3)	1(0.8)	59(44.0)	51(38.1)	15(11.2)	9(6.7)
<i>Total</i>	<i>440</i>	<i>289(65.7)</i>	<i>136(47.1)</i>	<i>150(51.9)</i>	<i>3(1.0)</i>	<i>138(47.8)</i>	<i>96(33.2)</i>	<i>33(11.4)</i>	<i>22(7.6)</i>

A total of 863 households were surveyed in the Central Zone. Of these, 67.4% owned at least a mosquito net. Mosquito ownership rate was slightly higher among households in Manyoni (69.3%) than in Mpwapwa (65.7%). In Manyoni district, the highest coverage was in the district capital than in the rural Chikunyu. In Mpwapwa, Kibakwe (about 30 km from district capital) had a higher net coverage than in Mpwapwa Ward (within the district capital). However, a large number of households in Kibakwe were sleeping under nets during the rainy season (64.5%). About 60% of the households in Manyoni Township had two or more nets.

### 3.3.3. Mosquito net ownership in Eastern Zone

Table 3.7c: Number (%) of households owning a mosquito net and season during which nets are used in the Eastern Zone

District/ Ward	Total	Own net	% of Household using net			Number of nets			
			All year	Rain season	Dry season	One	Two	Three	4+
<b>Ilala</b>									
Buguruni	303	244(80.5)	234(95.9)	5(2.1)	5(2.1)	165(67.6)	41(16.8)	24(9.8)	14(5.7)
Kiwalani	205	178(86.8)	173(97.2)	1(0.6)	4(2.3)	87(48.9)	53(29.8)	15(8.4)	23(12.9)
<i>Total</i>	<i>508</i>	<i>422(83.1)</i>	<i>407(96.4)</i>	<i>6(1.42)</i>	<i>9(2.13)</i>	<i>252(59.7)</i>	<i>94(22.3)</i>	<i>39(9.2)</i>	<i>37(8.8)</i>
<b>Mkuranga</b>									
Mkuranga	200	107(53.5)	73(68.2)	32(29.9)	2(1.9)	53(49.5)	29(27.1)	17(15.9)	8(7.5)
Vikindu	235	175(74.5)	138(78.9)	36(20.6)	1(0.6)	86(49.1)	50(28.6)	23(13.1)	16(9.1)
<i>Total</i>	<i>435</i>	<i>282(64.8)</i>	<i>211(74.8)</i>	<i>68(24.1)</i>	<i>3(1.1)</i>	<i>139(49.3)</i>	<i>79(28.0)</i>	<i>40(14.2)</i>	<i>24(8.5)</i>
<b>Mvomero</b>									
Mlali	203	135(66.5)	106(78.5)	23(17.0)	6(4.4)	66(48.9)	37(27.4)	19(14.1)	13(9.6)
Mzumbe	197	137(69.5)	89(65.0)	41(29.9)	7(5.1)	72(52.6)	44(32.1)	15(11.0)	6(4.4)
<i>Total</i>	<i>400</i>	<i>272(68.0)</i>	<i>195(71.7)</i>	<i>64(23.5)</i>	<i>13(4.8)</i>	<i>138(50.7)</i>	<i>81(29.8)</i>	<i>34(12.5)</i>	<i>19(7.0)</i>

In the Eastern Zone, a total of 1343 households were surveyed. Of these, 976 (72.7%) had at least a mosquito net. Net ownership was highest in Ilala and lowest in Mkuranga district. The majority of residents in Ilala were sleeping under a net throughout the year. A significant number of residents

Mvomero (23.5%) and Mkuranga 24.1%) were only sleeping under a net during the rainy season. In this zone, residents of Mlali in Mvomero district had the largest proportion of those owning two or more nets.

### 3.3.4. Mosquito net ownership in Lake Victoria Zone

**Table 3.7d: Number (%) of households owning a mosquito net and season during which nets are used in the Lake Zone**

District/ Ward	Total	Own net	% of Household using net			Number of nets			
			All year	Rain season	Dry season	One	Two	Three	4+
<b>Bukoba</b>									
Bujugo	344	147(42.7)	100(68.0)	44(29.9)	3(2.0)	71(48.3)	47(32.0)	23(15.7)	6(4.1)
Karabagaine	311	139(44.7)	84(60.4)	49(35.3)	6(4.3)	66(47.5)	46(33.1)	16(11.5)	11(7.9)
<i>Total</i>	<i>655</i>	<i>286(43.7)</i>	<i>184(64.3)</i>	<i>93(32.5)</i>	<i>9(3.2)</i>	<i>137(47.9)</i>	<i>93(32.5)</i>	<i>39(13.6)</i>	<i>17(5.9)</i>
<b>Musoma</b>									
Etaro	220	99(45.0)	62(62.6)	37(37.4)	0(0.0)	45(45.5)	42(42.4)	11(11.1)	1(1.0)
Mugango	201	75(37.3)	60(80.0)	14(18.7)	1(1.3)	46(61.3)	18(24.0)	7(9.3)	4(5.3)
<i>Total</i>	<i>421</i>	<i>174(41.3)</i>	<i>122(70.1)</i>	<i>51(29.3)</i>	<i>1(0.6)</i>	<i>91(52.3)</i>	<i>60(34.5)</i>	<i>18(10.3)</i>	<i>5(2.9)</i>
<b>Nyamagana</b>									
Butimba	187	155(82.9)	151(97.4)	0(0)	4(2.6)	74(47.7)	45(29.0)	22(14.2)	14(9.0)
Mirongo	194	150(77.3)	147(98.0)	0(0)	3(2.0)	50(33.3)	50(33.3)	27(18.0)	23(15.3)
<i>Total</i>	<i>381</i>	<i>305(80.1)</i>	<i>298(97.7)</i>	<i>0(0)</i>	<i>7(2.3)</i>	<i>124(40.7)</i>	<i>95(31.2)</i>	<i>49(16.1)</i>	<i>37(12.1)</i>
<b>Shinyanga</b>									
Mwamala	206	88(42.7)	48(54.6)	39(44.3)	1(1.1)	39(44.3)	33(37.5)	12(13.6)	4(4.6)
Usanda	168	72(42.9)	35(48.6)	35(48.6)	2(2.8)	34(47.2)	18(25.0)	16(22.2)	4(5.6)
<i>Total</i>	<i>374</i>	<i>160(42.8)</i>	<i>83(51.9)</i>	<i>74(46.3)</i>	<i>3(1.9)</i>	<i>73(45.6)</i>	<i>51(31.9)</i>	<i>28(17.5)</i>	<i>8(5.0)</i>

A total of 1831 households in the Lake Victoria Zone were surveyed. Of this, 925 (50.5%) had at least a mosquito net. Except for Nyamagana, in all other districts, less than half of the households had a mosquito net. A significant proportion (46.3%) of the members of the households was sleeping under a net only during the rainy season.

### 3.3.5. Mosquito net ownership in Southern Zone

**Table 3.7e: Number (%) of households owning a mosquito net and season during which nets are used Southern Zone**

District/ Ward	Total	Own net	% of Household using net			Number of nets			
			All year	Rain season	Dry season	One	Two	Three	4+
<b>Lindi</b>									
Makonde	169	158(93.5)	150(94.9)	7(4.43)	1(0.63)	49(31.0)	48(30.4)	28(17.7)	33(20.9)
Ndoro	212	205(96.7)	192(93.7)	3(1.46)	10(4.88)	90(43.9)	53(25.9)	27(13.2)	35(17.1)
<i>Total</i>	<i>381</i>	<i>363(95.3)</i>	<i>342(94.2)</i>	<i>10(2.75)</i>	<i>11(3.03)</i>	<i>139(38.3)</i>	<i>101(27.8)</i>	<i>55(15.2)</i>	<i>68(18.7)</i>
<b>Newala</b>									
Malatu	223	116(52.0)	80(69.0)	33(28.5)	3(2.6)	58(50.0)	35(30.2)	16(13.8)	7(6.0)
Nangurukuru	165	112(67.9)	74(66.1)	36(32.1)	2(1.8)	49(43.8)	36(32.1)	21(18.8)	6(5.4)
<i>Total</i>	<i>388</i>	<i>228(58.8)</i>	<i>154(67.5)</i>	<i>69(30.3)</i>	<i>5(2.2)</i>	<i>107(46.9)</i>	<i>71(31.1)</i>	<i>37(16.2)</i>	<i>13(5.7)</i>



In the Southern Zone, a total 769 of heads of households were interviewed and 591 (76.9%) of the households had at least a mosquito net. Over 95% of all households in Lindi Urban owned a net and the majority were sleeping under nets throughout the year. On the contrary, just of half of the households in Newala owned at least a mosquito net and only about two-thirds were sleeping under nets all year round. In Lindi, a quarter of the households had four or more nets.

### 3.3.6. Mosquito net ownership in Southern Highland Zone

**Table 3.7f: Number (%) of households owning a mosquito net and season during which nets are used in Southern Highlands**

District/ Ward	Total	Own net	% of Household using net			Number of nets			
			All year	Rain season	Dry season	One	Two	Three	4+
<b>Kilolo</b>									
Ilula	251	61(24.3)	17(27.87)	44(72.13)	0(0)	43(70.5)	14(23.0)	4(6.6)	0(0.0)
Mahenge	217	92(42.4)	38(41.3)	53(57.61)	1(1.09)	55(59.8)	26(28.3)	10(10.9)	1(1.1)
<i>Total</i>	<i>468</i>	<i>153(32.7)</i>	<i>55(35.95)</i>	<i>97(63.4)</i>	<i>1(0.65)</i>	<i>98(64.1)</i>	<i>40(26.1)</i>	<i>14(9.2)</i>	<i>1(0.7)</i>
<b>Kyela</b>									
Kyela U	238	221(92.9)	192(86.9)	24(10.86)	5(2.26)	53(24.0)	78(35.3)	50(22.6)	40(18.1)
Makwale	83	72(86.8)	59(81.94)	11(15.28)	2(2.78)	67(37.4)	60(33.5)	29(16.2)	23(12.9)
<i>Total</i>	<i>321</i>	<i>293(91.3)</i>	<i>251(85.7)</i>	<i>35(11.95)</i>	<i>7(2.39)</i>	<i>120(30.0)</i>	<i>138(34.5)</i>	<i>79(19.8)</i>	<i>63(15.8)</i>
<b>Songea</b>									
Maposeni	220	135(61.4)	61(45.2)	69(51.1)	5(3.7)	62(36.9)	56(33.3)	35(20.8)	15(8.9)
Tanga	83	44(53.0)	25(56.8)	19(43.2)	0(0.0)	36(40.9)	33(37.5)	11(12.5)	8(9.1)
<i>Total</i>	<i>303</i>	<i>179(59.1)</i>	<i>86(48.0)</i>	<i>88(49.2)</i>	<i>5(2.8)</i>	<i>98(38.3)</i>	<i>89(34.8)</i>	<i>46(18.0)</i>	<i>23(9.0)</i>
<b>Sumbawanga</b>									
Katandala	230	194(84.4)	162(83.5)	31(16.0)	1(0.5)	53(27.3)	55(28.4)	38(19.6)	48(24.7)
Pito	205	57(27.8)	40(70.2)	13(22.8)	4(7.0)	44(77.2)	7(12.3)	2(3.5)	4(7.0)
<i>Total</i>	<i>435</i>	<i>251(57.7)</i>	<i>202(80.5)</i>	<i>44(17.5)</i>	<i>5(2.0)</i>	<i>97(38.7)</i>	<i>62(24.7)</i>	<i>40(15.9)</i>	<i>52(20.7)</i>

Of the total 1793 households visited, 1527 responded to the question on net ownership. The majority of the respondents in Kyela (85.7%) and Sumbawanga (80.5%) were sleeping under mosquito net throughout the year. About two-thirds of the residents in Kilolo district were sleeping under nets only during the rainy season. Most of the households in Kilolo had only one mosquito net. Over one-quarter of the households in Songea and Sumbawanga had four or more mosquito nets.

### 3.3.7. Mosquito net ownership in Western Zone

**Table 3.7g: Number (%) of households owning a mosquito net and season during which nets are used in Western Zone**

District/ Ward	Total	Own net	% of Household using net			Number of nets			
			All year	Rain season	Dry season	One	Two	Three	4+
<b>Kigoma Ujiji</b>									
Kagera	239	86(36.0)	75(87.21)	8(9.3)	3(3.49)	33(38.4)	36(41.9)	13(15.1)	4(4.7)
Rusimbi	208	77(37.0)	70(90.91)	5(6.49)	2(2.6)	40(52.0)	20(26.0)	9(11.7)	8(10.4)
<i>Total</i>	<i>447</i>	<i>163(36.5)</i>	<i>145(89.0)</i>	<i>13(7.98)</i>	<i>5(3.07)</i>	<i>73(44.8)</i>	<i>56(34.4)</i>	<i>22(13.5)</i>	<i>12(7.4)</i>
<b>Urambo</b>									

Muungano	226	93(41.2)	30(32.3)	39(41.9)	24(25.8)	54(58.1)	25(26.9)	9(9.7)	5(5.4)
Urambo	244	107(43.9)	82(76.6)	18(16.8)	7(6.5)	58(54.2)	28(26.2)	15(14.0)	6(5.6)
<i>Total</i>	<i>470</i>	<i>200(42.6)</i>	<i>112(56.0)</i>	<i>57(28.5)</i>	<i>31(15.5)</i>	<i>112(56.0)</i>	<i>53(26.5)</i>	<i>24(12.0)</i>	<i>11(5.5)</i>

In the Western Zone, 39.6% of the 917 households surveyed had at least a net. There were more households owning at least a net in Urambo than Kigoma-Ujiji. Generally, this was the zone with the lowest (42.6%) net ownership. More household members in Kigoma-Ujiji (80%) than in Urambo (56%) were sleeping under nets all year round.

