

**Zimbabwe assistance Program in Malaria**

nEt durability study REPORT

DURABILITY MONITORING OF LONG-LASTING INSECTICIDAL NETS AT THE 18-MONTH PERIOD IN MALARIA-ENDEMIC REGIONS OF ZIMBABWE

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Abbreviations and Acronyms

**LLIN** Long-lasting insecticidal net

**NMCP** National Malaria Control Program

**pHI** Proportional Hole Index

**PMI** President’s Malaria Initiative

**PSI** Population Services International

**WHO** World Health Organization

**ZAPIM** Zimbabwe Assistance Program in Malaria

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Executive Summary

The Zimbabwe Assistance Program in Malaria (ZAPIM) implemented this assessment as part of a three year LLIN durability study in collaboration with the National Malaria Control Program (NMCP) and the National Institute of Health Research (NIHR) Zimbabwe. This study seeks to provide information to the NMCP, the United States Agency for International Development-President’s Malaria Initiative (USAID-PMI), ZAPIM, and other malaria stakeholders about the longevity of the LLIN-fabric integrity, LLIN survivorship/attrition rate, bio-efficacy of the LLINs and chemical content analysis. The study is also intended to establish the households’ practices with regards to net care and repair. NIHR conducted bioassays and Wallon Laboratory, Belgium conducted insecticide residual testing, also referred to as chemical residue or chemical analysis.

The LLIN Durability Study is a prospective longitudinal study of a cohort of LLINs distributed through a school-based mini-mass campaign with follow-up at specific intervals. This report details the findings of the month 18 assessment, which was the first follow-up to the baseline study conducted by the NMCP and Population Services International (PSI) in February–March 2016 (six months post distribution). As a follow-up to the month 6 baseline study, the same methodology was used, with only minimal changes to the questionnaire. The month 18 assessment was carried out in the same 12 malaria-endemic districts in Mashonaland Central and Mashonaland West Provinces that were assessed during the month 6 baseline. These 12 districts included differing malaria socio-demographic and ecological profiles: rural, commercial farming, peri-urban, and mining.

Of the 1,847 households selected for the month 18 sample, 1,740 (94% of targeted households) were successfully interviewed. This was nearly the same coverage as that attained during the month 6 baseline assessment.

Overall, the proportion of LLINs surviving in “serviceable” condition (calculated as the proportion of cohort LLINs in “serviceable” condition at the time of the survey divided by the total cohort LLINs, excluding LLINs given away, used elsewhere or stolen) declined from 96.7% at month 6 to 80.9% at month 18. Survivorship of LLINs differed by LLIN brand at month 18, with survivorship in “serviceable” condition of DawaPlus 2.0 higher (86.3%) than that of DuraNet (81.8%). (Of note, survivorship did not differ much by brand at baseline (DawaPlus 2.0- 96.7% and DuraNet-96.8%)). Further analysis was done to determine the proportion of nets surviving in serviceable condition according to sector. Survivorship was highest in the mining sector at baseline (98.3%) and at month 18 (86.9%). No substantial differences were noted between the commercial farming, peri-urban and rural sector at month 18.

Net all-cause attrition (defined as the proportion of cohort LLINs lost for any reason) increased almost four-fold from the baseline (6.1%) to the 18 month time point (23.0). Attrition of LLINs did not differ notably by brand at six months and the difference increased only marginally at 18 months. During the month 18 assessment, all-cause attrition was highest in Muzarabani (30.4%), followed by Hurungwe (28.2%), Makonde (26.4%) and Bindura (24.6%). Rushinga had the lowest attrition (12.5%), possibly because of the low number of nets monitored for durability. LLIN all-cause attrition was highest in the commercial farming sector (29.4%) at month 18 and lowest in the peri-urban sector (7.7%) at month 6. LLIN all-cause attrition was higher in DuraNet than in DawaPlus both at the six-month and 18-month points.

Assessment of the physical condition surviving LLINs (i.e., those available in the household at the time of the survey) was conducted. A total of 1,329 LLINs (686 DawaPlus 2.0 and 643 DuraNet) were assessed for fabric integrity at month18. Overall, just over 84% of the available LLINs were in “serviceable” condition. Slightly more than 86% of the DawaPlus 2.0 were in “serviceable” condition, while nearly 82% of the DuraNet fell in the “serviceable” category. At baseline, there was no difference in the physical condition of the two brands. Ninety-seven percent of both DawaPlus 2.0 and DuraNet were still “serviceable”.

Further analysis was done to determine the physical condition of the surviving nets according to sector. All the sectors, except peri-urban, had more than 80% of the LLINs classified as “serviceable” at month 18. Fabric integrity was highest in the mining sector (90.2%) for the LLINs in “serviceable” condition, followed by the commercial farming sector (85.1%), and lowest in the peri-urban sector (78.9%). Fabric integrity was also highest in the same sector at baseline (98.6%) and lowest in the commercial sector.

The study also assessed the location of the study nets in the field. The questions included the location of the net (where the net was found), type of sleeping place the net has been used for mostly, net use the night before the survey, number of nights that the net was used in the last week, net washing frequencies and the type of soap used for the last wash. All these questions have a bearing on the condition and performance of the LLINs. At month 18, forty-four percent of the nets were observed inside the house hanging and folded up or tied, 23% were inside the house hanging loose over sleeping spaces, 16% were stored away, and 12% were not hanging but not stored. The reed mat was the most popular sleeping space (43.2%), followed by bed and mattress (39.3%), bare-ground (6.4%), and grass and outside (0.2% each). The use of reed mat was most common in rural (54.6%) and commercial sectors (54.3%). At baseline, the reed mat (42.8%) and bed and mattress (25.9%) were also the most common sleeping places.

Washing of LLINs was not a common practice across the sectors. At month 18, almost 38% of the nets had been washed only once as compared to 61.2% at baseline stage. Only 10% of the nets had been washed at least four times, and 5% had never been washed at the 18-month point. The use of soap bar (baseline–38.5% and 18 months–43.8%) and detergents (baseline–45.6% and 18 months–35.6%) to wash the nets was a common practice across the sectors.

According to the bioassay results, DawaPlus 2.0 lost optimal mortality quicker than DuraNet (90.4% and 90.6% at six months; 51% and 98.1% at 18 months, respectively). Results of the chemical analysis show that DawaPlus 2.0 lost potency both at month 6 and 18 compared to DuraNet. The target dose of the DawaPlus 2.0 decreased from 44% at month 6 to 10% at month 18. Although the target dose of the DuraNet was higher than that of DawaPlus 2.0, it also declined from 77.6% at 6 months to 44.6% at 18 months. Although for DuraNet the chemical result declined to 44.6% the bioassays results were still very high at 98.1 % at 18 months indicating that that the nets were still highly effective. The decline in decay rates for the nets may be due to the way the net is chemically treated. For Dawa, the chemical is coated onto to the polyester netting material and for DuraNet the chemical is incorporated onto the net fabric. The way the net is treated has an effect on the retention of chemical after washing. For coated nets they tend to lose the chemical faster than those with the chemical which is incorporated. These results point to the need for programs to consider the way the nets are chemically treated during the procurement process.

# Introduction

WHO recommends universal LLIN coverage in malaria transmission areas, including most of sub-Saharan Africa, as an effective way to reduce malaria transmission. Malaria prevention with long-lasting insecticidal mosquito nets (LLINs) has seen a tremendous scale-up in sub-Saharan Africa in recent years. Many countries have now achieved high ownership coverage of LLINs and are approaching the universal coverage target of the World Health Organization (WHO) of one net for every two people or one net per sleeping space for the population at risk. LLINs are manufactured with either pre-treated material such as polyethylene or coated in the netting at production stage. The pyrethroid-treated LLINs that national malaria control programs (NMCPs) procure use this insecticide due to its relative safety for humans, rapid knock down rates, and rapid killing effect (Zaim, et al, 2000).

To achieve and maintain high coverage, net durability and the average useful life of a net must be known. LLINs manufacturers claim that mosquito nets last for an average of three years, and some indicate a useful life of up to five years. However, information regarding the durability of LLINs under field conditions is not available. Net durability and the average useful life of a net are critical elements in malaria control programs since they determine the frequency of net replacement (WHO, 2011). The WHO guidelines for monitoring LLIN recommend routine monitoring of LLIN:

* Survivorship
* Bio-efficacy (how much insecticide is on the net at a particular point and the chemical’s killing effect on vector mosquitoes)
* Fabric integrity (the extent of physical damage).

The 2011 WHO guidelines recommend assessing the physical LLIN durability using the proportionate Hole Index (pHI). The pHI scoring uses the number and sizes of holes in a net as a measure of physical net integrity. Bio-efficacy testing uses known pure breed species of *Anopheles* mosquitoes (in our case, laboratory-bred female *Anopheles arabiensis*) exposed to LLIN materials from different parts of the net. Knock down times at 30 to 60 minutes and mortality rates of *Anopheles* mosquitoes 24 hours after exposure to LLINs measure the efficacy of the netting material. Chemical assays measure the amount of insecticide still on the net. In 2013, the WHO released additional technical guidance outlining how to estimate the actual physical survival of nets and the median survival time calculated from multiple data points.