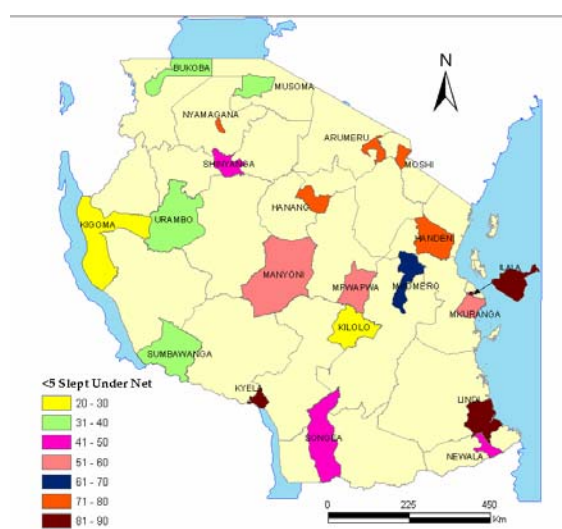
### 3.4. Mosquito coverage in <5 years children

**Table 3.8: The number (%) of households with at least one child <5 years sleeping under a mosquito net**

District	Ward	Total households	No. (%) households with at least one under five	No. (%) households with <5 years	
				slept under net during the previous night	slept under treated net during the previous night
Arumeru	Maji ya chai	312	149(47.8)	108(72.5)	65(43.6)
	Usa River	221	71(32.1)	64(90.1)	37(52.1)
	Total	533	220(41.3)	172(78.2)	102(46.4)
Bukoba	Bujugo	344	135(39.2)	47(34.8)	20(14.8)
	Kabaragaine	311	128(41.2)	35(27.3)	27(21.1)
	Total	655	263(40.2)	82(31.2)	47(17.9)
Hanang	Balangidalalu	191	97(50.8)	75(77.3)	39(40.2)
	Endasaki	183	73(39.9)	45(61.6)	30(41.1)
	Total	374	170(45.5)	120(70.6)	69(40.6)
Handeni	Chanika	153	55(35.9)	46(83.6)	20(36.4)
	Kwaluguru	207	86(41.5)	54(62.8)	33(38.4)
	Total	360	141(39.2)	100(70.9)	53(37.6)
Ilala	Buguruni	303	98(32.3)	81(82.7)	30(30.6)
	Kiwalani	205	80(39.0)	67(83.8)	25(31.3)
	Total	508	178(35.0)	148(83.2)	55(30.9)
Kigoma-Ujiji	Kagera	239	122(51.0)	24(19.7)	22(18.0)
	Rusimbi	208	103(49.5)	27(26.2)	14(13.6)
	Total	447	225(50.3)	51(22.7)	36(16.0)
Kilolo	Ilula	251	97(38.6)	10(10.3)	15(15.5)
	Mahenge	217	75(34.6)	25(33.3)	19(25.3)
	Total	468	172(36.8)	35(20.4)	34(19.8)
Kyela	Kyela mjini	238	102(42.9)	88(86.3)	54(52.9)
	Makwale	210	51(24.3)	40(78.4)	19(37.3)
	Total	448	153(34.2)	128(83.7)	73(47.7)
Lindi	Makonde	169	56(33.1)	49(87.5)	24(42.9)
	Ndoro	212	54(25.5)	50(92.6)	25(46.3)
	Total	381	110(28.9)	99(90.0)	49(44.5)
Manyoni	Chikuyu	210	58(27.6)	25(43.1)	21(36.2)
	Manyoni	213	55(25.8)	36(65.5)	25(45.5)
	Total	423	113(26.7)	61(54.0)	46(40.7)
Mkuranga	Mkuranga	200	96(48.0)	40(41.7)	19(19.8)
	Vikindu	235	101(43.0)	67(66.3)	25(24.8)
	Total	435	197(45.3)	107(54.3)	44(22.3)
Moshi	Majengo	202	71(35.1)	59(83.1)	32(45.1)
	Mji mpya	214	78(36.4)	52(66.7)	31(39.7)

District	Ward	Total households	No. (%) households with at least one under five	No. (%) households with <5 years	
				slept under net during the previous night	slept under treated net during the previous night
Mpwapwa	Total	416	149(35.8)	111(74.5)	63(42.3)
	Kibakwe	228	102(44.7)	64(62.8)	45(44.1)
	Mpwapwa	212	68(32.1)	29(42.7)	22(32.4)
Musoma	Total	440	170(38.6)	93(54.7)	67(39.4)
	Etaro	220	94(42.7)	36(38.3)	24(25.5)
	Mugango	201	90(44.8)	33(36.7)	9(10.0)
Mvomero	Total	421	192(45.6)	71(37.0)	33(17.2)
	Mlali	203	73(36.0)	43(58.9)	19(26.0)
	Mzumbe	197	69(35.0)	48(69.6)	26(37.7)
Newala	Total	400	142(35.5)	91(64.1)	45(31.7)
	Malatu	223	83(37.2)	34(41.0)	20(24.1)
	Nangurukuru	165	74(44.8)	30(40.5)	28(37.8)
Nyamagana	Total	388	157(40.5)	64(40.8)	48(30.6)
	Butimba	187	102(54.5)	78(76.5)	50(49.0)
	Mirongo	194	70(36.1)	54(77.1)	32(45.7)
Shinyanga	Total	381	172(45.1)	132(76.7)	82(47.7)
	Mwamala	206	83(40.3)	46(55.4)	23(27.7)
	Usanda	168	74(44.0)	25(33.8)	10(13.5)
Songea	Total	374	157(42.0)	71(45.2)	33(21.0)
	Maposeni	301	83(27.6)	30(36.1)	31(37.3)
	Tanga	138	66(47.8)	31(47.0)	34(51.5)
Sumbawanga	Total	439	149(33.9)	61(40.9)	65(43.6)
	Katandala	230	89(38.7)	68(76.4)	40(44.9)
	Pito	205	127(62.0)	20(15.8)	27(21.3)
Urambo	Total	435	216(49.7)	88(40.7)	67(31.0)
	Muongano	226	75(33.2)	25(33.3)	8(10.7)
	Urambo	244	89(36.5)	29(32.6)	21(23.6)
	Total	470	164(34.9)	54(32.9)	29(17.7)
	<b>Overall</b>	<b>9,166</b>	<b>3,610 (39.3)</b>	<b>1,939 (53.7)</b>	<b>1,140(31.6)</b>

A total of 1939 children underfives were sleeping under mosquito net (any type). Of these, 1140 (58.8%) were using insecticide treated nets (ITN). Overall, 31.6% of the underfives slept under an insecticide treated net during the previous night. Highest coverage was reported in Kyela (47.7%), Nyamagana (47.7%) and Arumeru (46.4%). Lowest ITN in underfives was reported in Kigoma-Ujiji (16.0%), Musoma (17.2%) and Urambo (17.7%). In Songea more underfives children were sleeping under ITN (43.6%) than in untreated nets (40.9%).



**Figure 2: Proportion of households with children < 5 years sleeping under mosquito net**

Out of 9,166 households visited, 3,610 (39.3%) had at least one under five child. Of these, in 1,939 (53.7%) of the households the child slept under a mosquito net during the night before the interview. Use of nets in children <5 years was most common in northern zone (74%); followed by eastern (66.9%) and southern zone (61.1%) (Figure 2). Districts with the largest proportion of <5 year children sleeping under a mosquito nets were Lindi Urban (90.0%), Kyela (83.7%), Ilala (83.2%) and Arumeru (78.2%). Only about a quarter (27%) of the children <5% in western zone were sleeping under a mosquito net. Lowest net coverage for <5 year was in Kigoma (22.7%), Kilolo (25%) and Bukoba Rural (31.2%).

The number of households with mosquito nets enough for all members of the households ranged from 18.9% (in Urambo) to 37.4% (in Hanang). Households with at least 50% or more occupants using mosquito nets ranged from 16.2% (in Urambo) to 42.8% (in Arumeru). A number of households had more nets than the number of occupants (Table 3.9).

### 3.5. Mosquito net ownership and household size

Majority of the households had a single mosquito net, and 45.3%, 30.4%, 14.7% and 9.6%, had 1, 2, 3 and 4 mosquito nets, respectively (Table 3.10).

**Table 3.9: Household net ownership in relation to size of respective household by district and ward**

District	Ward	Household s with no net	<50% of household members sleeping under net	≥50% of household members not all sleeping under net	All members of households sleeping under net	Household s with nets than number of occupants	Total househ olds
Arumeru	Maji ya chai	49(15.7)	103(33.0)	129(41.4)	26(8.3)	5(1.6)	312
	USA River	25(11.3)	62(28.1)	99(44.8)	35(15.8)	0(0.0)	221
	Total	74(13.9)	165(31.0)	228(42.8)	61(11.4)	5.0(0.9)	533
Hanang	Ballang'dalalu	36(18.9)	77(40.3)	65(34.0)	10(5.2)	3(1.6)	191
	Endasaki	55(30.1)	63(34.4)	46(25.1)	16(8.7)	3(1.6)	183
	Total	91(24.3)	140(37.4)	111(29.7)	26(7.0)	6(1.6)	374
Handeni	Chanika	42(27.5)	56(36.6)	43(28.1)	12(7.8)	0(0.0)	153
	Kwaluguru	85(41.1)	59(28.5)	48(23.2)	15(7.3)	0(0.0)	207
	Total	127(35.3)	115(31.9)	91(25.3)	27(7.5)	0(0.0)	360
Moshi	Majengo	26(12.9)	68(33.7)	85(42.1)	22(10.9)	1(0.5)	202

District	Ward	Households with no net	<50% of household members sleeping under net	of	≥50% of household members not all sleeping under net	of	All members of households sleeping under net	Households with nets than number of occupants	Total households
Manyoni	Mji mpya	77(36.0)	72(33.6)		47(22.0)		18(8.4)	0(0.0)	214
	Total	103(24.8)	140(33.7)		132(31.7)		40(9.6)	1(0.2)	416
	Chikuyu	79(37.6)	48(22.9)		53(25.2)		24(11.4)	6(2.9)	210
	Manyoni	51(23.9)	44(20.7)		71(33.3)		40(18.8)	7(3.3)	213
	Total	130(30.7)	92(21.8)		124(29.3)		64(15.1)	13(3.1)	423
Mpwapwa	Kibakwe	73(32.0)	80(35.1)		51(22.4)		19(8.3)	5(2.2)	228
	Mpwapwa	78(36.8)	64(30.2)		47(22.2)		19(9.0)	4(1.9)	212
	Total	151(34.3)	144(32.7)		98(22.3)		38(8.6)	9(2.1)	440
Ilala	Buguruni	59(19.5)	112(37.0)		92(30.4)		36(11.9)	4(1.3)	303
	Kiwalani	27(13.2)	70(34.2)		89(43.4)		19(9.3)	0(0.0)	205
	Total	86(16.9)	182(35.8)		181(35.6)		55(10.8)	4(0.8)	508
Mkuranga	Mkuranga	93(46.5)	65(32.5)		28(14.0)		11(5.5)	3(1.5)	200
	Vikindu	60(25.5)	66(28.1)		76(32.3)		31(13.2)	2(0.9)	235
	Total	153(35.2)	131(30.1)		104(23.9)		42(9.7)	5(1.2)	435
Mvomero	Mlali	68(33.5)	56(27.6)		60(29.6)		16(7.9)	3(1.5)	203
	Mzumbe	60(30.5)	66(33.5)		50(25.4)		19(9.6)	2(1.0)	197
	Total	128(32.0)	122(30.5)		110(27.5)		35(8.8)	5(1.3)	400
Bukoba	Bujugo	197(57.3)	78(22.7)		40(11.6)		26(7.6)	3(0.9)	344
	Karabagaine	172(55.3)	90(28.9)		40(12.9)		7(2.3)	2(0.6)	311
	Total	369(56.3)	168(25.7)		80(12.2)		33(5.0)	5(0.8)	655
Musoma	Etaro	121(55.0)	67(30.5)		27(12.3)		5(2.3)	0(0.0)	220
	Mugango	126(62.7)	52(25.9)		17(8.5)		5(2.5)	1(0.5)	201
	Total	247(58.7)	119(28.3)		44(10.5)		10(2.4)	1(0.2)	421
Nyamagana	Butimba	32(17.1)	65(34.8)		72(38.5)		17(9.1)	1(0.5)	187
	Mirongo	44(22.7)	37(19.1)		78(40.2)		32(16.5)	3(1.6)	194
	Total	76(20.0)	102(26.8)		150(39.4)		49(12.9)	4(1.1)	381
Shinyanga	Mwamala	118(57.3)	55(26.7)		28(13.6)		5(2.4)	0(0.0)	206
	Usanda	96(57.1)	37(22.0)		25(14.9)		9(5.4)	1(0.6)	168
	Total	214(57.2)	92(24.6)		53(14.2)		14(3.7)	1(0.3)	374
Lindi	Makonde	11(6.5)	37(21.9)		75(44.4)		34(20.1)	12(7.1)	169
	Ndoro	7(3.3)	44(20.8)		103(48.6)		51(24.1)	7(3.3)	212
	Total	18(4.7)	81(21.3)		178(46.7)		85(22.3)	19(5.0)	381
	Malatu	107(48.0)	57(25.6)		47(21.1)		12(5.4)	0(0.0)	223
	Nangurukuru	53(32.1)	48(29.1)		59(35.8)		5(3.0)	0(0.0)	165
Kigoma Ujiji	Total	160(41.2)	105(27.1)		106(27.3)		17(4.4)	0(0.0)	388
	Kagera	153(64.0)	58(24.3)		23(9.6)		4(1.7)	1(0.4)	239
	Rusimbi	131(63.0)	48(23.1)		19(9.1)		10(4.8)	0(0.0)	208
	Total	284(63.5)	106(23.7)		42(9.4)		14(3.1)	1(0.2)	447
Urambo	Muongano	133(58.9)	44(19.5)		41(18.1)		8(3.5)	0(0.0)	226
	Urambo	137(56.2)	45(18.4)		36(14.8)		22(9.0)	4(1.6)	244
	Total	270(57.5)	89(18.9)		77(16.4)		30(6.4)	4(0.9)	470
Kilolo	Ilula	190(75.7)	40(15.9)		16(6.4)		5(2.0)	0(0.0)	251
	Mahenge	125(57.6)	48(22.1)		29(13.4)		14(6.5)	1(0.5)	217
	Total	315(67.3)	88(18.8)		45(9.6)		19(4.1)	1(0.2)	468
Kyela	Kyela mjini	17(7.1)	45(18.9)		117(49.2)		51(21.4)	8(3.4)	238
	Makwale	31(14.8)	41(19.5)		76(36.2)		56(26.7)	6(2.9)	210
	Total	48(10.7)	86(19.2)		193(43.1)		107(23.9)	14(3.1)	448
Songea R	Maposeni	133(44.2)	66(21.9)		73(24.3)		23(7.6)	6(2.0)	301

District	Ward	Households with no net	<50% of household members sleeping under net	of	≥50% of household members not all sleeping under net	of	All members of households sleeping under net	Households with nets than number of occupants	Total households
	Tanga	50(36.2)	47(34.1)		34(24.6)		6(4.4)	1(0.7)	138
	Total	183(41.7)	113(25.7)		107(24.4)		29(6.6)	7(1.6)	439
Sumbawanga	Katandala	36(15.7)	65(28.3)		89(38.7)		30(13.0)	10(4.4)	230
	Pito	148(72.2)	49(23.9)		8(3.9)		0(0.0)	0(0.0)	205
	Total	184(42.3)	114(26.2)		97(22.3)		30(6.9)	10(2.3)	435
	<b>Overall total</b>	<b>3,411 (37.1)</b>	<b>2,494 (27.1)</b>		<b>2,351 (25.6)</b>		<b>825 (9.0)</b>	<b>115 (1.3)</b>	<b>9,166</b>

Overall, in 27.1%, 25.6%, 9.0% of the households, less than half, more than half but not all, and all occupants were sleeping under a mosquito net, respectively. Districts with the largest proportion of ≥50% of the household members sleeping under mosquito nets included Arumeru (46.9%) and Lindi (46.7%). In Manyoni and Lindi, 3.1% and 5% of the households were found to have more nets than the number of household occupants (Table 3.10). Only 9% (801/9196) of the households had all occupants sleeping under a mosquito net. Kyela district had about a quarter (23.9%) of the households with all occupants sleeping under nets. The proportion of households with all occupants sleeping under mosquito net was highest in 10.3% and this was observed in the Southern Highland zone. In the other zones it was 9.2% in northern, 9.8% in central, 5.8% in Lake Victoria and 6.9% in Western zone.