## Background

In Zimbabwe, the mainstay of malaria prevention has been vector control through the use of indoor residual spraying (IRS) and promotion of LLINs. Since 2010, financial support from PMI and the Global Fund (GF) has enabled the NMCP to scale up the use of LLINs. Currently, NMCP with support from partners promotes LLINs in 35 of the 47 malaria risk districts with the aim of attaining universal access. GF and PMI supported mass LLIN distribution campaigns in 2013, 2014, and 2016. In 2015, the NMCP, through PSI, conducted a mini-campaign targeting pupils in grades three and six in 12 districts of Mashonaland Central and Mashonaland West Provinces. These were selected to represent different malaria epidemiological patterns and socio-ecological disparities.

In 2016, The NMCP and partners initiated a net durability study to establish the following evidence:

* Longevity of the LLIN-fabric
* Survivorship/attrition rate
* Bio-efficacy of the LLINs over time
* Chemical content over time.

The durability study uses a prospective longitudinal study approach, in which nets are identified at the time of distribution and then followed at regular intervals, from six months up to 36 months. There is evidence to suggest that prospective follow-up of a cohort of nets is a suitable method for determining attrition and the decline in fabric integrity and insecticidal activity of a product over time. The study overview is summarized in Figure 1 below.

**Figure1:** **LLIN durability monitoring study overview**

**Distribution**

**Assess**

Attrition

Integrity

***Subsample****:*

Insecticidal residue

Insecticidal effectiveness

**Assess**

Attrition

Integrity

***Subsample:***

Insecticidal residue

Insecticidal effectiveness

**Assess**

Attrition

Integrity

***Subsample:***

Insecticidal residue

Insecticidal effectiveness

Damage mechanism (optional)

**Sampling (maximum 6 months after campaign)**

**Assess**

Attrition

Integrity

***Subsample:***

Insecticidal residue

Insecticidal effectiveness

The durability study focuses on the LLINs distributed by PSI to pupils who in 2015 were in grade 6 in the 12 districts of Mashonaland Central and Mashonaland West Provinces. The districts are Bindura, Centenary, Guruve, Hurungwe, Kariba, Mbire, Makonde, Mazowe, Mt Darwin, Rushinga, Shamva and Zvimba. PSI distributed two brands of LLINs—DawaPlus 2.0 and DuraNet.

Using WHO guidelines, PSI and ZAPIM assessed physical LLIN durability using the pHI at month 6 and month 18 post distribution. (Note that the month 12 assessment was deferred to 18 months to ensure the smooth handover and takeover of the study from PSI to ZAPIM.)

## Objectives of the month 18 assessment

1. To assess LLIN physical durability (survivorship, attrition and integrity) and insecticidal activity and content, and to estimate median LLIN survival of DawaPlus 2.0 and DuraNet LLINs in 12 malaria endemic districts in Mashonaland Central and Mashonaland West Provinces in Zimbabwe over the 18-Month period and.
2. To compare the physical durability (survivorship, attrition and integrity) of DawaPlus 2.0 and DuraNet LLINs across the different priority sectors (peri-urban, commercial farming, rural, and mining) and identify major determinants of field performance.
3. To describe major behavioral aspects of net care and repair and their impact on overall net durability (survivorship, physical durability and insecticidal activity).
4. To assess the impact of socioeconomic factors on LLIN performance in different priority sectors (peri-urban, rural, mining and commercial farming settlements).

This report details the findings of the month 18 (midpoint) assessment. The framework for determining the proportion of LLINs surviving in serviceable condition is presented in Figure 2 below. Where applicable, the findings of this month18 assessment are presented following this format.

**Figure 2: Framework for determining the proportion of LLINs surviving in serviceable condition**



# Methodology

The month 18 assessment used the same methodology implemented for the month 6 baseline, with only minimal changes to the questionnaire. Please see the overall durability study protocol and the month 6 baseline report for details on the overall methodology and sampling frame.

## Sample Frame and Size

The assessment was carried out in 12 malaria endemic districts in Mashonaland Central and West Provinces in Zimbabwe with differing malaria socio-demographic and ecological profiles: rural, commercial farming, peri-urban, and mining community. PSI provided a master list of 1,847 households that participated during the month 6 baseline. Based on the master list, all households were expected to be visited in the 12 districts for the month 18 assessment. The number of households targeted in each sector was as follows:

* Rural: 473 households
* Commercial Farming: 468 households
* Peri-urban: 454 households
* Mining: 452 households.

From the 1, 847 households, the same LLIN given to a sixth grader and followed up at baseline was selected for investigation at 18 months (and will be followed up at 24 and 36 months). For bioassays and chemical analysis, 105 LLINs (53 DuraNet and 52 DawaPlus 2.0) were selected and removed (with replacements given) from randomly-selected households. In order to maximize the response rate, a minimum of three visits or call backs were made to a household before the respondent was deemed completely unavailable for the interview.

## Questionnaire

A structured questionnaire similar to the one used for the month 6 baseline was administered to heads of households. A few questions were added or rephrased to improve data quality, based on experience gained during the month 6 assessment. The questionnaire collected the following basic information:

* Household characteristics (composition, assets, factors potentially associated with net damage)
* Status of LLINs received by six graders from the mini-campaign and identification of any new nets obtained from any source post-campaign
* Exposure to care and repair messages
* Net care and repair behavior and attitudes and perceptions towards care and repair (assessed using a series of Likert score questions),
* Presence or absence of mini-campaign nets (received by sixth graders) and reasons for loss, if applicable
* Assessment of existing mini-campaign nets, including use patterns (location, type of sleeping place, users of the net), recalled damage mechanisms, washing and drying habits and a physical assessment of holes and repairs on each net
* Assessment of any other net in the household’s possession (nets not from the mini-campaign).

The questionnaire was programmed in the SurveyToGo software and configured on smartphones. The smartphones were used to collect the data and had the capability to choose either English or Shona when administering the questionnaire. This software was also used for the baseline study. As a backup mechanism, the smartphones were configured so that all completed interviews would be automatically uploaded on the SurveyToGo server. Data were synchronized to the server at the end of each day or interview for enhanced security, quality assurance, and data protection. In cases where the research assistants had data-sync challenges, the team leaders, supervisors, and ZAPIM team members were always available to provide assistance.

## Training and Field Work

### Training

The training of 44 research assistants, 12 district team leaders and two provincial supervisors took place on April 20–22, 2017. The research assistants were drawn from the Environmental Health Technicians and Environmental Health Officers, with the team leaders being District Environmental Health Officers. The provincial supervisors were Provincial Field Officers. ZAPIM facilitated the training with technical assistance from the NMCP and NIHR. The training sessions covered the following areas:

* Background of the LLIN Durability Study and reasons for undertaking the study
* Research Ethics
* Experiences from the baseline study (which was done by PSI at six months)—good practices, challenges, lessons learned, and recommendations
* Interviewing techniques and field procedures
* Detailed review of the questionnaire content, instruction and practice, and mock interviews between participants in the classroom
* Review of all the consent forms including the process of informed consent, storage, and safety for consent forms
* Roles and responsibilities of the supervisors, team leaders, and research assistants during the survey
* Use and maintenance of smartphones as well as administration of questionnaire using smartphone and troubleshooting

Throughout the training, the participants were reminded to follow local community norms and customs during their field work and to be sensitive to the different cultures in the areas of operation. Team leaders and supervisors were also trained in methods of data quality control procedures and effective fieldwork coordination.

### Fieldwork

Forty-four research assistants conducted data collection for the study. Each district had research assistants and one team leader. The two provincial supervisors had overall responsibility for supervising the district teams in the provinces. The ZAPIM team members, NMCP Vector Control Officer, NIHR Principal Entomologist, and Principal Technologist supervised field work in all the districts. The research assistants completed the daily tracker or summary sheet together with the district team leaders and then sent to the provincial and national supervisors. Completed interviews were transferred from each research assistant’s smartphone to the SurveyToGo server on a daily basis. From the server, the ZAPIM team could easily identify the smartphones whose data had not been transferred and immediately assist the field staff. In order to facilitate communication and monitoring, each research assistant was assigned a unique identification number. Data collection took place from April 25 to May 12, 2017.

## Bioassays and chemical content analysis

NIHR conducted bioassays using the standard WHO method noted above. Wallon Laboratory based in Belgium conducted insecticide residual testing, also referred to as chemical residue or chemical analysis, using gas or high performance liquid chromatographic methods to determine insecticide levels in the LLIN fabric.

## Ethical Considerations

The survey was approved by the Medical Research Council of Zimbabwe and Abt Associates’ Institutional Review Board. Informed written consent was obtained from the head of the household before the questionnaires were administered. Signed consent was also obtained from the guardians of all children between 15 and 17 years of age before they participated in the interviews. All the respondents retained a copy of the consent form. Household identifiers were used only for locating and identifying households. At the analysis level, these were de-identified and were therefore not linked with the household data.

## Data Processing and Analysis

The ZAPIM staff made sure that all the data from the smartphones were transferred to the SurveyToGo software before it was edited, cleaned, and tabulated. The data were then exported to Microsoft Excel for easy checking of any inconsistencies. Once the team was satisfied with the quality of data, the data were exported from MS Excel to STATA Version 14 for analysis.

## Quality Control and Assurance

ZAPIM used a variety of complementary quality control measures and checks to ensure that the data and findings were of high quality. Some of the controls include the following:

* **Training:** All participants involved in the LLIN Durability Study received comprehensive training to strengthen their capacity in their designated area of focus. All research assistants, district team leaders, and provincial supervisors were trained on the data collection tools at one central location, which ensured the sharing of the same information and understanding of the survey objectives, instruments, and expected survey output.
* **Field teams supervision:** District team leaders, provincial supervisors, and national supervisors provided field team oversight using supervisory checklists, observing the interviews, and visiting interviewed households for spot checks.
* **Field editing:**Interviews were edited by the research assistants and team leaders in the field before they were synced. This was done to ensure that quality data was collected and high response rates for households achieved.

Figure 3 below summarizes the quality assurance activities in terms of general timing and flow of non-overlapping steps. These steps are organized under three stages, as is the rest of the document: pre-data collection, data collection, and post-data collection.

**Figure 3: Summary of the Quality Assurance Activities of the LLIN Durability Study**

## Limitations of the Study

Not all of the targeted households were interviewed. The study was conducted during the school holiday, so some of the households were not interviewed due to absenteeism and relocation. The research teams also were not able to follow up on some of the study nets since they had been left at boarding schools by the beneficiaries. Other nets were locked in the rooms. A total of six households refused to be interviewed for different reasons.

# Results

## Sample Coverage

PSI provided a master list of 1,847 households that participated at the month 6 baseline (assessment. Based on the master list, all households were expected to be visited in the 12 districts. Of these sampled households, 25.6% (473 households) were in rural areas, 25.3% (468 households) in commercial farming areas, 24.6% (454 households) in peri-urban areas, and 24.5% (452 households) in mining areas. Out of the 1,847 households selected for the sample, 1,740 (94%) were successfully interviewed. This was nearly the same coverage as that attained during the month 6 baseline assessment. Households that relocated to nearby areas were followed up and interviewed. The majority of the respondents were spouses of head of household (45.7%), followed by head of household (36.3%). The rest were any other family members aged 18 years and above.

## Characteristics of Households Surveyed

This survey also collected information on other socioeconomic characteristics such as household’s main material of the roof, walls and floors, household’s main energy source for cooking, and fly screening of the windows. The physical characteristics of the dwelling in which household members lives are important determinants of the health status of household members and may be potentially associated with net damage. They can also be indicators of the socioeconomic status of the household, which may have a direct bearing on health and general welfare. This information will be used to interpret findings presented later in the report. Table 1 below shows some of the household characteristics according to sector.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  | Table 1. Percentage distribution of households by selected household characteristics, according to the sector, Net Durability Study at 18 Months 2017, Zimbabwe |  |  |

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| Number and Percentage of Households   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **Rural** | | **Commercial** | | **Mining** | | **Peri-Urban** | | **Total** | | |  | Number | Percent | Number | Percent | Number | Percent | Number | Percent | Number | Percent | | **Roof Material** |  |  |  |  |  |  |  |  |  |  | | Grass | 156 | 30.9 | 170 | 36.9 | 29 | 7.2 | 27 | 7.3 | 382 | 22.0 | | Zinc/Iron | 101 | 20.0 | 119 | 25.8 | 121 | 30.1 | 77 | 20.7 | 418 | 24.0 | | Asbestos | 244 | 48.3 | 168 | 36.4 | 240 | 59.7 | 249 | 66.9 | 901 | 51.8 | | Tiles | 3 | 0.6 | 2 | 0.4 | 10 | 2.5 | 7 | 1.9 | 22 | 1.3 | | Cement | 1 | 0.2 | 1 | 0.2 | 1 | 0.3 | 12 | 3.2 | 15 | 0.9 | | Other | 0 | 0.0 | 1 | 0.2 | 1 | 0.3 | 0 | 0 | 2 | 0.1 | | **Wall Material** |  |  |  |  |  |  |  |  |  |  | | Grass | 5 | 1.0 | 5 | 1.1 | 5 | 1.2 | 1 | 0.3 | 16 | 0.9 | | Mud | 69 | 13.7 | 107 | 23.2 | 30 | 7.5 | 21 | 5.7 | 227 | 13.1 | | Plastered | 163 | 32.3 | 70 | 15.2 | 80 | 19.9 | 156 | 41.9 | 469 | 27.0 | | Brick | 266 | 52.7 | 265 | 57.5 | 272 | 67.7 | 189 | 50.8 | 992 | 57.0 | | Other | 2 | 0.4 | 14 | 3.0 | 15 | 3.7 | 5 | 1.3 | 36 | 2.1 | | **Floor Material** |  |  |  |  |  |  |  |  |  |  | | Earth or Sand | 66 | 13.1 | 89 | 19.3 | 21 | 5.2 | 49 | 13.2 | 225 | 12.9 | | Clay/ Dung | 121 | 24.0 | 137 | 29.7 | 19 | 4.7 | 18 | 4.8 | 295 | 17.0 | | Wood or bamboo | 1 | 0.2 | 1 | 0.2 | 6 | 1.5 | 1 | 0.3 | 9 | 0.5 | | Vinyl or Parquet | 2 | 0.4 | 1 | 0.2 | 4 | 1 | 1 | 0.3 | 8 | 0.5 | | Tiles or Cement | 315 | 62.4 | 232 | 50.3 | 352 | 87.6 | 298 | 80.1 | 1,197 | 68.8 | | Other | 0 | 0.0 | 1 | 0.2 | 0 | 0 | 5 | 1.3 | 6 | 0.3 | | **Energy Source for Cooking** |  |  |  |  |  |  |  |  |  |  | | Firewood | 492 | 97.4 | 447 | 97.0 | 187 | 46.5 | 258 | 69.4 | 1,384 | 79.5 | | Charcoal | 0 | 0.0 | 0 | 0.0 | 1 | 0.3 | 4 | 1.1 | 5 | 0.3 | | Kerosene | 1 | 0.2 | 0 | 0.0 | 3 | 0.8 | 2 | 0.5 | 6 | 0.3 | | Gas | 1 | 0.2 | 0 | 0.0 | 3 | 0.8 | 24 | 6.5 | 28 | 1.6 | | Electricity | 11 | 2.2 | 14 | 3.0 | 208 | 51.7 | 84 | 22.6 | 317 | 18.2 | |  | **505** | **100.0** | **461** | **100.0** | **402** | **100.0** | **372** | **100.0** | **1,740** | **100.0** | |  |  |  |  |  |  |  |  |  |  |  | |

There were no substantial or otherwise relevant differences between household characteristics at the 6 month or 18 month time points. The respondents were also asked if ever they cook in a room that is also used for sleeping. Overall, 69.7% of households said they had never cooked in a room that is also used for sleeping compared to 68.6% at month 6. This was highest in the mining sector at points (76.3% at month 6 and 78.6% at month 18). Figure 4 illustrates the frequency of cooking in a room that is also used for sleeping according to sector.

**Figure 4: Percentage of households showing the frequency of cooking in a sleeping room at 6 and 18 Month Points, Net Durability Study at 18 Months 2017, Zimbabwe**

Data were also collected on whether households stored food or crop in any of the rooms used for sleeping. Overall, 64.1% of all households interviewed at month 18 said they stored food or crop in any of the rooms used for sleeping compared to 68.4% at month 6. The respondents were asked whether the windows of their houses were fly-screened. This is not a common practice across the four sectors and was an additional question added for the 18 month assessment. More than 96% of the households in each sector indicated that the windows were not fly-screened. Overall, about 46 percent of the respondents were not aware that the windows should be fly-screened. Of the remaining respondents, 28 percent said they did not have money to buy the screens, 15 percent said they did not know how to do it, nine percent said they did not own the house, and two percent said the house did not have windows.

### Distribution of LLINS monitored according to brand

A total of 2,000 LLINs were distributed to the households enrolled for assessment at the month 6 baseline, and the same LLINs would be followed up to 36 months. According to the data set provided by PSI, 1,834 LLINs were monitored during the month 6 assessment. Of these, 923(50.3%) were DawaPlus 2.0 and 911 (49.7%) were DuraNet A total of 1,329 LLINs were seen from the 1,740 households interviewed at month 18. Sections 3.4 and 3.5 explain in greater detail reasons for the decline between the month 6 and month 18 assessments and provide a detailed analysis of net survivorship and attrition during at month 18. Table 2 and Figure 4 show the distribution of LLINs monitored at month 18 per brand in each district and by sector.