### 3.6. Insecticide treated nets coverage

**Table 3.10: Number (%) of households with insecticide treated nets (ITN)**

District	No. respondents	Households with ITN	All are ITN	1/2	1/3	2/3	1/4	3/4
<b>Northern</b>								
Arumeru	533	245(46.0)	220(89.8)	9(3.7)	2(0.8)	3(1.2)	4(1.6)	3(1.2)
Hanang	374	165(44.1)	149(90.3)	10(6.1)	2(1.2)	3(1.8)	0(0.0)	0(0.0)
Handeni	360	109(30.3)	106(97.3)	1(0.9)	2(1.8)	0(0.0)	0(0.0)	0(0.0)
Moshi urban	416	157(37.7)	147 (93.6)	5(3.2)	2(1.3)	1(0.6)	1(0.6)	0(0.0)
<b>Sub-total</b>	<b>1,683</b>	<b>676(40.2)</b>	<b>622(92.0)</b>	<b>25(3.7)</b>	<b>8(1.2)</b>	<b>7(1.0)</b>	<b>5(0.7)</b>	<b>3(0.4)</b>
<b>Central</b>								
Manyoni	423	159(37.6)	129(81.1)	15(9.4)	7(4.4)	4(2.5)	2(1.3)	1(0.6)
Mpwapwa	440	125(28.4)	113(90.4)	7(5.6)	1(0.8)	0(0.0)	1(0.8)	2(1.6)
<b>Sub-total</b>	<b>863</b>	<b>284(32.9)</b>	<b>242(85.2)</b>	<b>22(7.8)</b>	<b>8(2.8)</b>	<b>4(1.4)</b>	<b>3(1.1)</b>	<b>3(1.1)</b>
<b>Eastern</b>								
Ilala	508	145(28.5)	141(97.2)	2(1.4)	0(0.0)	1(0.7)	1(0.7)	0(0.0)
Mkuranga	435	89(20.5)	77(86.5)	5(5.6)	2(2.3)	3(3.4)	0(0.0)	1(1.1)
Mvomero	400	113(28.3)	106(93.8)	4(3.5)	0(0.0)	2(1.8)	1(0.9)	0(0.0)
<b>Sub-total</b>	<b>1,343</b>	<b>347(25.8)</b>	<b>324(93.4)</b>	<b>11 (3.2)</b>	<b>2(0.6)</b>	<b>6(1.7)</b>	<b>2(0.6)</b>	<b>1(0.3)</b>
<b>Lake</b>								
Bukoba rural	655	103(15.7)	89(86.4)	8(7.8)	2(1.9)	1(1.0)	1(1.0)	1(1.0)
Musoma rural	421	53(12.6)	49(92.5)	1(1.9)	1(1.9)	1(1.9)	0(0.0)	1(1.9)
Nyamagana	381	176(46.2)	166(94.3)	5(2.8)	3(1.7)	1(0.6)	1(0.6)	0(0.0)
Shinyanga rural	374	54(14.4)	50(92.6)	3(5.6)	0(0.0)	1(1.9)	0(0.0)	0(0.0)
<b>Sub-total</b>	<b>1,831</b>	<b>386(21.1)</b>	<b>354(91.7)</b>	<b>17(4.4)</b>	<b>6(1.6)</b>	<b>4(1.0)</b>	<b>2(0.5)</b>	<b>2(0.5)</b>
<b>Southern</b>								
Lindi urban	381	163(42.8)	142(87.1)	9(5.5)	3(1.8)	5(3.1)	1(0.6)	2(1.2)
Newala	388	89(22.9)	73(82.0)	6(6.7)	4(4.5)	2(2.3)	1(1.1)	2(2.3)

<i>Sub-total</i>	769	252(32.8)	215(85.3)	15(6.0)	7(2.8)	7(2.8)	2(0.8)	4(1.6)
<b>Western</b>								
Kigoma urban	447	59(13.2)	53(89.8)	4(6.8)	2(3.4)	0(0.0)	0(0.0)	0(0.0)
Urambo	470	73(15.5)	64(87.7)	5(6.9)	1(1.4)	1(1.4)	0(0.0)	2(2.7)
<i>Sub-total</i>	917	132(14.4)	117(88.6)	9(6.8)	3(2.3)	1(0.8)	0(0.0)	2(1.5)
<b>Southern Highlands</b>								
Kilolo	468	82(17.5)	69(84.2)	8(9.7)	1(1.2)	4(4.9)	0(0.0)	0(0.0)
Kyela	448	203(45.3)	179(88.2)	10(4.9)	5(3.2)	3(1.9)	1(0.6)	3(1.9)
Songea rural	439	173(39.4)	133(76.9)	21 (12.2)	4(3.3)	8(6.7)	0(0.0)	0(0.0)
Sumbawanga urban	435	135(31.0)	118(87.4)	9(6.6)	2(1.5)	5(3.7)	1(0.7)	0(0.0)
<i>Sub-total</i>	1,790	593(33.1)	499(84.2)	48 (8.1)	12(2.4)	20(4.1)	2(0.4)	3(0.6)
<b>Overall total</b>	<b>9,166</b>	<b>2,670 (29.0)</b>	<b>2,373(88.9)</b>	<b>235 (5.3)</b>	<b>46 (1.0)</b>	<b>47 (1.9)</b>	<b>16 (0..6)</b>	<b>23(0.9)</b>

Key: 1 /2= half; 1/3= one-third; 2/3= two thirds; ¼= quarter; 3 /4 = three quarters of nets are treated.

Only 29% of the households had at least one insecticide treated mosquito nets. Only ITNs were available in about half (51.4%) of the households. The largest proportion of households with ITN was observed in northern zone (40.2%), with Arumeru (46%) and Hanang (44.1%) districts having the highest ITN coverage. The lowest proportion (15.5%) of households with ITN was found in the Western Zone. Districts which had the lowest ITN coverage were Musoma Rural (12.6%), Kigoma-Ujiji (13.2%), and Shinyanga Rural (14.4%) (Table 3.10; Figure 5). At least in 8.1% of the households had half of the nets as ITNs.

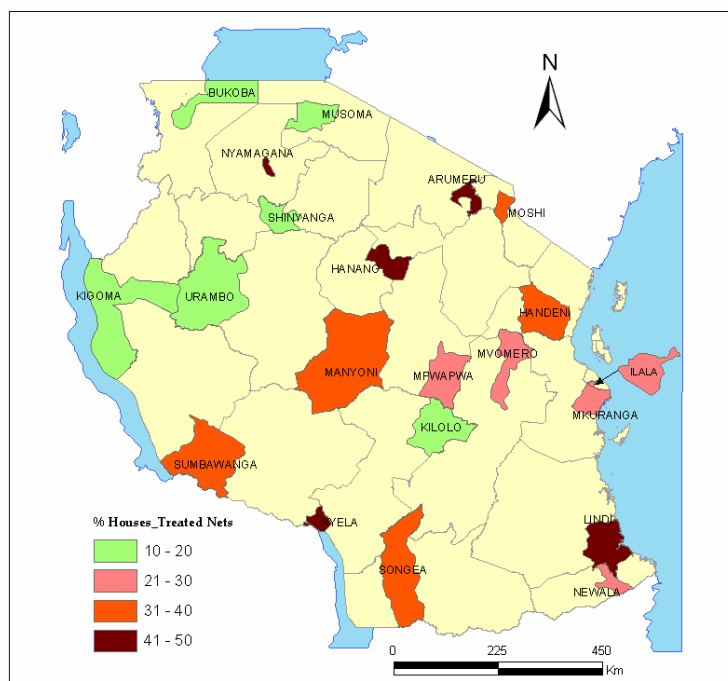
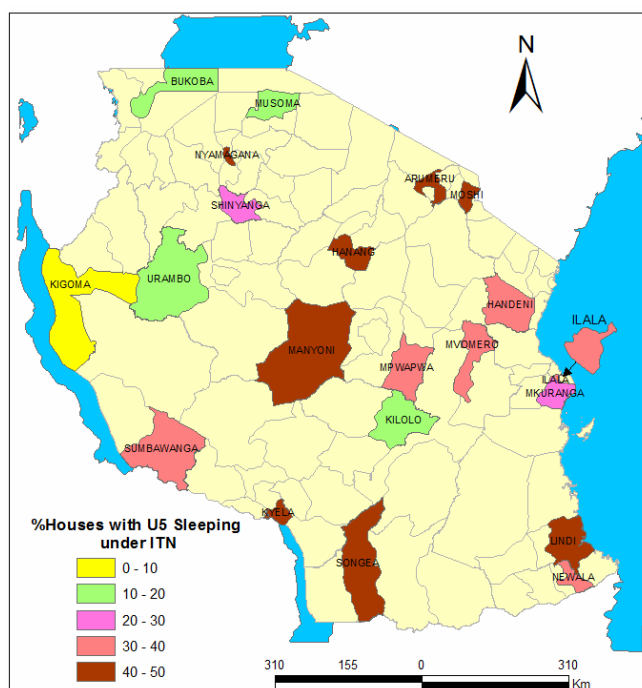


Figure 4: Proportion of households with at least one ITN by district, 2008

**Table 3:11. Comparison of mosquito net ownership between rural and urban districts**

Variable	Rural District	Urban District	Total
	No respondents (%)	No respondents (%)	No respondents (%)
No net	2,844 (40.3)	567 (26.6)	3,411 (37.1)
At least a net	4,219 (59.7)	1,566 (73.4)	5,785 (62.9)
Single net	1,868 (44.3)	734 (46.9)	2,602 (45.0)
Two nets	1,327 (31.5)	441 (28.2)	1,768 (30.6)
Three nets	1,024 (24.3)	391 (25.0)	1,415 (24.5)
<5 years not using net	1,378 (49.6)	293 (35.1)	1,671 (46.3)
< 5 years using net	1,398 (50.4)	541 (64.9)	1,939 (53.7)
ITN	1,970 (25.1)	700 (32.8)	2,670 (29.0)

Of the total respondents, 76.8% (7,063) and 23.0% (2,133) were from rural and urban districts, respectively. A total of 5,785 (62.9%) owned at least a mosquito net. Of these, 4,219 and 1,566 were from the rural and urban districts, respectively. More households in the urban districts (73.4%) than rural districts (59.7%) owned at least a mosquito net. Likewise, there were more households (64.9%) in the urban districts with < 5years children sleeping under mosquito nets than in the rural districts (50.4%). More households in urban (32.8%) than in rural districts (25.1%) had at least one insecticide treated net (Table 3:11).



**Figure 5: Households (%) with <5 years slept under treated net during the previous night**

### 3.7. Management of torn nets and preference for indoor residual spray, net colour and shape

Of the 4,613 respondents who have had torn nets, 59.1% repaired the nets and 20.6% did not. More respondents (92.9%) in Manyoni district had torn nets than in any other district. Ilala district had the largest proportion (32.9%) of those who did not repair torn nets (Table 3.12).



**Table 3.12: Number (%) of respondents and action taken when having a torn net**

District	Total	Repair of torn net		
		No	Yes	Not had a torn net
<b>Northern</b>				
Arumeru	459	104(22.7)	279(60.8)	76(16.6)
Hanang	283	46(16.3)	125(44.2)	112(39.6)
Handeni	233	42(18.0)	140(60.1)	51(21.9)
Moshi urban	313	46(14.7)	174(55.6)	93(29.7)
<b>Sub-total</b>	<b>1,288</b>	<b>238(18.5)</b>	<b>718(55.8)</b>	<b>332(25.8)</b>
<b>Central</b>				
Manyoni	293	48(16.4)	224(76.5)	21(7.2)
Mpwapwa	289	61(21.1)	176(60.9)	52(18.0)
<b>Sub-total</b>	<b>582</b>	<b>109(18.7)</b>	<b>400(68.7)</b>	<b>73(12.5)</b>
<b>Eastern</b>				
Ilala	422	139(32.9)	252(59.7)	31(7.4)
Mkuranga	282	68(24.1)	171(60.6)	43(15.3)
Mvomero	272	46(16.9)	135(49.6)	91(33.5)
<b>Sub-total</b>	<b>976</b>	<b>253(25.9)</b>	<b>558(57.2)</b>	<b>165(16.9)</b>
<b>Lake</b>				
Bukoba	286	58(20.3)	132(46.2)	96(33.6)
Musoma	174	29(16.7)	111(63.8)	34(19.5)
Nyamagana	305	62(20.3)	186(61.0)	57(18.7)
Shinyanga	160	20(12.5)	61(38.1)	79(49.4)
<b>Sub-total</b>	<b>925</b>	<b>169(18.3)</b>	<b>490(53.0)</b>	<b>266(28.8)</b>
<b>Southern</b>				
Lindi	363	71(19.6)	272(74.9)	20(5.5)
Newala	228	72(31.6)	138(60.5)	18(7.9)
<b>Sub-total</b>	<b>591</b>	<b>143(24.2)</b>	<b>410(69.4)</b>	<b>38(6.4)</b>
<b>Western</b>				
Kigoma	163	35(21.5)	116(71.2)	12(7.4)
Urambo	200	35(17.5)	125(62.5)	40(20.0)
<b>Sub-total</b>	<b>363</b>	<b>70(19.3)</b>	<b>241(66.4)</b>	<b>52(14.3)</b>
<b>Southern Highlands</b>				
Kilolo	153	27(17.7)	81(52.9)	45(29.4)
Kyela	400	101(25.3)	251(62.8)	48(12.0)
Songea	256	34(13.3)	161(62.9)	61(23.8)
Sumbawanga	251	49(19.5)	110(43.8)	92(36.7)
<b>Sub-total</b>	<b>1,060</b>	<b>211(19.9)</b>	<b>603(56.9)</b>	<b>246(23.2)</b>
<b>Overall total</b>	<b>5,785</b>	<b>1,193(20.6)</b>	<b>3,420(59.1)</b>	<b>1,172(20.3)</b>

On average, 90.7 (8,123/8,953) of the respondents would prefer using ITN than having their house spraying with long lasting residual insecticide, regardless of the type of insecticide used. When asked for a preference between ITN and IRS, the majority of the responded preferred ITNs (77-98.8%) to indoor residual spraying (1.3-23.0%) (Table 3.13).