**Table 2 Distribution of LLINs monitored at month 6 and month 18 per brand in each district, Net Durability Study at 18 Months 2017, Zimbabwe**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Period | Province | District | DawaPlus 2.0 | DuraNet | Total | Percent | |
| Number of Nets | | Dawa | DuraNet |
| Month 6 | Mashonaland Central | Bindura | 128 | 109 | 237 | 54.0 | 46.0 |
| Guruve | 91 | 60 | 151 | 60.3 | 39.7 |
| Mazowe | 97 | 141 | 238 | 40.8 | 59.2 |
| Mbire | 38 | 36 | 74 | 51.4 | 48.6 |
| Mt Darwin | 50 | 61 | 111 | 45.0 | 55.0 |
| Muzarabani | 95 | 96 | 191 | 49.7 | 50.3 |
| Rushinga | 1 | 13 | 14 | 7.1 | 92.9 |
| Shamva | 88 | 78 | 166 | 53.0 | 47.0 |
| Mashonaland West | Hurungwe | 106 | 101 | 207 | 51.2 | 48.8 |
| Kariba | 9 | 9 | 18 | 50 | 50 |
| Makonde | 111 | 110 | 221 | 50.2 | 49.8 |
| Zvimba | 109 | 97 | 206 | 52.9 | 47.1 |
| **Total** | | **923** | **911** | **1834** | **50.3** | **49.7** |
| Month 18 | Mashonaland Central | Bindura | 93 | 73 | 166 | 56.0 | 44.0 |
| Guruve | 73 | 40 | 113 | 64.6 | 35.4 |
| Mazowe | 82 | 98 | 180 | 45.6 | 54.4 |
| Mbire | 32 | 28 | 60 | 53.3 | 46.7 |
| Mt Darwin | 46 | 50 | 96 | 47.9 | 52.1 |
| Muzarabani | 61 | 64 | 125 | 48.8 | 51.2 |
| Rushinga | 1 | 12 | 13 | 7.7 | 92.3 |
| Shamva | 68 | 60 | 128 | 53.1 | 46.9 |
| Mashonaland West | Hurungwe | 73 | 62 | 135 | 54.1 | 45.9 |
| Kariba | 9 | 5 | 14 | 64.3 | 35.7 |
| Makonde | 81 | 84 | 165 | 49.1 | 50.9 |
| Zvimba | 67 | 67 | 134 | 50.0 | 50.0 |
| **Total** | | **686** | **643** | **1,329** | **51.6** | **48.4** |

**Figure 5:** **Distribution of LLINs monitored at month 6 and month 18 per brand in each sector, Net Durability Study at 18 Months 2017, Zimbabwe**

More DawaPlus 2.0 nets were monitored for durability than the DuraNet nets in the rural, and commercial farming sectors. There were more DuraNet nets than DawaPlus 2.0 nets in the mining sector, with the difference being marginal at 18 month point.

## All-Cause Attrition

For the purpose of the study (and as outlined in Figure 2 above), all cause attrition is defined as the proportion of LLINs lost for any reason, including attrited nets (those destroyed, discarded or repurposed) and lost nets (those given away, used elsewhere or stolen). The findings are compared with those of the month 6 baseline assessment in Table 3 below.

**Table 3: LLIN All-cause attrition at month 6 and month 18 by District, Net Durability Study at 18 Months 2017, Zimbabwe**

**Cording**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Period | Province | District | Total number of nets expected to be monitored | Number of nets no longer in HH | Percent  (All-Cause Attrition) |
| 6 Months | Mashonaland Central | Bindura | 237 | 27 | 11.4 |
| Guruve | 151 | 0 | 0 |
| Mazowe | 238 | 29 | 12.2 |
| Mbire | 74 | 0 | 0 |
| Mt Darwin | 111 | 0 | 0 |
| Muzarabani | 191 | 4 | 2.1 |
| Rushinga | 14 | 0 | 0 |
| Shamva | 166 | 0 | 0 |
| Mashonaland West | Hurungwe | 207 | 0 | 0 |
| Kariba | 18 | 0 | 0 |
| Makonde | 221 | 0 | 0 |
| Zvimba | 206 | 52 | 2.5 |
| **Total** | | **1834** | **112** | **6.1** |
| 18 Months |  | Bindura | 220 | 54 | 24.5 |
|  | Guruve | 142 | 29 | 20.4 |
|  | Mazowe | 225 | 45 | 20.0 |
|  | Mbire | 73 | 13 | 17.8 |
|  | Mt Darwin | 112 | 16 | 14.3 |
|  | Muzarabani | 180 | 55 | 30.6 |
|  | Rushinga | 15 | 2 | 13.3 |
|  | Shamva | 159 | 31 | 19.5 |
|  | Hurungwe | 188 | 53 | 28.2 |
|  | Kariba | 18 | 4 | 22.2 |
|  | Makonde | 225 | 60 | 26.7 |
|  | Zvimba | 169 | 35 | 20.7 |
| **Total** | | **1,726** | **397** | **23.0** |

Net all-cause attrition increased almost four-fold from the baseline (6.1%) to the month 18 time point (23.0%). During the month 18 assessment, it was highest in Muzarabani (30.4%), followed by Hurungwe (28.2%), Makonde (26.4%) and Bindura (24.6%). Rushinga had the lowest attrition (12.5%), potentially because of the low number of nets monitored. Further analysis was also done to establish net attrition by sector. Figure 5 below shows net attrition by sector.

**Figure 6: LLIN attrition at month 6 and month 18 by sector, Net Durability Study at 18 Months 2017, Zimbabwe**

LLIN attrition was highest in the peri-urban sector (7.7%) at month 6 and in the commercial farming sector (29.4%) at month 18. While the pattern was almost the same at month 18 vs month 6 for the rural (20.8%), mining (20.8%) and peri-urban (20.5%) sectors, net attrition was also significantly higher at month 18 in the three sectors. 3. Table 4 compares the net attrition by type of LLIN at six and 18 months.

**Table 4: LLIN attrition (%) by type of LLIN at month 6 and month 18, Net Durability Study at 18 Months 2017, Zimbabwe**

|  |  |  |
| --- | --- | --- |
| Brand of LLIN | LLIN Attrition at 6 Months | LLIN Attrition at 18 Months |
| DawaPlus 2.0 | 5.3% | 21.0% |
| DuraNet | 6.8% | 25.1% |
| **Total** | **6.1%** | **23.0%** |

LLIN attrition was higher in DuraNet than in Dawa both at the month 6 and month 18. However, attrition of LLINs did not differ substantially by brand at six months; the difference increased marginally at 18 months.

### Reasons for All-Cause LLIN Attrition

The households that had a net no longer in the household were asked to indicate what happened to the LLIN. As described above, the proportion of cohort LLINs attrited and lost for any reason, including being given away, (all cause attrition) increased from 6.1% at baseline to 23% at month 18. At month 18, the most common reason given for a net no longer being present in the household was that it was being used by family members elsewhere. About 13% (n=1726) of the LLINs were being used by family members elsewhere as compared to only approximately 2% at baseline. This was a common reason across the four sectors. At baseline stage, almost 3% of the LLINs were given away to relatives and this was the main reason cited for a missing net. Table 5 shows the reasons given for missing the net at month 6 and month 18.

**Table 5: Reasons given for a missing net at 6 months and 18 months** **Point, Net Durability Study at 18 Months 2017, Zimbabwe**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reasons** | **Month 6** | | **Month 18** | |
| **Attrited** | | | | |
|  | Number of LLINs | Percent (n=1834) | Number of LLINs | Percent (n=1726) |
| Net was destroyed accidentally | 4 | 0.2 | 24 | 1.4 |
| Net was thrown away | 0 | 0 | 22 | 1.3 |
| Material used for other purpose | 0 | 0 | 7 | 0.4 |
| **Sub-Total** | **4** | **0.2** | **53** | **3.1** |
| **Nets Lost** | | | | |
| Used by family members elsewhere | 35 | 1.9 | 227 | 13.1 |
| Net was given away to relatives | 53 | 2.9 | 46 | 2.6 |
| Net was given away to others | 11 | 0.6 | 29 | 1.7 |
| Net was stolen | 4 | 0.2 | 17 | 1.0 |
| Net was sold | 1 | 0.1 | 1 | 0.1 |
| Do not know | 4 | 0.2 | 24 | 1.4 |
| **Sub-Total** | **108** | **5.9** | **344** | **19.9** |
| **Total** | **112** | **6.1** | **397** | **23.0** |

## Attrition Due to Wear and Tear

This section presents findings on the cohort nets that were reported as attrited because they were too worn and therefore thrown away, destroyed or used for other purposes. Table 6 below shows attrition due to wear and tear at baseline and at month 18.

**Table 6: Attrition due to wear and tear at month 6 and month 18**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Reasons** | **Month 6** | | **Month18** | |
| Number of LLINs | Percent (n=1834) | Number of LLINs | Percent (n=1726) |
| Net was destroyed accidentally | 4 | 0.2 | 24 | 1.4 |
| Net was thrown away | 0 | 0 | 22 | 1.3 |
| Material used for other purpose | 0 | 0 | 7 | 0.4 |
| **Total** | **4** | **0.2** | **53** | **3.1** |

The proportion of cohort nets that were reported lost due to wear and tear increased from 0.2% at baseline to 3.1% during 18 month period.

## Physical Assessment of Results

Fabric integrity results are presented by district, sector and brand of net, based on the three integrity condition categories: “good,” “acceptable,” and “torn.” The baseline results and those at month 18 are also compared. Fabric or physical integrity was assessed by looking at the level of damage (number of holes and repairs) on the LLINs. This was done by counting and classifying the number of holes (including tears in the netting and split seams) by their location on the net and their size. Holes were classified into the following categories from the WHO guidelines: smaller than a thumb (0.5–2 cm), larger than a thumb but smaller than a fist (2–10 cm), larger than a fist but smaller than a head (10–25 cm) and larger than a head (> 25 cm). Holes less than 0.5 cm were ignored. Evidence of repairs to the net fabric and the type of repair were also recorded on the hole counting form, but not considered as holes. Thus, using the proportional hole index (pHI):

* “Good”= total hole surface area <0.01m² or pHI<64
* “Acceptable”= total hole surface area <=0.1 m² or pHI= 65-642
* “Torn ”= total hole surface area >0.1m² or pHI>642.
* Serviceable nets= Good + Acceptable.