**Table 3.13: Number (%) of respondents and their preference for either insecticide treated net or indoor residual spray**

District	Insecticide treated net	Indoor residual spraying	Total
<b>Northern</b>			
Arumeru	487(92.9)	37(7.1)	524
Hanang	337(93.9)	22(6.1)	359
Handeni	324(92.6)	26(7.4)	350
Moshi Urban	366(90.8)	37(9.2)	403
<b>Sub-total</b>	<b>1,514(92.5)</b>	<b>122(7.5)</b>	<b>1,636</b>
<b>Central</b>			
Manyoni	358(87.1)	53(12.9)	411
Mpwapwa	362(83.4)	72(16.6)	434
<b>Sub-total</b>	<b>720(85.2)</b>	<b>125(14.8)</b>	<b>845</b>
<b>Eastern</b>			
Ilala	444(87.6)	63(12.4)	507
Mkuranga	371(85.9)	61(14.1)	432
Mvomero	374(94.4)	22(5.6)	396
<b>Sub-total</b>	<b>1,189(89.1)</b>	<b>146(10.9)</b>	<b>1,335</b>
<b>Lake Victoria</b>			
Bukoba Rural	621(97.0)	19(3.0)	640
Musoma Rural	395(98.0)	8(2.0)	403
Nyamagana	316(98.8)	4(1.3)	320
Shinyanga Rural	363(98.1)	7(1.9)	370
<b>Sub-total</b>	<b>1,695(97.8)</b>	<b>38(2.2)</b>	<b>1,733</b>
<b>Southern</b>			
Lindi Urban	288(77.0)	86(23.0)	374
Newala	296(78.5)	81(21.5)	377
<b>Sub-total</b>	<b>584(77.8)</b>	<b>167(22.2)</b>	<b>751</b>
<b>Western</b>			
Kigoma Urban	400(93.7)	27(6.3)	427
Urambo	396(85.5)	67(14.5)	463
<b>Sub-total</b>	<b>796(89.4)</b>	<b>94(10.6)</b>	<b>890</b>
<b>Southern Highlands</b>			
Kilolo	430(93.3)	31(6.7)	461
Kyela	423(94.6)	24(5.4)	447
Songea Rural	406(93.8)	27(6.2)	433
Sumbawanga Urban	366(86.7)	56(13.3)	422
<b>Sub-total</b>	<b>1,625(92.2)</b>	<b>138(7.8)</b>	<b>1,763</b>
<b>Overall total</b>	<b>8,123(90.7)</b>	<b>830(9.3)</b>	<b>8,953</b>

Control of bedbugs, lice, fleas, mites and cockroaches was the major added advantage of using insecticide treated nets. On average, 30.8% and 19.6% of the respondents mentioned cockroach and beg bud control as the main advantage of using ITN, respectively. Control of bedbug was mentioned by a significant large proportion of the respondents in Manyoni (40.9%) and Mpwapwa (34.1%) districts. Control of mites (soft ticks) was important in Mpwapwa (11%) and Bukoba (19.2%) districts. A significant number of respondents in Shinyanga district mentioned ITN to have an impact in louse (48.8%) and fleas (22%) control (Table 3.14).

**Table 3.14: Number (%) respondents on added advantages of using ITN (other than mosquito control)**

District	Bedbug	Lice	Fleas	Mites	Cockroach	Others	Total
Arumeru	14(8.6)	5(3.1)	0(0.0)	4(2.5)	72(44.2)	68(41.7)	163
Hanang	34(23.3)	2(1.4)	10(6.9)	11(7.5)	79(54.1)	10(6.9)	146
Handeni	27(21.8)	11(8.9)	11(8.9)	9(7.3)	55(44.4)	11(8.9)	124
Moshi	28(16.8)	4(2.4)	2(1.2)	0(0.0)	67(40.1)	66(39.5)	167
<b>Sub-total Northern Zone</b>	<b>103(17.2)</b>	<b>22(3.7)</b>	<b>23(3.8)</b>	<b>24(4.0)</b>	<b>273(45.5)</b>	<b>155(25.8)</b>	<b>600</b>
Manyoni	65 (40.9)	10 (6.3)	14 (8.8)	7 (4.4)	55 (34.6)	8 (5)	159
Mpwapwa	87 (34.1)	2 (0.8)	4 (1.6)	28 (11.0)	22 (8.6)	112 (43.9)	255
<b>Sub-total Central Zone</b>	<b>152 (36.7)</b>	<b>12 (2.9)</b>	<b>18 (4.4)</b>	<b>35 (8.5)</b>	<b>77(18.6)</b>	<b>120 (29)</b>	<b>414</b>
Ilala	8 (2)	3 (0.7)	4 (1)	12 (3)	187 (46)	193 (47.4)	407
Mkuranga	80 (27.5)	1 (0.3)	2 (0.7)	15 (5.2)	41 (14.1)	152 (52.2)	291
Mvomero	42 (23)	9 (4.9)	17 (9.3)	10 (5.5)	64 (35)	41 (22.4)	183
<b>Sub-total Eastern Zone</b>	<b>130 (14.8)</b>	<b>13 (1.5)</b>	<b>23 (2.6)</b>	<b>37 (4.2)</b>	<b>292 (33.1)</b>	<b>386 (43.8)</b>	<b>881</b>
Bukoba	16 (21.9)	10 (13.7)	10 (13.7)	14 (19.2)	9 (12.3)	14 (19.2)	73
Musoma	11 (25)	8 (18.2)	7 (15.9)	2 (4.6)	5 (11.4)	11 (25)	44
Nyamagana	11 (15.7)	4 (5.7)	1 (1.4)	0 (0.0)	52 (74.3)	2 (2.9)	70
Shinyanga	5 (12.2)	20 (48.8)	9 (22.0)	1 (2.4)	5 (12.2)	1 (2.4)	41
<b>Sub-total Lake Zone</b>	<b>43 (18.9)</b>	<b>42 (18.4)</b>	<b>27 (11.8)</b>	<b>17 (7.5)</b>	<b>71 (31.1)</b>	<b>28 (12.3)</b>	<b>228</b>
Lindi	47 (20.4)	1 (0.4)	2 (0.9)	0 (0.0)	38 (16.5)	143 (61.9)	231
Newala	28 (13.5)	7 (3.4)	9 (4.3)	0	19 (9.1)	145 (69.7)	208
<b>Sub-total Southern Zone</b>	<b>75 (17.1)</b>	<b>8 (1.8)</b>	<b>11 (2.5)</b>	<b>0</b>	<b>57 (13)</b>	<b>288 (65.6)</b>	<b>439</b>
Kigoma-Ujiji	7 (4.1)	1 (0.6)	3 (1.7)	12 (6.9)	124 (71.7)	26 (15)	173
Urambo	18 (14.6)	4 (3.3)	2 (1.6)	3 (2.4)	91 (74)	5 (4.1)	123
<b>Sub-total Western Zone</b>	<b>25 (8.5)</b>	<b>5 (1.7)</b>	<b>5 (1.7)</b>	<b>15 (5.1)</b>	<b>215 (72.6)</b>	<b>31 (10.5)</b>	<b>296</b>
Kilolo	6(7.2)	0(0.0)	1(1.2)	6(7.2)	26(31.3)	44(53.0)	83
Kyela	89(36.5)	5(2.1)	8(3.3)	23(9.4)	97(39.8)	22(9.0)	244
Songea	10(12.8)	3(3.9)	3(3.9)	8(10.3)	13(16.7)	41(52.6)	78
Sumbawanga	42(23.0)	5(2.7)	12(6.6)	5(2.7)	45(24.6)	74(40.4)	183
<b>Sub-total Southern Highlands</b>	<b>147(25.0)</b>	<b>13(2.2)</b>	<b>24(4.1)</b>	<b>42(7.1)</b>	<b>181(30.8)</b>	<b>181(30.8)</b>	<b>588</b>
<b>Overall total</b>	<b>675(19.6)</b>	<b>115(3.3)</b>	<b>131(3.8)</b>	<b>170(4.9)</b>	<b>1,166(33.8)</b>	<b>1,189(34.5)</b>	<b>3,446</b>

Over 99% of the respondents would like to have a free insecticide treated net. As regards to the colour preference of a mosquito net, the majority (52.9%) preferred blue coloured net (Northern=45.6%; Central=59.2%; Eastern=56.4%; Lake= 54.4%; Southern= 60.3%, Western= 58.5%) and Southern Highlands= 49.1%). Other colour preferences were white (29.6%), green (14.1%), black (2.1%) and pink (1.2%) (Table 3.15).

**Table 3.15: Number (%) of respondents and their preferred colour of mosquito nets**

District	White	Blue	Pink	Green	Black	Total
Arumeru	94(58.0)	40(24.7)	5(3.1)	22(13.6)	1(0.6)	162
Hanang	30(20.6)	80(54.8)	5(3.4)	29(19.9)	2(1.4)	146
Handeni	24(20.2)	77(64.7)	2(1.7)	16(13.5)	0(0.0)	119
Moshi	123(73.7)	32(19.2)	10(6.0)	11(6.6)	0(0.0)	167
<b>Sub-total</b>	<b>271(45.6)</b>	<b>229(38.6)</b>	<b>13(2.2)</b>	<b>78(13.1)</b>	<b>3(0.5)</b>	<b>594</b>
Manyoni	70 (44)	70 (44)	3 (1.9)	14 (8.8)	2 (1.3)	159
Mpwapwa	34 (13.3)	175 (68.6)	1 (0.4)	33 (12.9)	12 (4.7)	255

District	White	Blue	Pink	Green	Black	Total
<b>Sub-total</b>	<b>104 (25.1)</b>	<b>245 (59.2)</b>	<b>4 (1)</b>	<b>47 (11.4)</b>	<b>14 (3.4)</b>	<b>414</b>
Ilala	170 (41.8)	191 (46.9)	2 (0.5)	42 (10.3)	2 (0.5)	407
Mkuranga	46 (15.8)	191 (65.6)	1 (0.3)	38 (13.1)	15 (5.2)	291
Mvomero	34 (18.9)	113 (62.8)	6 (3.3)	24 (13.3)	3 (1.7)	180
<b>Sub-total</b>	<b>250 (28.5)</b>	<b>495 (56.4)</b>	<b>9 (1)</b>	<b>104 (11.9)</b>	<b>20 (2.3)</b>	<b>878</b>
Bukoba	12 (16.4)	37 (50.7)	0	20 (27.4)	4 (5.5)	73
Musoma	6 (13.6)	34 (77.3)	0	4 (9.1)	0	44
Nyamagana	37 (52.9)	27 (38.6)	0	5 (7.1)	1 (1.4)	70
Shinyanga	5 (12.2)	26 (63.4)	0	10 (24.4)	0	41
<b>Sub-total</b>	<b>60 (26.3)</b>	<b>124 (54.4)</b>	<b>0</b>	<b>39 (17.1)</b>	<b>5 (2.2)</b>	<b>228</b>
Lindi	91 (39.6)	107 (46.5)	3 (1.3)	21 (9.1)	8 (3.5)	230
Newala	13 (6.3)	157 (75.5)	0	30 (14.4)	8 (3.9)	208
<b>Sub-total</b>	<b>104 (23.7)</b>	<b>264 (60.3)</b>	<b>3 (0.7)</b>	<b>51 (11.6)</b>	<b>16 (3.7)</b>	<b>438</b>
Kigoma Ujiji	47 (27.5)	91 (53.2)	1 (0.6)	28 (16.4)	4 (2.3)	171
Urambo	28 (22.8)	81 (65.9)	3 (2.4)	9 (7.3)	2 (1.6)	123
<b>Sub-total</b>	<b>75 (25.5)</b>	<b>172 (58.5)</b>	<b>4 (1.4)</b>	<b>37 (12.6)</b>	<b>6 (2)</b>	<b>294</b>
Kilolo	9 (10.8)	44 (53)	1 (1.2)	28 (33.7)	1 (1.2)	83
Kyela	79 (32.8)	110 (45.6)	3 (1.2)	41 (17.0)	8 (3.3)	241
Songea	9 (11.5)	44 (56.4)	1 (1.3)	24 (30.8)	0	78
Sumbawanga	53 (29)	89 (48.6)	2 (1.1)	36 (19.7)	3 (1.6)	183
<b>Sub-total</b>	<b>150 (25.6)</b>	<b>287 (49.1)</b>	<b>7 (1.2)</b>	<b>129 (22.1)</b>	<b>12 (2.1)</b>	<b>585</b>
<b>Total</b>	<b>1,014 (29.6)</b>	<b>1,816 (52.9)</b>	<b>40 (1.2)</b>	<b>485 (14.1)</b>	<b>76 (2.2)</b>	<b>3,431</b>

A strong preference for blue mosquito nets was observed among respondents in Musoma (77.3%) and Newala (75.5%) districts. On the other hand, the weakest preference (24.7%) for blue nets was observed among respondents in Arumeru district.

The majority of the respondents (82%) preferred rectangular shaped net (Table 3.16). Interestingly, respondents from Coastal districts (Ilala=94.4%; Mkuranga=89.6%; Lindi=96.9% and Newala=93.4%) showed the strongest preference for rectangular nets. About a quarter (28.2%) of the respondents in the northern zone districts had preference for a conical shaped net.

**Table 3.16: Number (%) of respondents and their preference to the shape of the mosquito net**

Zone	District	Conical	Rectangular	Total
Northern	Arumeru	41(25.6)	119(74.4)	160
	Hanang	33(24.6)	101(75.4)	134
	Handeni	36(31.3)	79(68.7)	115
	Moshi	52(31.5)	113(68.5)	165
	<b>Sub-total</b>	<b>162(28.2)</b>	<b>412(71.8)</b>	<b>574</b>
Central	Manyoni	20(13.3)	130(86.7)	150
	Mpwapwa	41(20.0)	164(80.0)	205
	<b>Sub-total</b>	<b>61(17.2)</b>	<b>294(82.8)</b>	<b>355</b>
Eastern	Ilala	20(5.7)	334(94.4)	354
	Mkuranga	23(10.4)	198(89.6)	221
	Mvomero	29(17.4)	138(82.6)	167
	<b>Sub-total</b>	<b>72(9.7)</b>	<b>670(90.3)</b>	<b>742</b>
Lake	Bukoba	25(37.3)	42(62.7)	67
	Musoma	7(15.9)	37(84.1)	44
	Nyamagana	19(27.1)	51(72.9)	70
	Shinyanga	6(14.6)	35(85.4)	41
	<b>Sub-total</b>	<b>57(25.7)</b>	<b>165(74.3)</b>	<b>222</b>

Southern	Lindi	7(3.1)	219(96.9)	226
	Newala	10(6.6)	142(93.4)	152
	<b>Sub-total</b>	<b>17(4.5)</b>	<b>361(95.5)</b>	<b>378</b>
Western	Kigoma-Ujiji	19(29.7)	45(70.3)	64
	Urambo	27(23.5)	88(76.5)	115
	<b>Sub-total</b>	<b>46(25.7)</b>	<b>133(74.3)</b>	<b>179</b>
Southern Highlands	Kilolo	24(28.9)	59(71.1)	83
	Kyela	26(15.6)	141(84.4)	167
	Songea	10(18.5)	44(81.5)	54
	Sumbawanga	48(32.0)	102(68.0)	150
	<b>Sub-total</b>	<b>108(23.8)</b>	<b>346(76.2)</b>	<b>454</b>
	<b>Total</b>	<b>523 (18.0)</b>	<b>2,381 (82.0)</b>	<b>2,904</b>

The majority of the respondents preferred to have a national identity for the nets distributed in Tanzania. Respondents who preferred to have mosquito nets with a logo in form of a national flag formed the largest proportions (61.8%). Other preferences included Mount Kilimanjaro (16.8%), Court of Arms (10%), and Giraffe (8.4%) (Table 3.17).

**Table 3.17: Number (%) of respondents and their preference for an identity on nets distributed in Tanzania**

Zone/ District	Prefer national identify	National flag	Giraffe	National identity			Total
				Mount Kilimanjaro	Court of Arms	Others	
<b>Northern</b>							
Arumeru	163(100.0)	76(46.6)	21(12.9)	44(27.0)	20(12.3)	2(1.2)	163
Hanang	141(96.6)	86(61.0)	9(6.4)	40(28.4)	5(3.6)	1(0.7)	141
Handeni	122(98.4)	62(50.8)	22(18.0)	36(29.5)	2(1.6)	0(0.0)	122
Moshi Urban	163(97.6)	93(57.1)	6(3.7)	51(31.3)	13(8.0)	0(0.0)	163
<b>Sub-total</b>	<b>589(98.2)</b>	<b>317(53.8)</b>	<b>58(9.9)</b>	<b>171(29.0)</b>	<b>40(6.8)</b>	<b>3(0.5)</b>	<b>589</b>
<b>Central</b>							
Manyoni	156(98.1)	101(64.7)	20(12.8)	20(12.8)	15(9.6)	0(0.0)	156
Mpwawwa	254(99.6)	150(59.1)	27(10.6)	27(10.6)	36(14.2)	14(5.5)	254
<b>Sub-total</b>	<b>410(99.0)</b>	<b>251(61.2)</b>	<b>47(11.5)</b>	<b>47(11.5)</b>	<b>51(12.4)</b>	<b>14(3.4)</b>	<b>410</b>
<b>East</b>							
Ilala	407(100.0)	226(55.5)	17(4.2)	111(27.3)	49(12.0)	4(1.0)	407
Mkuranga	291(100.0)	163(56.0)	20(6.9)	50(17.2)	42(14.4)	16(5.5)	291
Mvomero	171(93.4)	102(59.7)	16(9.4)	50(29.2)	3(1.8)	0(0.0)	171
<b>Sub-total</b>	<b>869(98.6)</b>	<b>491(56.5)</b>	<b>53(6.1)</b>	<b>211(24.3)</b>	<b>94(10.8)</b>	<b>20(2.3)</b>	<b>869</b>
<b>Lake</b>							
Bukoba Rural	72(98.6)	47(65.3)	5(6.9)	16(22.2)	3(4.2)	1(1.4)	72
Musoma Rural	44(100.0)	34(77.3)	2(4.6)	7(15.9)	1(2.3)	0(0.0)	44
Nyamagana	70(100.0)	50(71.4)	5(7.1)	15(21.4)	0(0.0)	0(0.0)	70
Shinyanga Rural	41(100.0)	37(90.2)	1(2.4)	3(7.3)	0(0.0)	0(0.0)	41
<b>Sub-total</b>	<b>227(99.6)</b>	<b>168(74.0)</b>	<b>13(5.7)</b>	<b>41(18.1)</b>	<b>4(1.8)</b>	<b>1(0.4)</b>	<b>227</b>
<b>Southern</b>							
Lindi Urban	230(99.6)	157(68.3)	23(10.0)	14(6.1)	25(10.9)	11(4.8)	230
Newala	206(99.0)	148(71.8)	17(8.3)	8(3.9)	26(12.6)	7(3.4)	206
<b>Sub-total</b>	<b>436(99.3)</b>	<b>305(70.0)</b>	<b>40(9.2)</b>	<b>22(5.1)</b>	<b>51(11.7)</b>	<b>18(4.1)</b>	<b>436</b>
<b>Western</b>							
Kigoma-Ujiji	172(99.4)	139(80.8)	11(6.4)	15(8.7)	3(1.7)	4(2.3)	172
Urambo	118(95.9)	79(67.0)	16(13.6)	7(5.9)	12(10.2)	3(2.5)	118
<b>Sub-total</b>	<b>290(98.0)</b>	<b>218(75.2)</b>	<b>27(9.3)</b>	<b>22(7.6)</b>	<b>15(5.2)</b>	<b>7(2.4)</b>	<b>290</b>
<b>S. Highlands</b>							

Kilolo	82(98.8)	42(51.2)	11(13.4)	10(12.2)	14(17.1)	5(6.1)	82
Kyela	238(97.5)	159(66.8)	18(7.6)	20(8.4)	33(13.9)	8(3.8)	238
Songea	78(100.0)	42(54.6)	5(6.4)	6(7.7)	152(19.2)	10(12.8)	78
Sumbawanga	181(98.9)	109(60.2)	13(7.2)	20(11.1)	24(13.3)	15(8.3)	181
<i>Sub-total</i>	<i>579(98.5)</i>	<i>352(60.8)</i>	<i>47(8.1)</i>	<i>56(9.7)</i>	<i>86(14.8)</i>	<i>38(6.6)</i>	<i>579</i>
<b>Overall total</b>	<b>3,400 (98.7)</b>	<b>2,102 (61.8)</b>	<b>285 (8.4)</b>	<b>570 (16.8)</b>	<b>341 (10.0)</b>	<b>102 (3.0)</b>	<b>3,400</b>

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## DISCUSSION

In this study, it was observed that two thirds (62.7%) of the households in Tanzania own at least one mosquito net. However, the proportion of those with insecticide treated nets is still low (29%). A significant variation was observed between districts with the highest and lowest net coverage. While the majority of the respondents in northern (76.5%) and southern (76.5%) zones own at least a mosquito net, the majority of people in Kilolo (65.2%), Kigoma-Ujiji (63.5%) and Musoma Rural (58.7%) had no mosquito nets. Ownership of ITN showed a similar trend. The largest proportions of households with ITN were found in northern zone (40.2%), particularly in Arumeru (46%) and Hanang (44.1%) districts. The lowest proportions of households with ITN were in Musoma (12.6%), Kigoma-Ujiji (13.2%), and Shinyanga (14.4%). Mosquito net ownership was higher among households in urban than rural districts

Mosquito net ownership was highest in Lindi Urban, Kyela, Arumeru, Ilala, and Nyamagana. Lindi, Ilala and Nyamagana are urban districts. Like in a recent survey by Hanson et al. (2007), urban residence was a significant predictor of mosquito net use among households in Tanzania. However, this was not true for Kigoma-Ujiji. This is most probably due to poor knowledge on the relationship between mosquito density and malaria transmission. Low mosquito coverage in Kilolo district (located in higher altitudes) (Mboera et al., 2006) is likely to be attributed to low mosquito densities and hence prompting people from using nets mainly during the cool part of the year. The reasons for low net utilisation in some districts could not be established. However, poverty, low knowledge on the linkage between mosquito and malaria transmission and low ITN promotion in these districts are likely to play a great role in the low coverage of ITN.

There was a seasonal variation in the mosquito net usage in some districts. In such districts a high mosquito net utilisation was observed during the rainy season. The low net usage during the dry season is likely to be attributed to low mosquito densities. In a recent study in India, low mosquito density was reported as one of the reasons given by people for the low use rate of ITN (Jambulingam et al., 2008). Mosquito nets may have a higher acceptability in many households as a defense against mosquito nuisance bites than as malaria prevention (Okenu et al., 1999; Yohannes et al., 2000; Jambulingam et al., 2008). The seasonal usage of mosquito net among households in a number of districts needs to be addressed through appropriate health education programmes. Communities should be made aware of the benefits of mosquito net use in the prevention of malaria rather than prevention of mosquito biting nuisance. It is important communities are made aware of the benefit of mosquito nets in the prevention of malaria to enhance the use rate throughout the year. The observations that insecticide treated nets had added advantage in the control of coackroaches, bed bugs and fleas should be included in in health education and promotion packages.

Already, it has been established that affordability of voucher nets has been another significant contributor to low coverage of pregnant women in the poorer quintiles (Hanson et al., 2007). Mosquito net possession has been reported to be lower among poorest quintiles compared to least-poor quintiles. Moreover, campaigns have shown to have a significant contribution to the increase in net ownership in southern Tanzania (Skarbinski et al., 2007).

Although our findings indicate ITN coverage of 42.8% in Lindi, reports available indicate a much higher coverage (Skarbinski et al., 2007). In 2005, 162,254 bednets bundled with insecticide were distributed in Lindi Region, achieving a 98.3% (NMCP, 2005). The highest net coverage among children in Lindi (90%) is likely to be a result of the distribution done in 2005. In a study by Skarbinski et al. (2007), 79.6% of the children in Lindi Region had received a mosquito net. In general, the higher net coverage among the under 5s was as expected because this is one of the target population for the subsidised mosquito nets.

The low ITN found in Lindi in the current study is likely to indicate that the previously distributed nets were not re-treated by the time of this survey.

Generally, household ownership of any mosquito net in this study is slightly higher than that reported recently. In a recent survey by Hanson et al. (2007), household ownership of at least one net increased from 43% to 57% between 2005 and 2006. The same report has shown that among children under five years of age, use of any net increased from 28 to 41%, and ITN use from 15 to 28%. According to Tanzania Net Voucher Scheme, 36% of the households in Tanzania have at least one ITN and 65% have at least one net; 26% of children < 5years sleep under an ITN and 23 % of pregnant women sleep under an ITN (MoH, 2008).

In over three quarters (77%) of the households, mosquito nets were visually inspected by the research team. Household owners denying entry of their bed room made it difficult to verify their responses. In a recent study in Mvomero, Tanzania, the response of households on the number of mosquito nets they had differ significantly from the available nets (Mboera et al., 2007b). This has an implication in determining net coverage by just relying solely on the verbal responses from the household respondent. The presence of torn nets in a number of households was common. Interestingly, the majority of the people do repair their torn nets. Respondents in Manyoni district had the largest proportion (97.5%) of individuals who had torn nets. The tendency to repair torn nets indicates community knowledge that an intact net has high protective effect.

A preference for shape and colour of net was observed in all districts. However, this varied from district to district. Over half of the respondents prefer blue coloured nets while over three-quarters of the respondents prefer rectangular nets. Another recent study in the country has established that blue colour and rectangular-shaped nets were important attributes in determining the choice of an ITN (Mujinja, 2002). Similarly, in Uganda, rectangular nets were preferred more than conical or triangular nets (Okello-Ogojo, 2001). In a study in Malawi, rural communities preferred rectangular nets followed by conical nets, whereas in urban areas the preference was for conical nets followed by rectangular nets. Unlike in studies in Tanzania, the most popular colour in Malawi was white, which was slightly higher amongst urban compared to rural responders (Coombes et al., 1998).

It was interesting to note that the majority of the respondents were in favour of the use of ITN rather than indoor residual spraying (IRS). The low preference of IRS is likely to be due to its requirement for taking out personal belonging before the beginning of the spraying exercise.

The National Malaria Control Programme in collaboration with development partners plan to introduce new interventions from late 2008. These include a catch up campaign in which all children under five will receive a free LLIN. The voucher will continue to be distributed to pregnant women and infants as a keep up strategy to maintain the high coverage achieved from the catch up campaign. Complementing these efforts will be the re-treatment of the existing net crop and a major scale up of behaviour change communication activities. According to NATNET Tanzania, the target for high ITN/LLIN coverage has shifted from the Abuja target of 60% to 80% with the aim of producing more broad based impact (NATNETS, 2008). Tanzania has planned a “Catch Up” campaign combined with a “Keep Up” campaign using LLINs to rapidly increase coverage. It is important that the variations in mosquito net coverage observed in this study are taken into consideration. Already, it has been shown in southern Tanzania that free mosquito net distribution is effective in rapidly and equitably increasing household ownership and use of nets (Skarbinski et al., 2007).



In conclusion, on average, only two thirds and one-third of the households in Tanzania own at least one mosquito net (any type) and insecticide treated net, respectively. Tanzania expects that ITN coverage of under fives in 2009, after the Under Five Catch-up Campaign is complete, to be at least 80%. It is clear from this and other studies that coverage targeted only at the vulnerable groups may be appropriate but not perfect. Community-wide distribution of mosquito nets for universal coverage needs to be emphasised to accelerate the scaling up of net coverage for impact in the country. This is possible now that initiatives to provide every sleeping bed with an ITN are available.