To calculate the pHI, the number of holes in each category was multiplied by a category weight: *pHI = # size 1 holes + (# size 2 holes x 23) + (# size 3 holes x 196) + (# size 4 holes x 576).*

A total of 1,329 LLINS (686 DawaPlus 2.0 and 643 DuraNet) were assessed for physical condition or fabric integrity at 18-month point. Of these, 845 LLINs (63.6%) fell into the “good” category, 273 LLINs (20.5%) were categorized as “acceptable,” and 211 LLINs (15.9%) fell into “torn” category. Thus, overall, 84.1% of the LLINs were still serviceable as compared to 97% at baseline. There was a significant decline from baseline where 93% were in the “good” category, 4% were categorized as “acceptable” and 3% were in “torn” category. Table 7 shows the physical condition or fabric integrity at 6 and 18 months period by type of LLIN.

**Table 7: Physical assessment of results at month 6 and month 18 by type of LLIN, Net Durability Study at 18 Months 2017, Zimbabwe**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Period | Brand of LLIN | pHI Category | | | | |
| **Good= pHI<64** | **Acceptable= pHI=65-642** | **Serviceable= Good + Acceptable** | **Torn= pHI>642** | **Total** |
| **6 Months** | DawaPlus 2.0 | 859 | 36 | 895 | 28 | 923 |
| **%** | **93.1** | **3.9** | **97.0** | **3.0** | **100.0** |
|  | | | | | |
| DuraNet | 847 | 37 | 884 | 27 | 911 |
| **%** | **93.0** | **4.0** | **97.0** | **3.0** | **100.0** |
|  | | | | | |
| **Total** | **1,706** | **73** | **1,779** | **55** | **1,834** |
| **%** | **93.0** | **4.0** | **97.0** | **3.0** | **100.0** |
| **18 Months** | DawaPlus 2.0 | 441 | 151 | **592** | 94 | 686 |
| **%** | **64.3** | **22.0** | **86.3** | **13.7** | **100.0** |
|  | | | | | |
| DuraNet | 404 | 122 | **526** | 117 | 643 |
| **%** | **62.8** | **19.0** | **81.8** | **18.2** | **100.0** |
|  | | | | | |
| **Total** | **845** | **273** | **1,118** | **211** | **1,329** |
| **%** | **63.6** | **20.5** | **84.1** | **15.9** | **100.0** |

Overall, just over 84% of the available LLINs were in “serviceable” condition. Slightly more than 86% of the DawaPlus 2.0 were in “serviceable” condition, compared to nearly 82% of the DuraNet nets. At baseline, there was no difference in the physical condition of the two brands and ninety-seven percent of both DawaPlus 2.0 and DuraNet were still “serviceable”. Further analysis was done to determine the physical condition of the nets according to sector. Figure 6 gives a comparison of the fabric integrity at six and eighteen months by sector.

**Figure 7: Physical Assessment of Results at 6 and 18-month point, by sector, Net Durability Study at 18 Months 2017, Zimbabwe**

All the sectors, except peri-urban, had more than 80% of the LLINs classified as “serviceable” at month 18. Fabric integrity was highest in the mining sector (90.2%) for the LLINs in “serviceable” condition, followed by the commercial farming sector (85.1%) and lowest in the peri-urban sector (78.9%). Fabric integrity was also highest in the same sector at baseline (98.6%) and lowest in the commercial sector. The proportion of LLINs in the torn category increased from 3% at baseline to 15.9% at month 18.

## Net Care and Repair

This section presents findings on the care of nets owned by households that participated in the assessment. Data were collected from households on whether they had experienced holes in the nets that they own, how the holes happened, and net repair. Overall, 55.3 percent of the households had experienced holes in the nets that they owned at month 18 compared to 25.5% at baseline.

**Figure 8: Percentage of households that experienced net holes at 6 and 18 Month Points, by sector, Net Durability Study at 18 Months 2017, Zimbabwe**

The proportion of households that experienced holes in the nets doubled between month 6 and month 18 in rural, mining and peri-urban sectors. The households cited three major contributing factors for the holes in the nets: got caught on edge or nail, pulled and torn on corner, and caused by rats or mice. Overall, 88.9 percent of the LLINs monitored were not repaired at all by way of fully closing the hole. About 4.6 percent of the LLINs had one hole repaired. This is clear lack of culture among the communities to repair damaged nets. Table 8 below shows the reasons given by households for not repairing the holes.

**Table 8: Reasons given by households for not repairing holes at month 6 and month 18, Net Durability Study at 18 Months 2017, Zimbabwe**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Reasons | 6 Months | | 18 Months | |
| Frequency | Percent | Frequency | Percent |
| Holes are not big enough to repair | 104 | 57.8 | 124 | 21.8 |
| Don’t know how to repair | 19 | 10.6 | 110 | 19.3 |
| No time for this | 7 | 3.9 | 94 | 16.5 |
| It is not necessary | 6 | 3.3 | 88 | 15.5 |
| It is not possible to repair holes | 1 | 0.6 | 61 | 10.7 |
| Do not have materials to repair | 6 | 3.3 | 33 | 5.8 |
| Don’t know | 26 | 14.4 | 18 | 3.2 |
| Other | 11 | 6.1 | 41 | 7.2 |
| Total | **180** | **100.0** | **569** | **100.0** |

Slightly less than one-quarter of respondents (21.8%) felt that the holes were not big enough to repair as compared to 57.8% at month 6. A significant proportion (19.3%) indicated that they did not know how to repair the holes. This was almost double the proportion of respondents who cited the same reason at baseline stage (10.6%). About 17 percent of the households had no time to repair the holes, and 15.5 percent thought that it was unnecessary. About seven percent of the respondents indicated that the nets were used by children or other family and not aware that the net had been torn. They also had other nets to use after getting replacements.

## Survivorship of Serviceable LLINs

The study looked at the proportion of nets surviving in serviceable condition, calculated as the proportion of nets in serviceable condition among those nets not lost to follow up (see Figure 2). Table 9 below gives a comparison of the proportion of nets surviving in serviceable condition at baseline and month 18.

**Table 9: Proportion of Nets Surviving in Serviceable Condition at month 6 and month 18, by Type of LLIN**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Period | Brand of LLIN | All Cohort nets not lost to follow up (excluding nets given away, used elsewhere or stolen) | Number of Nets in Serviceable condition | % of Surviving Nets |
| Month 6 | DawaPlus 2.0 | 925 | 895 | 96.7% |
| DuraNet | 913 | 884 | 96.8% |
| Total | | **1,838** | **1,779** | **96.7%** |
|  | | | | |
| Month 18 | DawaPlus 2.0 | 686 | 592 | 86.3% |
| DuraNet | 643 | 526 | 81.8% |
| Total | | **1,382** | **1,118** | **80.9** |

The proportion of nets surviving in serviceable condition decreased from 96.7% at baseline to 80.9% during at month 18. Survivorship did not differ much by brand at baseline. Survivorship of DawaPlus 2.0 was higher (86.3%) than that of DuraNet (81.8%) during 18 month period. Further analysis was done to determine the proportion of nets surviving in serviceable condition according to sector. Table 10 below gives a comparison of the proportion of nets surviving in serviceable condition at baseline and 18 month period according to sector.

**Table 10: Proportion of Nets Surviving in Serviceable Condition at month 6 and month 18, by Sector**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Period | Sector | All Cohort nets not lost to follow up (excluding nets given away, used elsewhere or stolen) | Number of Nets in Serviceable Condition | % of Surviving Nets |
| Month 6 | Rural | 475 | 461 | 97.0% |
| Commercial Farming | 443 | 417 | 94.1% |
| Mining | 468 | 460 | 98.3% |
| Peri-Urban | 452 | 441 | 97.5% |
| Total | | **1,838** | **1,779** | **96.7%** |
|  | | | | |
| Month 18 | Rural | 412 | 327 | 79.3% |
| Commercial Farming | 345 | 274 | 79.4% |
| Mining | 328 | 285 | 86.9% |
| Peri-Urban | 297 | 232 | 78.1% |
| Total | | **1,382** | **1,118** | **80.9%** |

Survivorship was highest in the mining sector at baseline (98.3%) and at month 18 (86.9%). There was no substantial difference between the commercial farming, peri-urban and rural sector at month 18 period. Survivorship was lowest in the commercial farming sector (94.1%) at baseline.

## Determinants of LLIN Field Performance

Various questions were asked to assess the condition and the performance of the study nets in the field. The questions included the location of the net (where the net was found), type of sleeping place the net has been used for mostly, net use the night before the survey, number of nights that the net was used in the last week, net washing frequencies and the type of soap used for the last wash. All these questions have a bearing on the condition and performance of the LLINs.

Almost 44% of the nets were inside the house hanging and folded up or tied, 23% were inside house hanging loose over sleeping place, almost 16% were unpacked and stored away, 12% were not hanging but not stored, two percent of the nets were stored away and still in the package, with one percent on the washing line.

The reed mat was the most popular sleeping space (43.2%), followed by bed and mattress (39.3%) and ground (6.4%), with the least popular being grass and outside (0.2% each). The use of reed mat was most common in rural (37.8%) and commercial sectors (30.7%). It was less common in the peri-urban (16.4%) and mining sector (15%). At baseline, the reed mat (42.8%) and bed and mattress (25.9%) were also the most common sleeping places.

Over 55 percent of the nets were slept under by any person the night before the study (rural 60.6%, commercial 58.5%, mining 41.0%, and peri-urban 59.6%). About 46 percent of the nets had been used in all the nights of the week before the study (rural 53.1%, commercial 47.5%, mining 33.7%, and peri-urban 47.1%). Slightly greater than 19 percent had not been used the previous week, 14.9% had been used for some nights (1-4), 11% for most nights (5-6), and 8.6% had not been used at all.

About 84% of the nets had ever been washed as compared to 61% at baseline stage. The frequency of washing was very low at both time points. Almost 38% of the nets had been washed only once at month 18 as compared to 61.2% at baseline stage. About 33% of the nets had been washed only twice and 14% only three times as compared to 25.4% and 8.2% at baseline respectively. Only 10% of the nets had been washed at least four times and 5% had never been washed at 18-month point. The use of bar soap (baseline 38.5% and month 18 43.8%) and detergents (baseline 45.6% and month 18 35.6%) to wash the nets was a common practice across the sectors.

## Bioassay Results

The WHO cone bioassay method measures the knock down and mortality rates of susceptible mosquitoes after exposure to LLINs. NIHR used a laboratory-reared susceptible female *Anopheles* *arabiensis* strain in all bioassays. The WHO recommendation for definitions of effectiveness of LLINs based on bioassay results are, according to Kilian et al. 2008:

• Minimal effectiveness: KD60 ≥75% or mortality ≥ 50%

• Optimal effectiveness: KD60 ≥ 95% or mortality ≥ 80%

**Table 11: Effectiveness levels of LLINs on the basis of month 6 and month 18 bioassays when tested against *An. arabiensis* mosquitoes**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Period** | **Type of Net** | **Minimal Effectiveness** | | **Optimal Effectiveness** | |
| KD60 ≥75% | Mortality ≥ 50% | KD60 ≥ 95% | Mortality ≥ 80% |
| 6 Months Post Distribution | DawaPlus 2.0  (n=52) | 46 (88.5%) | 51 (98.1%) | 13 (25%) | 47 (90.4%) |
| DuraNet (n=53) | 53 (100%) | 53 (100%) | 52 (98.1%) | 48 (90.6%) |
| 18 Months Post Distribution | DawaPlus 2.0  (n=49) | 16 (32.7%) | 49 (100%) | 4 (8.2%) | 25 (51%) |
| DuraNet  (n=52) | 53 (100%) | 53 (100%) | 14 (26.4%) | 52 (98.1%) |

KD60 = Knock Down of mosquitoes 60 minutes after exposure to treated nets

**Figure 9: 24 hour bioassay results on DuraNet month 6 and month 18, Net Durability Study at 18 Months 2017, Zimbabwe**

Bioassays were conducted on 53 and 52 DuraNets at month 6 and month 18 respectively. At month 6, 48 (90.6%) of the nets had mosquitoes mortalities of 80% and above, whilst 5 (9.4%) of the nets had mortalities below 80%, which is the WHO minimum standard. For the bioassays conducted at month 18, 51(98.1%) of the nets had mortalities at 80% and above with 1 (1.9%) net having a mortality of 75%, which was the lowest recorded mortality at month 18.

**Figure 10: 24 hour bioassay results on DawaPlus 2.0 at month 6 and month 18, Net Durability Study at 18 Months 2017, Zimbabwe**

The above graph shows the bioassay results for DawaPlus.2.0 at month 6 and month 18 assessments. The results show that, at month 6, 47 (90.4%) of DawaPlus2.0 nets had mortalities of 80% or above and 5 (9.6%) having mortalities below 80%.The mortalities at month 6 ranged from 37.5 to 100%. At month 18, a total of 49 nets had bioassays done. The bioassay results showed that 26 (53.1%) nets had mortalities of 80% and above whilst 23 (46.9%) recorded mortalities below the optimal effectiveness of 80%.The range was 75% to 100%.

**Figure 12: Chemical results for DuraNet at month 6 and month 18 assessments, Net Durability Study at 18 Months 2017, Zimbabwe**

The chemical analysis results for DuraNet nets show that at month 6 (baseline) 45 (77.6%) of the nets had a chemical content within the recommended target dose of 4.35-7.25g/kg of alpha-cypermethrin, with 13 (22.4%) falling below the target dose. The results ranged from 1.23g/kg to 5.47g/kg with a mean of 4.62g/kg which is above the minimum target dose. At month 18, 25 (44.6%) DuraNet had the recommended target dose of 4.35-7.25g/kg. The mean at month 18 was 4.15g/kg which fell below the minimum target dose of 4.35g/kg.

**Figure 13: Chemical Results for DawaPlus 2.0 at month 6 and month 18 assessments, Net Durability Study at 18 Months 2017, Zimbabwe**

For DawaPlus 2.0 nets a total of 56 nets were analysed at month 6. Of these nets 26 (44.4%) had the required minimum target dose of between 1.5-2.5g/kg, whilst 30 (53.6%) were below the minimum target dose. The chemical content for DawaPlus2.0 net samples ranged from 0.46g/kg to 1.89g/kg at month 6 with a mean of 1.42g/kg and from 0.05-1.92 g/kg at month 18. At 18 months a total of 50 nets were analysed. Of these only 5 (10%) had required target doses and 45 (90%) had doses below the minimum of 4.35g/kg. The range was 0.05-1.92 g/kg with a mean of 0.94g/kg. For the DawaPlus 2.0 nets, none had the required chemical target dose of 2g/kg at both the month 6 and month 18 assessments.

# Discussion

LLIN durability monitoring indicated a decline in the proportion of LLINs surviving in serviceable condition from 96.7% percent at the six- month point to 80.9% at month 18. This was expected as six months is a short time for nets to have been significantly damaged. These preliminary findings are consistent with the results of Morgan et al (2015) in Mozambique, Gnanguenon et al (2014) in Nigeria and Hakizimana et al (2014) in Rwanda [7-8, 10]. Survivorship was lowest at baseline (94.1%) in the commercial farming sector compared to the other three sectors: rural, mining, and peri-urban, which were all above 97%. It was highest in the mining sector (86.9%) during 18 month period compared to the other three sectors whose survivorship ranged from 78.1% to 79.4%. Survivorship of DawaPlus 2.0 was higher (86.3%) than that of DuraNet (81.8%) at month18. It did not differ much by brand at baseline. For program planners preparing for replacement campaigns, it would be useful to have such data about type of nets in the field, rate of deterioration and which brand to prioritize as early as possible. Results from this assessment showed that from six to eighteen months, a quantifiable picture began to emerge regarding the physical deterioration of nets in the field.

Net all-cause attrition increased almost four-fold (23%) from the baseline to the 18 month time point. Attrition appears to be higher compared to findings from studies elsewhere. However, on a positive note, 13.1% were being used by family members elsewhere. Hassan et al. in Sudan, report 19% attrition after 18 months can be estimated. However, other studies report slightly higher rates of 20% attrition after 12 months in Uganda and Liberia, 43% after 18 months in Benin and 45% after 24 months in Sudan. Future LLIN monitoring efforts may need to investigate if such high proportion of nets said to be used by family members elsewhere still exist.

Using the pHI calculations, slightly more than 86% of the DawaPlus 2.0 were in serviceable condition at month 18. Nearly 82 percent of the DuraNet fell in the “serviceable” category. At baseline, there was no difference in the physical condition of the two brands. Ninety-seven percent of both DawaPlus 2.0 and DuraNet were still serviceable. Similar integrity patterns were noted for the DuraNet. This was expected, as six months is a short time for nets to have been significantly damaged. A limitation of this assessment is that repairs to nets that had developed holes were rarely observed. The households cited three major contributing factors for the holes in the nets. Overall, 88.9% of the LLINs with holes were not repaired at all. Low repair rates were also reported by Smith et al., Kilian et al. and Shirayama et al. so this appears to be a widespread issue. It is likely that longevity of nets can be significantly improved simply by making repairs to them and perhaps by extension, encouraging behaviour that would prevent the nets from developing holes to start with. The fact that the proportion of holes differed by net brand can also be used as a measure of net quality and have a profound impact on program planning and procurement decisions.

The analysis of determinants of damage in this assessment also revealed a number of factors that are associated with poverty (poor housing, crowding, absence of adequate sleeping places, sleeping on reed mat) as well as behavioural aspects such as letting the net hang loose during the day, not storing it properly when not in use (mice), having food or crops stored in the same room (mice) and the general attitude of the household towards net care and repair. Repair behaviour can be induced by intensifying SBCC activities. Although repair of damaged nets can be induced by improved attitude towards care and repair, this should be seen as an ultimate solution to measurably improve net condition. Focus should, therefore, be on preventive behaviour that protects the net from damage, such as folding or tying the net up every day, keeping children away, avoiding storing food or crops in the same room, and storing the net safely when not in use.