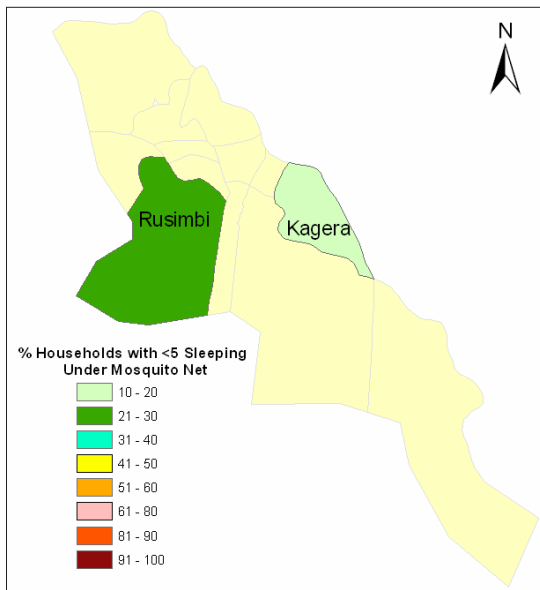
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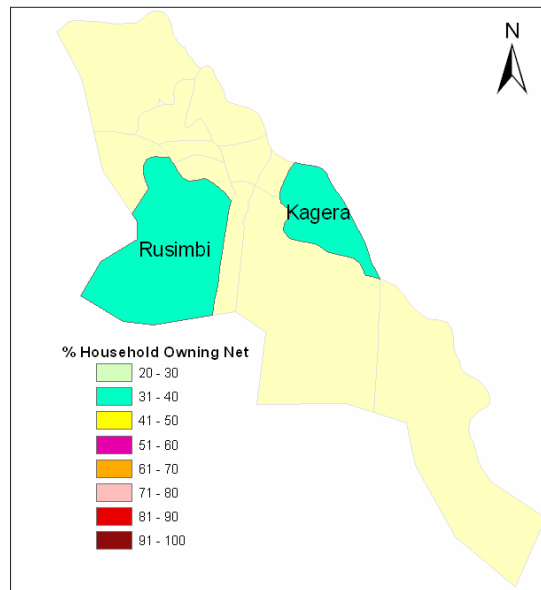
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**APPENDIX: SCHEMATIC PRESENTATION OF MOSQUITO COVERAGE BY DISTRICT**

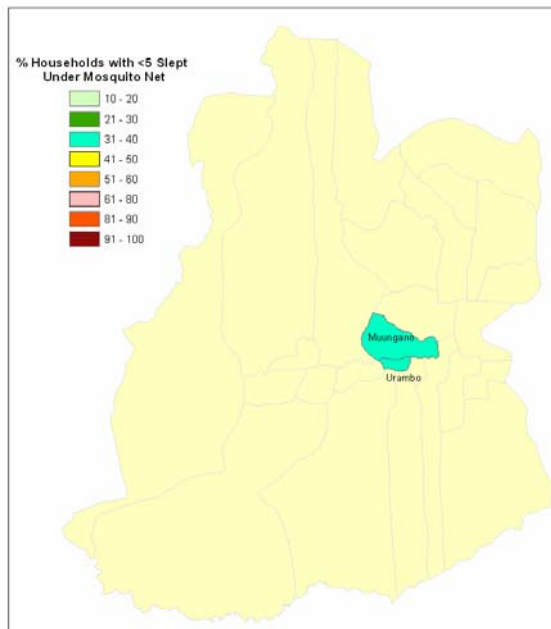


(a)

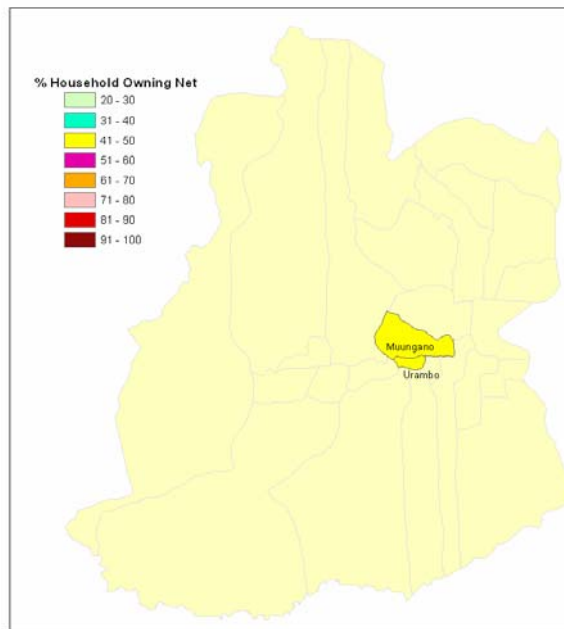


(b)

% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Rusimbi and Kagera wards, in Kigoma-Ujiji District

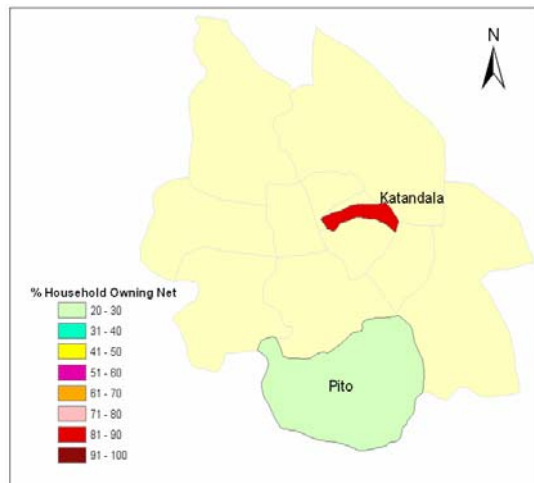
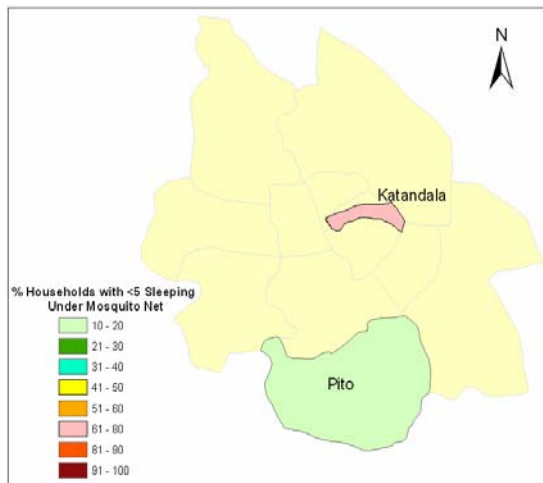


(a)

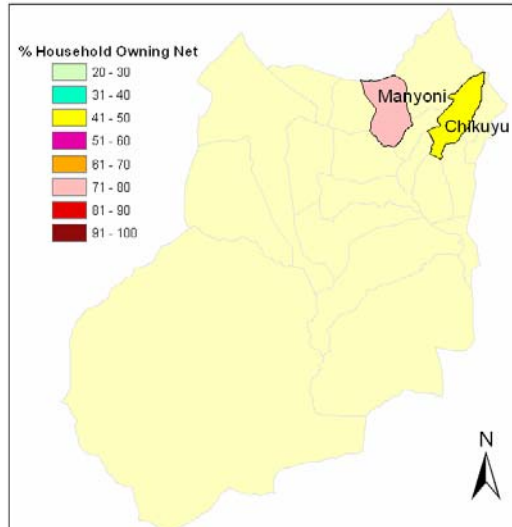
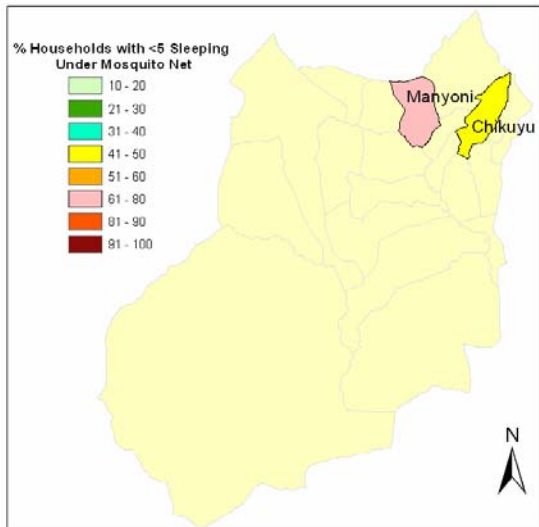


(b)

% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Muungano and Urambo wards in Urambo District



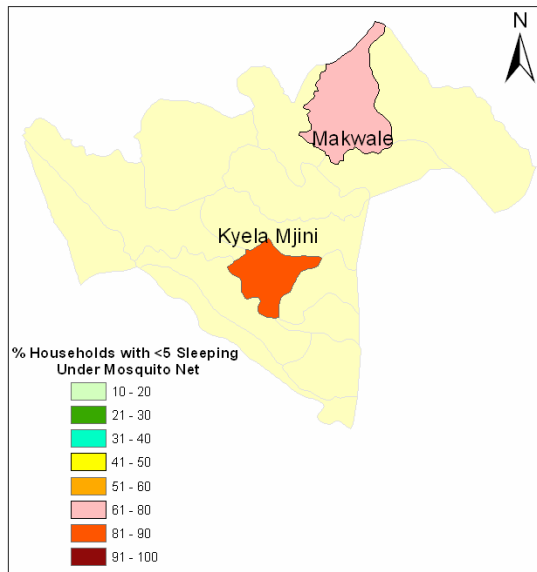
**% Households (a) < 5 years sleeping under mosquito net and (b) owning at least a net in Pito and Katandala wards in Sumbawanga Urban District**



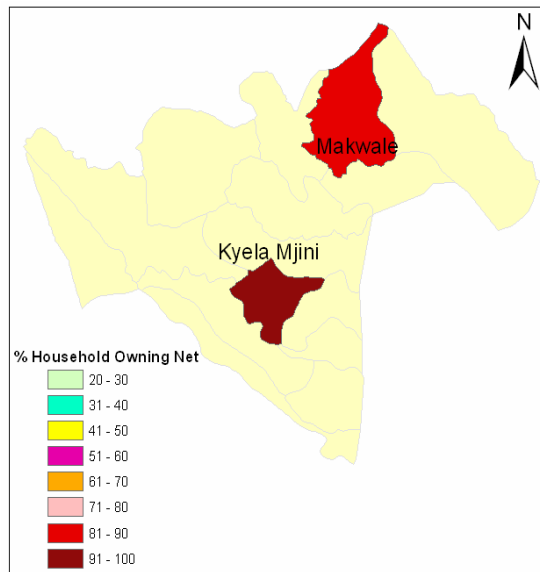
**(a)**

**(b)**

**% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Manyoni and Chikuyu wards in Manyoni District**

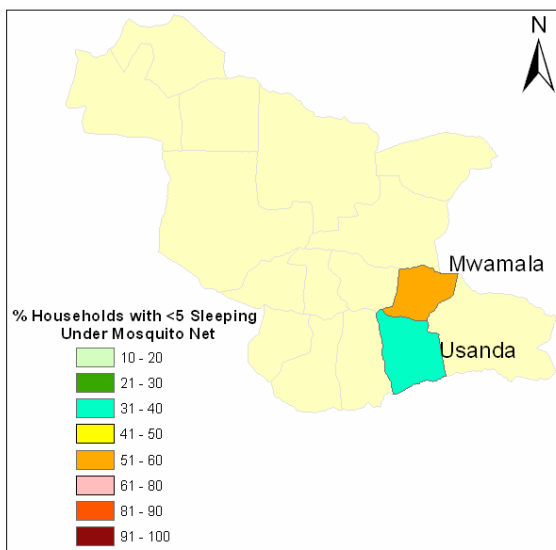


(a)

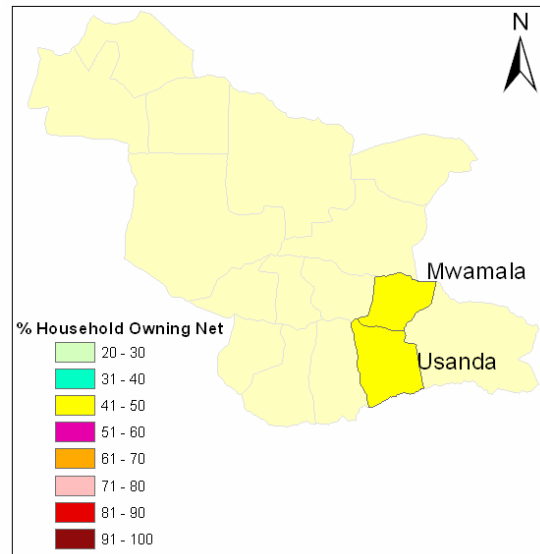


(b)

% Households (a) with < 5 years sleeping under mosquito net and (b) owning at least a net in Kyela Mjini and Makwale wards in Kyela District

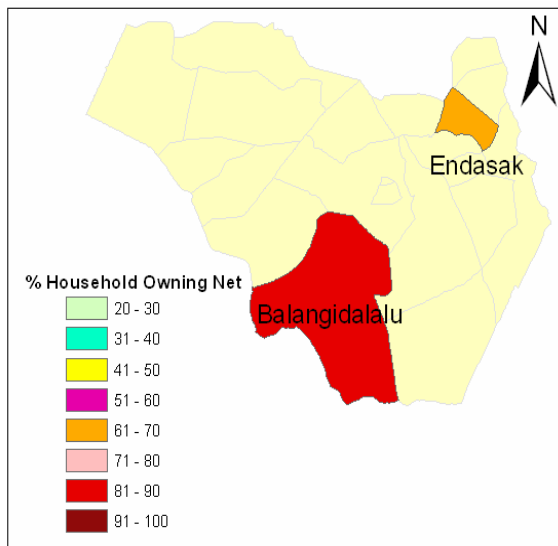
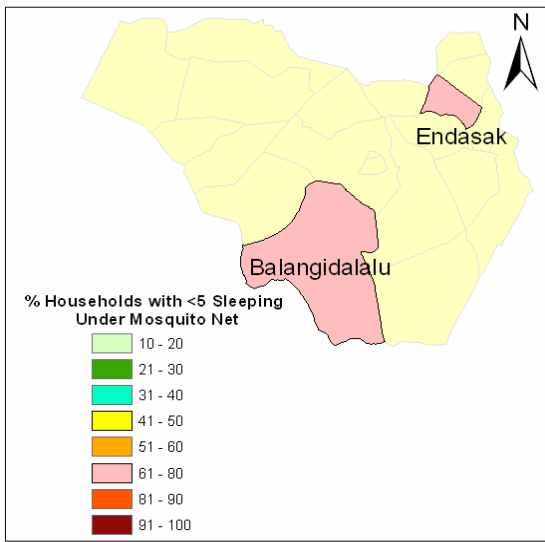


(a)



(b)