Factors that affect LLIN durability, can act to a greater or lesser extent, in different settings. Given the number of factors that affect LLIN durability and the variation between settings where they are distributed, it is not surprising that reliance on generalizations about how long nets last could be misleading. While the interpretation of pHI thresholds should continue to be refined, they provide a much needed reference for ‘real time’ evaluation of LLIN interventions, in the country and elsewhere.

One hundred percent of the DuraNet maintained minimum knock down levels both at six- and 18-month points. DuraNet were manufactured in such a way that the fibre could retain minimum amount of insecticide that was enough to knock down *An. arabiensis* mosquitoes. On the other hand, 55.8 percent of DawaPlus 2.0 lost minimum knock down effect from six to 18 months post distribution. In terms of optimal knock down effect, 100 percent of DuraNet nets were consistent for a period of 18 months, and this was just the opposite of DawaPlus 2.0 which had a very low percentage of nets with optimal knock down over the same period.

Optimal mortality on *An. arabiensis* mosquitoes increased slightly with DuraNet (8.6%) and a reduction was observed with DawaPlus 2.0 (45.4%). DawaPlus 2.0 showed an increase of 35.3% that reached minimum killing effect (loss in optimum killing effect observed). DuraNet showed a decrease of 7.8% of nets that had a minimum killing effect of *An. arabiensis* mosquitoes.

# Conclusion and Recommendations

Eighteen months after the LLIN mass campaign, 23.0% percent of the LLINs in the households surveyed were missing for different reasons. Although it is understandable that six months is a short time for nets to be missed, there was an increase in LLIN attrition between the two time points. The assessment also showed loss of net fabric integrity at 18 months’ point to a degree that called into question their ongoing serviceability, during year three of the planned distribution-replacement cycle. The DuraNet seemed to suffer more loss of fabric integrity than the DawaPlus 2.0 brand. If loss of fabric integrity also means loss of protection from man-vector contact, as assumed, then adjustments to LLIN distribution planning are needed, along with more comprehensive monitoring of LLIN durability. An almost complete lack of repairs also suggests that a programme of teaching and encouraging net repairs may be a means of increasing LLIN longevity.

As the country continues to scale up LLIN coverage, it will be important to have specific information on LLIN durability in a variety of settings. Monitoring enables programs to identify products that perform below expectations. It also provides useful feedback to manufacturers in their efforts to improve their products. The rule of thumb that nets should be replaced every three years is commonly followed. Yet field studies have shown that the durability of LLINs varies within and among countries and that the durability of different types of nets also varies. This variation stems from behavioural, mechanical, and chemical elements so country-specific information is thus useful for guiding NMCP and PMI procurement and programmatic decisions. This information should be generated in as short a time frame as possible to ‘inform’ decisions on how best to replace failing LLINs before they compromise the efficacy of the intervention. The implementation of routine net distributions after mass campaigns may be imperative as this study shows that LLINs experience attrition and therefore are rendered ineffective due to damage. Thus, LLIN replacement cycles in the country need to be informed in order to effectively control and prevent malaria.

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Appendices

## **Appendix 1: Data Analysis Framework**

| **Research Objectives/ Domains** | **Questionnaire Section** | | **Question** | **Analysis Notes** |
| --- | --- | --- | --- | --- |
| **Section** | **Sub-Objective** | **Net Durability Study @ 18 Months** |
| Household Characteristics | Section 2a: Household Characteristics | Demographics | Q01, Q02, Q03, Q04, Province, District, Type of Sector | Type of respondent, Literacy of respondent, Respondent’s level of education  Calculate;   * No of households surveyed by province, district and sector * Proportion of respondents by type * Proportion of respondents who can read and write * Proportion of respondents according to the highest level of school attended   *Disaggregate by province, district and type of sector* |
| Q05, Q06, Q07  Q19-Q22, Q08-Q11 | Calculate;   * Proportions of the different household features (flooring, walls and roof) * Proportion of hygiene features (toilet facilities and source of drinking and cooking). * Proportion of households with windows fly screened * Tabulate distribution of responses for not screening the windows and eaves used? * Tabulate the type of screens used by households   *Disaggregate by province, district and type of sector*  *These will be useful in computing socioeconomic different patterns with respect to LLIN availability and use.* |
| Household Characteristics | Section 2a: Household Characteristics | Sleeping Patterns | Q12-Q18 | * Average number of rooms owned by households surveyed * Proportion of rooms used for sleeping * Proportion of sleeping spaces inside houses used by households surveyed * Proportion of sleeping spaces inside houses with LLINs * Proportion of sleeping spaces outside including those in the fields used by households surveyed * Proportion of sleeping spaces outside houses including at the field with LLINs * Proportion of households that store food or crop in any of the rooms used for sleeping * Proportion of respondents that said have seen rats or mice in the house or their traces in the last 6 months   *Disaggregate by province, district and type of sector* |
| Net Ownership | Section 2b: Net Ownership | Net Ownership | Q24, Q25, Q26, Q27, Q29 | * Proportion of households that own any mosquito nets * Distribution of households by number of nets owned including those outside or at the field * Distribution of households by number of nets received from the school based mini mass LLIN campaign held in September and October 2015 * Proportion of households that obtained any mosquito nets since the school campaign from any other source * Proportion of households that obtained any additional mosquito nets by source   *Disaggregate by province, district and type of sector* |
| Net Ownership | Section 2b: Net Ownership | Knowledge on ownership and use of nets | Q30, Q31, Q32, Q33, Q34, Q35-Q42 | * Proportion of respondents that received any information on use and care and repair of mosquito nets from any source in the last 6 months * Tabulate the distribution of the sources of the information * Tabulate the distribution of the content of the messages that the respondents heard or saw * Proportion of respondents that said they discussed caring for or repairing the nets with their family * Proportion of households indicating the seasons that they use nets * Proportion of respondents indicating actions they could take (Q35-42)   *Disaggregate by province, district and type of sector* |
| Net Care and Repair | Section 3: Net Care and Repair | Care of nets | Q43, Q44, Q45, Q48 | * Proportion of households that have ever experienced any holes in the nets they own * Tabulate the distribution of how the holes happened * Proportion of households that have ever tried to repair any of these holes or get them repaired by someone else * Tabulate the distribution of the responses to the main reason holes were not repaired * Tabulate the distribution of the responses to the what households do to prevent nets from tearing or getting holes * Tabulate the distribution of the responses to the recommended way to wash a mosquito net * Proportion of respondents indicating how much they agree with the statements on net care and repair (Q51-58)   *Disaggregate by province, district and type of sector* |
| Campaign net included in monitoring | Section 5: Campaign net included in monitoring | Net given to Sixth grader | Q59, Q60, Q61, Q62, Q63, Q64, Q65, Q66, Q67, Q68, Q69, Q70, Q71, Q72, Q73, Q84 | * Proportion of households whose net is still present * Calculate distribution of type /brand of nets * Tabulate the response trends for reasons for missing net * Tabulate the distribution of responses to what the material was used for if used for other purpose * Tabulate the response trends for reasons for not keeping the net * Tabulate the response trends for where the net being monitored was found * Tabulate the distribution of responses to type of sleeping place the net has been used for mostly * Proportion of nets slept under by any person last night * Tabulate the response trends for reasons for not sleeping under the net last night * Tabulate the response trends for “who used the net last night” * Tabulate trends in frequency of using the net in the previous week * Proportion of nets washed * Tabulate trends in frequency of washing nets in the last 6 months * Proportion of households that used type of soap for the last wash * Tabulate the response trends for “where the net was dried”   *Disaggregate by province, district and type of sector* |
|  |  | Hole Counting | Q74, Q75, Q76, Q77, Q78, Q79, Q80, Q81, Q82, Q83, | * Proportion of nets that have ever had holes * Tabulate the response trends for how the net had problem/s * Proportion of nets with holes size 1 (0.5-2 cm) * Proportion of nets with holes size 2 (2-10 cm) * Proportion of nets with holes size 3 (10-25 cm) * Proportion of nets with holes size 4 (larger than 25 cm) * Proportion of nets with repairs (hole fully closed) * Proportion of nets with partial repairs (hole reduced but still there) * Proportion of nets modified in any way * Tabulate the response trends for how the net was modified   *Disaggregate by province, district and type of sector* |

## **Appendix 2: Daily Summary Activity Form**

**DAILY SUMMARY NET DURABILITY STUDY ACTIVITIES (for Team Leaders) ELS: 01**

**DATE:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **PROVINCE:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **DISTRICT:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**VILLAGE/FARM/LOCATION:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **NO. OF RESEARCH ASSISTANTS IN TEAM**: \_\_\_\_\_\_\_\_**TEAM NUMBER**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **VARIABLES** | | **NAME OF RESEARCH ASSISTANT (\*indicate name of research assistant and his/her # below)** | | | | | | **Total** |
|  |  |  |  |  |  |
| 1. No. of households Visited: HHV | |  |  |  |  |  |  |  |
| 2. No. of households interviewed: HHI | |  |  |  |  |  |  |  |
| 3. No of households which refused: HHR | |  |  |  |  |  |  |  |
| 4. No of LLINs seen/observed: LLINs | |  |  |  |  |  |  |  |
| 5. No of study LLINs found: SLLINF | |  |  |  |  |  |  |  |
| 7. No. of households revisited: HHRV | |  |  |  |  |  |  |  |
| 8. Issues/Challenges encountered |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| 9. Issues/Challenges resolved |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