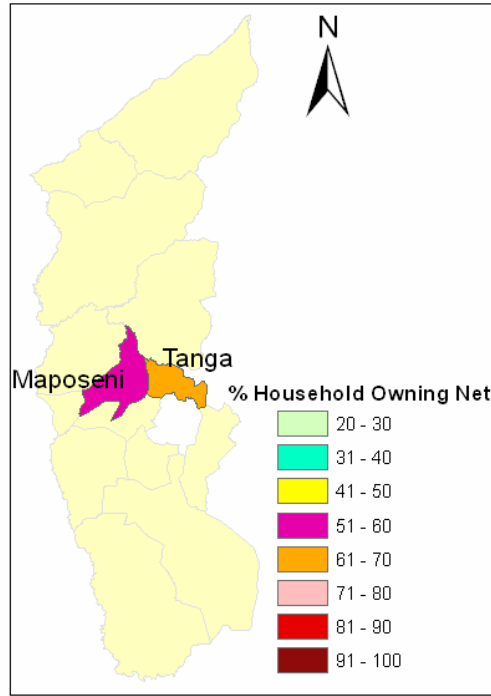
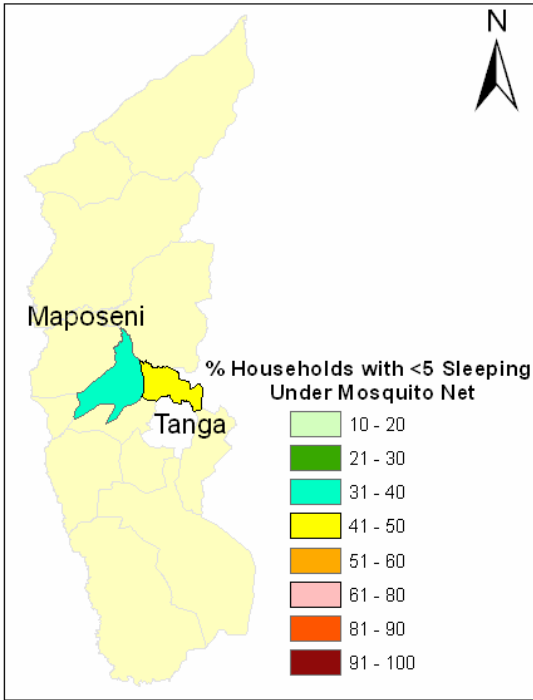
% Households (a) with < 5 years sleeping under mosquito net and (b) owning at least a net in Mwamala and Usanda wards in Shinyanga Rural District



(a)

(b)

% Households (a) with <5 years sleeping under mosquito net and (b) owning at least net in Balang'idalau and Endasak wards in Hanang District

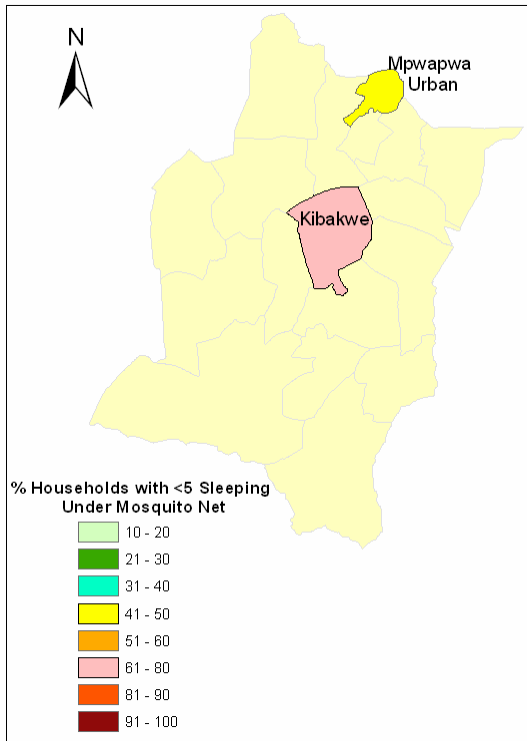


(a)

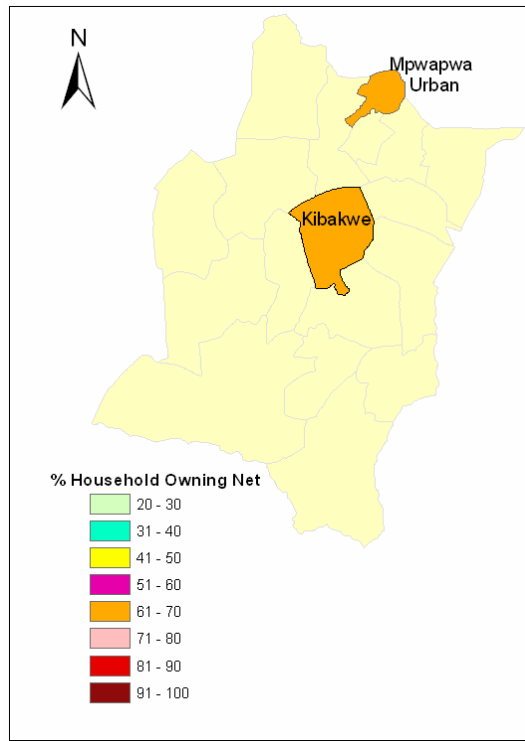
(b)

% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Maposeni and Tanga wards in Songea Rural District



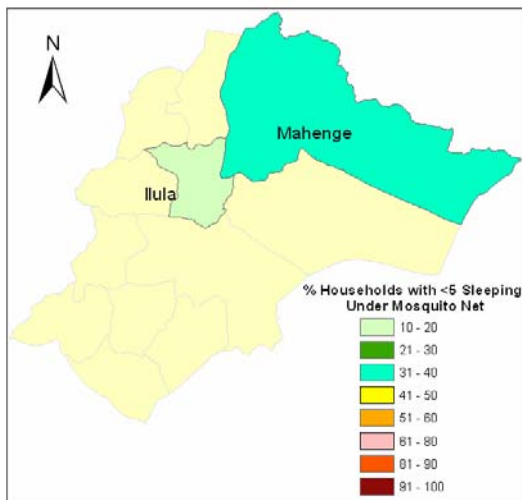


(a)

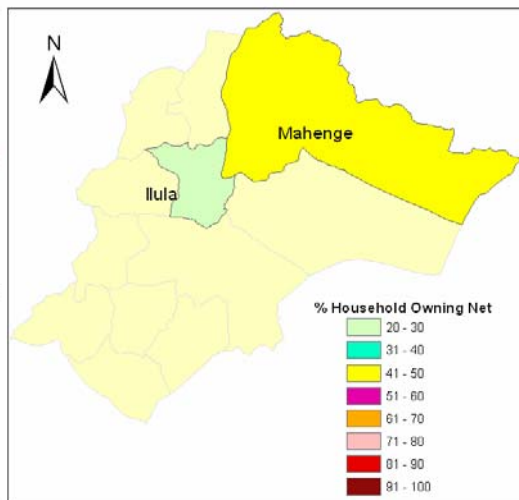


(b)

% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Mpwapwa Urban and Kibakwe wards in Mpwapwa District

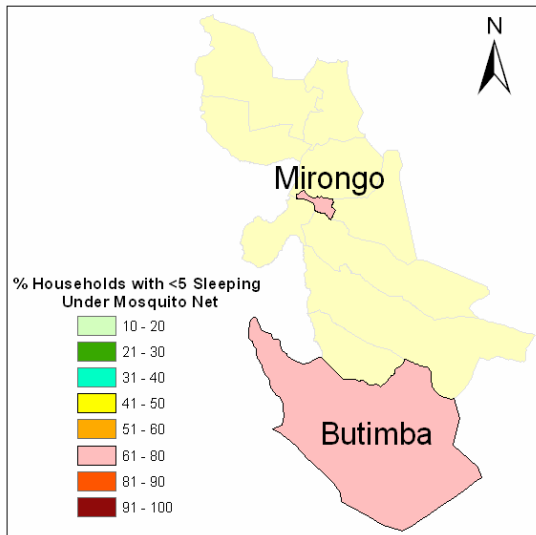


(a)

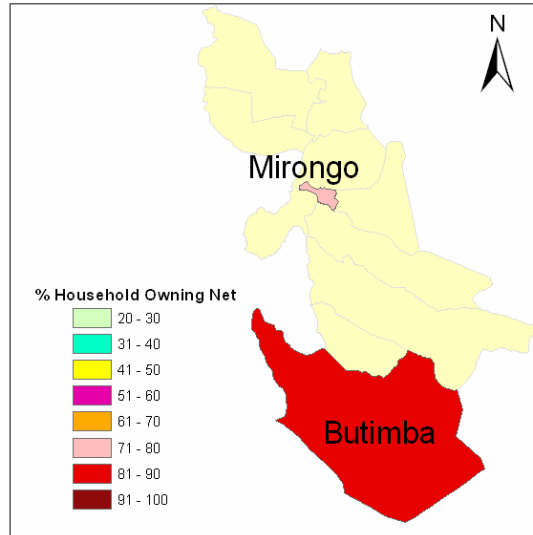


(b)

% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Mahenge and Ilula wards in Kilolo District

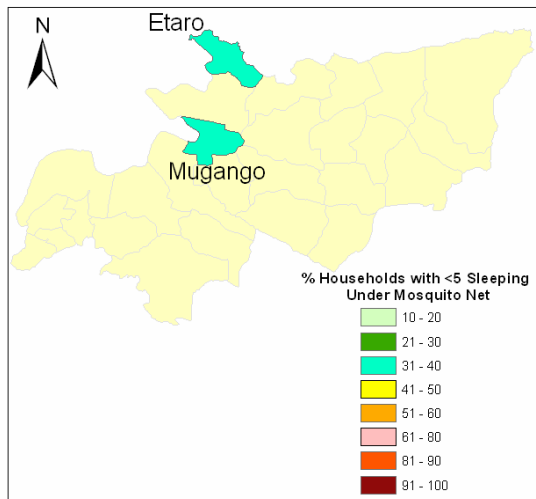


(a)

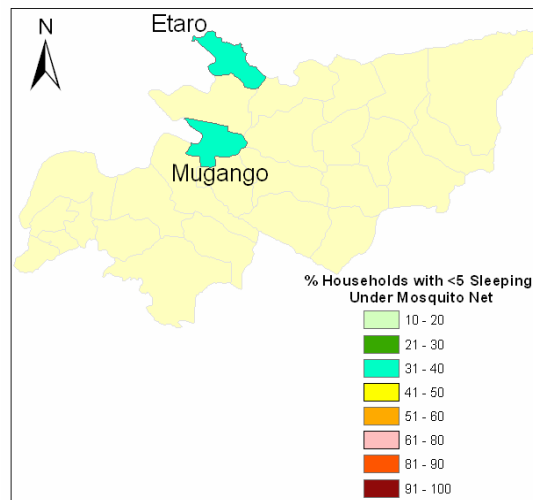


(b)

% Households (a) with <5 years who sleep under mosquito net and (b) owning at least a net in Mirongo and Butimba wards in Nyamagana District

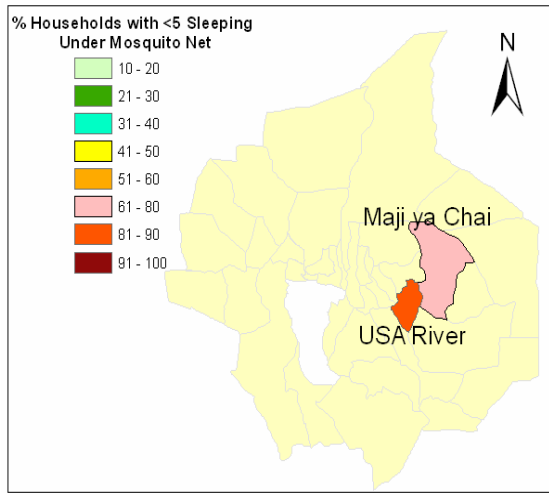


(a)

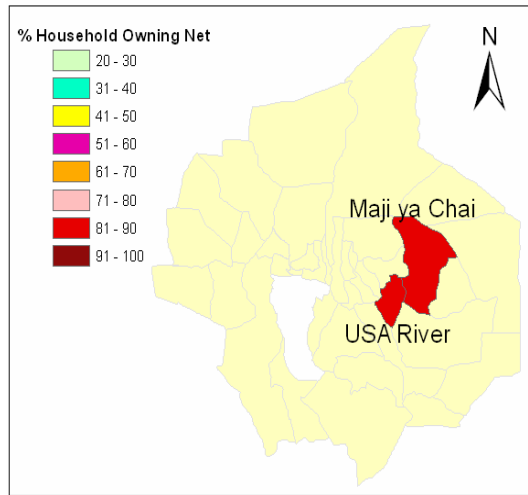


(b)

% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Etaro and Mugango wards in Musoma Rural District

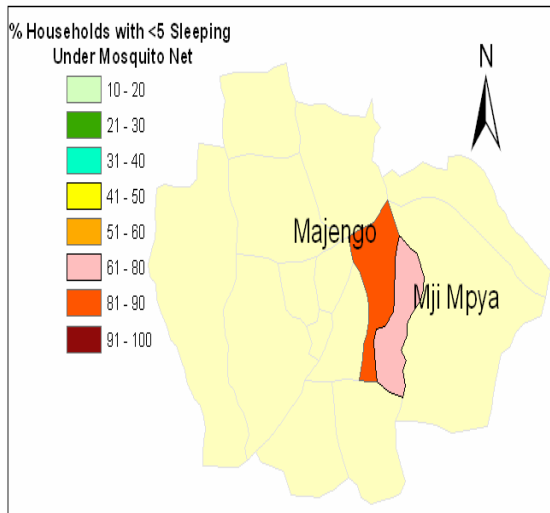


(a)

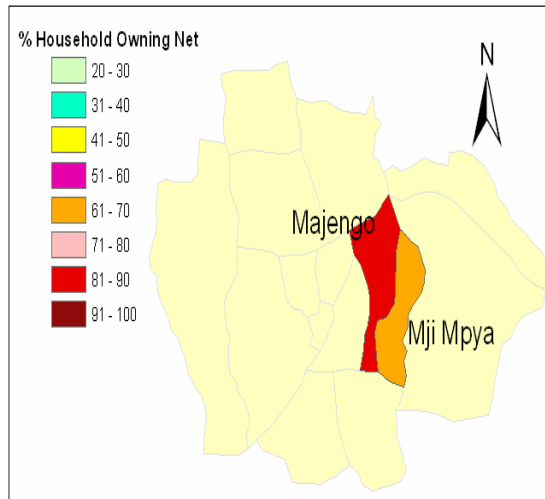


(b)

% Households (a) with <5 years underfive who sleep under mosquito net and (b) owning at least a net in Maji ya Chai and Usa River wards in Arumeru District

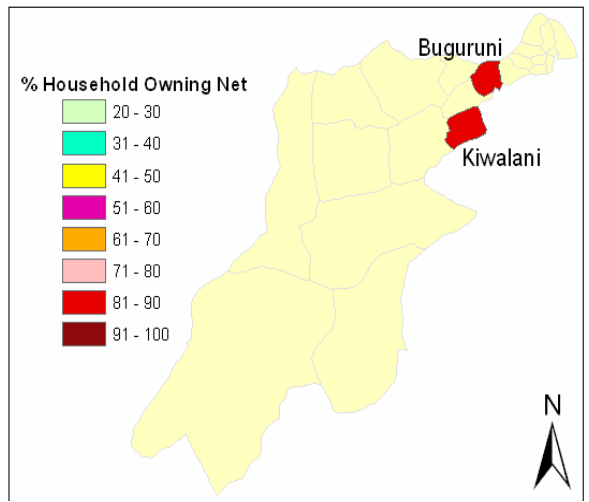
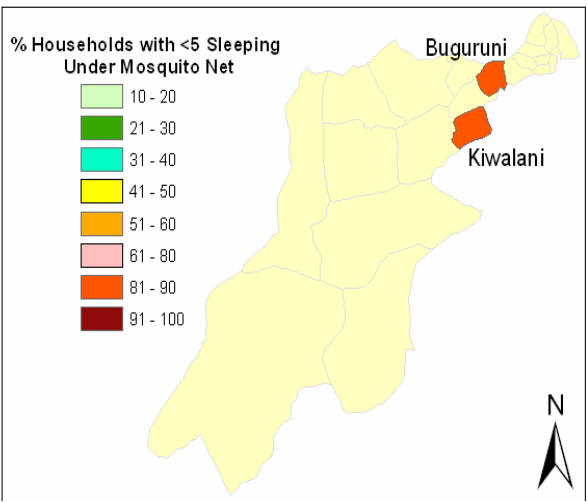


(a)



(b)

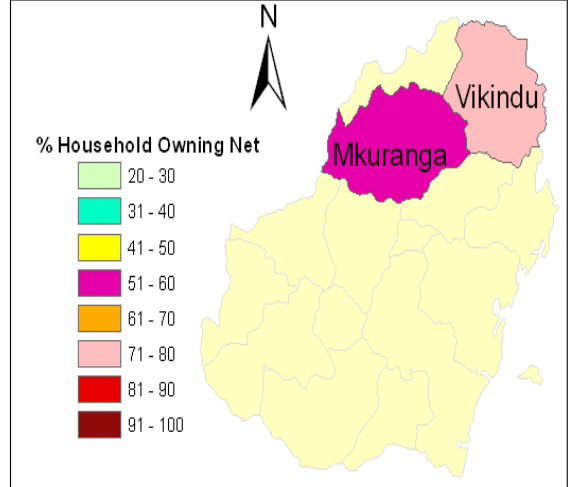
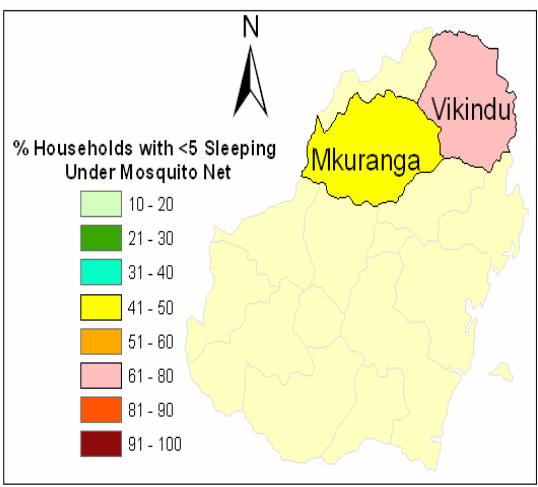
% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Majengo and Mji Mpya wards in Moshi Urban District



(a)

(b)

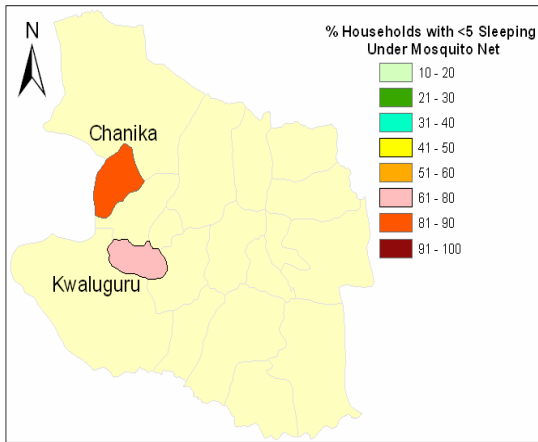
% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Buguruni and Kiwalani wards, Ilala District



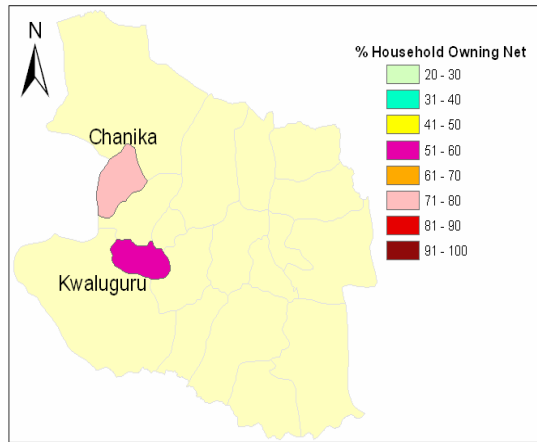
(a)

(b)

% Households (a) with <5 years sleeping under mosquito net and (b) owning at least a net in Vikindu and Mkuranga wards in Mkuranga District

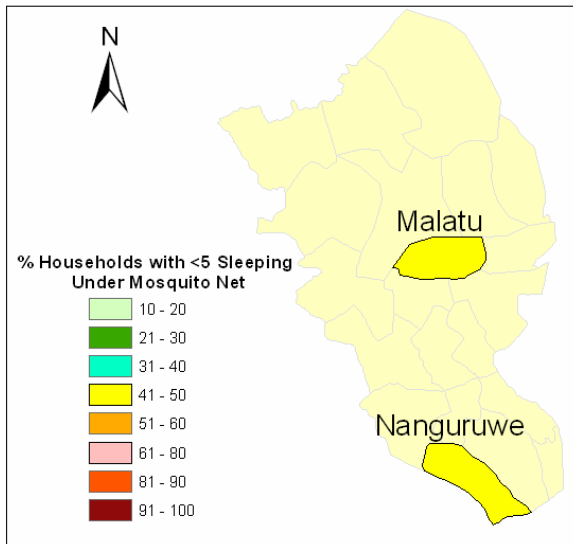


(a)

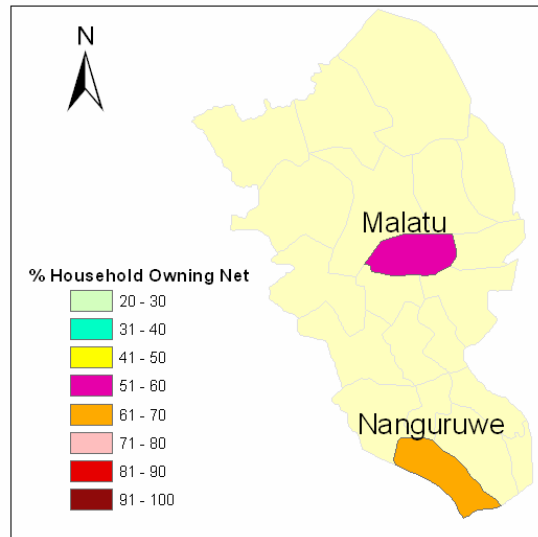


(b)

% Households (a) with <5year sleeping under mosquito net and (b) Owning at least a net in Chanika and Kwaluguru wards in Handeni District

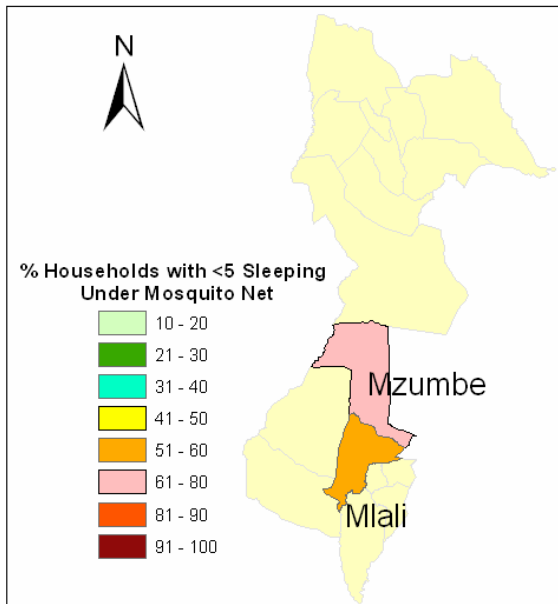


(a)

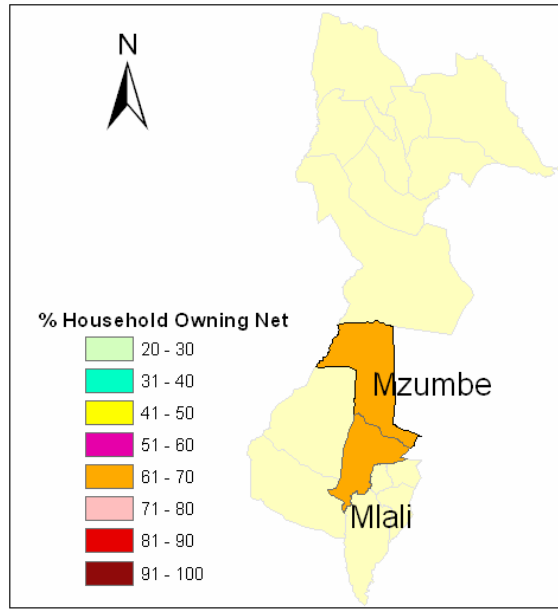


(b)

% Households (a) with <5years sleeping under mosquito net (b) owning at least a net in Malatu and Nanguruwe wards in Newala District

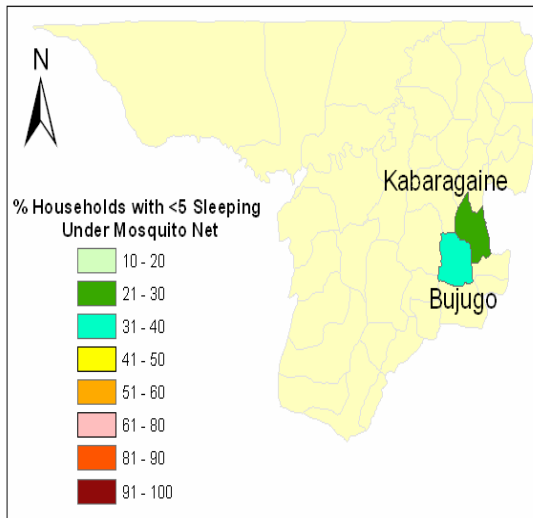


(a)

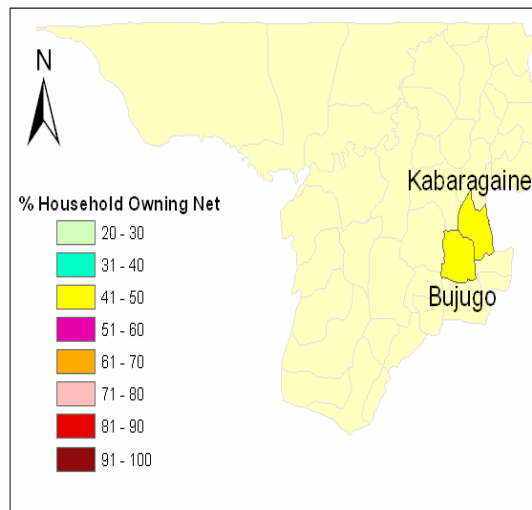


(b)

% Households (a) with <5 year sleeping under mosquito net and (b) owning at least a net in Mzumbe and Mlali wards in Mvomero

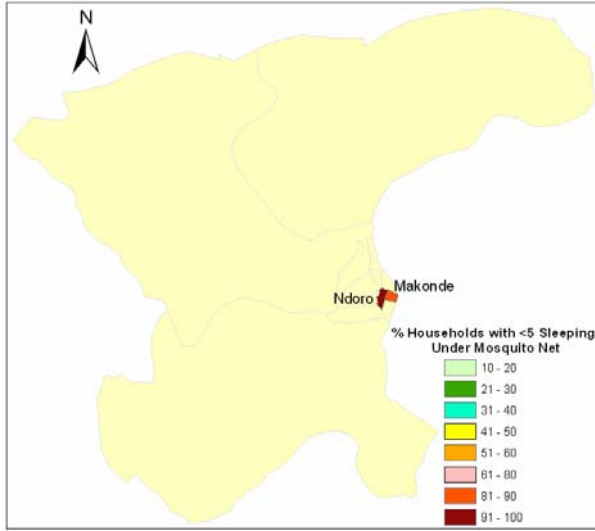


(a)

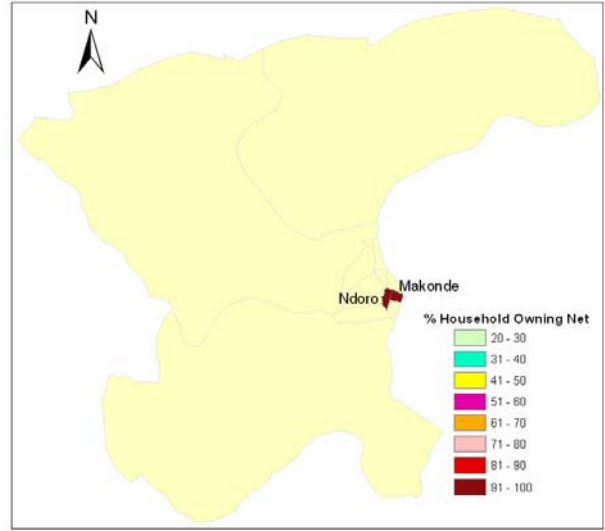


(b)

% Households (a) with <5years sleeping under mosquito net and (b) owning at least a net in Bujugo and Kabaragaine wards in Bukoba Rural District



(a)



(b)

% Households (a) with <5 years sleeping under mosquito net and (b) owning net at least a net in Ndoro and Makonde wards in Lindi Urban District