Other Comments: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**NAME OF TEAM LEADER\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**NAME OF SUPERVISOR\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

## **Appendix 3: Checklist for Data Quality Monitoring during Data Collection – Supervisors**

**Net Durability Study April/May 2017 Form ELS 02**

**Checklist for Data Quality Monitoring during Data Collection – Supervisors**

**CATEGORY A:** **Field Monitoring**

Date: Location:

Name: Designation:

1. **Define the monitoring objective**

|  |  |
| --- | --- |
|  | Regular compliance for the study |
|  | Local authority support |
|  | Respondents’ receptiveness |
|  | Supervisors’ effectiveness |
|  | Data collectors’ effectiveness |
|  | Software functionality |
|  | Device (smart phone) functionality |

|  |  |
| --- | --- |
| Other |  |

1. **Local leaders participation**

|  |
| --- |
| Willing to participate in the study \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Attitude towards the study \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Attitude towards Research Assistants \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Support \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Concern (if any) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |

1. **Households participation**

|  |
| --- |
| Willingness to participate in the study \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Positive attitude towards the study \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Positive attitude towards Research Assistants \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Openness in sharing information \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Concern (if any) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1. **Supervisors/team leaders effectiveness**

|  |
| --- |
| Evidence of presence in the field \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Effectiveness in responding to issues whilst in the field \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Evidence of data review \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| General support to Research Assistants \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Concern (if any)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1. **Data collectors effectiveness**

|  |
| --- |
| Adherence to the study protocol \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Attitude towards respondents \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Use of the survey tool and the smartphones \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Fluency \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Precision \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Completeness \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Concern (if any)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1. **Software functionality**

|  |  |
| --- | --- |
|  | Is the survey version up-to-date? |
|  | Is the survey in the production mode? |
|  | Are the inbuilt data quality controls functional? |
|  | User credentials? |
|  | Does the survey complete? |

|  |  |
| --- | --- |
| Concerns |  |

1. **Devices (smart phones) functionality**

|  |  |
| --- | --- |
|  | Are the devices up to standard? |
|  | Do the devices connect to the internet? |
|  | Do the devices Sync Survey? |
|  | Do the devices capture GPS coordinates? |
|  | Are the power banks functioning well? |

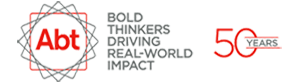
|  |  |
| --- | --- |
| Concerns |  |

1. General observations and recommendations

..............................................................

## **Appendix 4: Net Durability Study Questionnaire**

## C:\Users\oiu\Downloads\MOHCC new Logo clr.tif

[](https://abtassoc.sharepoint.com/AboutAbt/Pages/50th-Anniversary.aspx) 

ZIMBABWE LLIN Durability Monitoring

Follow-up Survey 18 Months – Questionnaire

SPEAK TO THE HEAD OF THE HOUSEHOLD: Hello. My name is . . . . ………………and I am working for ZAPIM/MOHCC. We are interviewing people here in -----------------------------------------[Name of Place] in order to obtain information on how long mosquito nets last under usage in your community over 3 years. We are intending to interview randomly selected households with children who were sixth graders in 2015 and who received LLINs in your area school for this study. With your permission we would like to interview one respondent in this household ideally the household head or caregiver.

We would like your permission to identify a respondent and begin the interview. [Note: Ensure formal consent (and assent if needed) process is done prior to interviewing the selected respondent].

I certify that the nature and purpose, the potential benefits and possible risks associated with participating in this research have been explained to the participant. Yes [ ] No [ ]

***Makadii. Ini ndinonzi…………………….. uye ndinoshandira ZAPIM/ MoHCC. Tirikuita hurukuro nevanhu muno mudunhu renyu[---------------] kuti tiwane ruzivo pamusoro pekuti mamosikito neti ekudzivirira Malaria achashandiswa mudunhu renyu kwemakore matatu anogara zvakadii . Tirikutarisira kuita hurukuro mudzimba dzatasarudza zvisina rusarura kuti dzive paongororo ino; Dzimba idzi dzinevana vaive mugiredhi rechitanhatu (grade 6) gore ra2015 avovakawana mamosikito neti ekudzivirira malaria munharaunda ino. Mukatipa mvumo, tinokumbirawo kuita hurukuro nemunhu mumwechete pamusha uno. Munhu uyu anofanira kuve anotungamira kana anochengeta vana pamusha uno.***

Tinokumbirawo mvumo yekusarudza achatipindura mibvunzo tichibva tatanga hurukuro yedu

Ndinotsinhira kuti ongororo ino, zvinangwa, zvingabatsire uye zvikanganiso zvinechekuita nekuve muongororo ino zvatsanangurwa kumuongororwi. Hongu [ ] Kwete [ ]

|  |  |  |  |
| --- | --- | --- | --- |
| **IDENTIFICATION**  **Province: Mashonaland Central**  **Mashonaland West**  **(*Tick Applicable)***  **District:** BinduraGuruveHurungwe  Kariba  Makonde  Mazowe  Mbire  Mt Darwin  Muzarabani  Rushinga  Shamva  Zvimba | | | |
| **(*Tick Applicable)***  **Type of Sector: Rural**  **Commercial**  **Mining**  **Peri-Urban**  **(*Tick Applicable)*** | | | |
| **Cluster Number** |  |  | |
| **Net ID Number** |  |  | Enter this number at the top of each page |

**HOUSEHOLD VISIT**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| B1 | Household visit details | | Visit 1 | Visit 2 | | Visit 3 |  |
|  | 0 = recipient not home  1 = recipient home , consented and interview completed  2=Home, consented and interview not completed  3 = recipient home but refuse  4 = moved away to unknown location | |  |  | |  |
| B2 | Date of interview | dd/mm/yyyy | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  | / |  |  | / |  |  |  |  | | | | | |
| B3 | Interviewer Code |  | Code | |  | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| B4 | Is the household still at the same location?  If NO, enter new GPS coordinates below | Yes | No |  |
| 1 | 0 |
|  |  |
| Latitude: |  | |
| Longitude: |  | |
|  | decimal format | |

**INTRODUCTION AND CONSENT**

**Go through the consent form together with the respondent**

|  |  |  |
| --- | --- | --- |
| **Respondent agrees to be interviewed......................................** | **1** | **Go to Q01** |
| **Respondent does not agree to be interviewed……………….** | **0** | **End** |

**SECTION 2: Household characteristics and net ownership**

| **No** | **Question** | **Categories** | | | | | | | | **Skip** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| I would first like to ask some questions about the household, characteristics of the house and possessions of the household.  Ndinoda kutanga nokubvunza mibvunzo inoenderana nemusha wenyu pamwe nemidziyo yamuinayo pamusha penyu. | | | | | | | | | | |
| Q01 | Who is responding to this questionnaire?  **Ndiani ari kupindura mibvunzo iyi?** |  | | | |  | | |  | |
| Head of household | | | | 1 | | |
| Spouse of head of household | | | | 2 | | |
| Other family member | | | | 3 | | |
| Q02 | Can the respondent read and write?  **Ari kupindura mibvunzo anogona kuverenga kana kunyora here?** |  | | | |  | |  | | |
| Yes | | | | 1 | |
| No | | | | 0 | |
| Don’t know | | | | 98 | |
| Q03 | Has the respondent ever attended school?  **Arikupindura mibvunzo ino aka enda kuchikoro here?** | Yes | | | | 1 | | **No or on’t Know ⇨Q05** | | |
| No | | | | 0 | |
| Don’t know | | | | 98 | |
| Q04 | What was the highest level of school the respondent attended? (Primary, Secondary, Higher)  **Ndechipi chinhanho chepamusoro mukudzidza chakasvikwa ne ari kupindura mibvunzo pamusha uno?** | Primary | | | | 1 | |  | | |
| Secondary | | | | 2 | |
| Higher | | | | 3 | |
| Don’t know | | | | 98 | |
| Q05 | What is the main material of the roof?  **Denga remba rakapfirirwa nei**  **Observe and record without asking** | Grass | | | | 1 | |  | | |
| Thatch | | | | 2 | |
| Zinc/Iron/Aluminum sheets | | | | 3 | |
| Asbestos | | | | 4 | |
| Tiles | | | | 5 | |
| Cement | | | | 6 | |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | 7 | |
| Q06 | What is the main material of the walls?  **Madziro emba akavakwa nei?**  **Observe and record without asking** | Grass | | | | 1 | |  | | |
| Mud | | | | 2 | |
| Plastered | | | | 3 | |
| Brick/Concrete | | | | 4 | |
| Others specify | | | | 5 | |
| Q07 | What is the main material of the floor?  **Pasi pemumba mamunogara pakavakwa kana kugadzirwa nei?**  **Observe and record without asking** | Earth or sand | | | | 1 | |  | | |
| Clay/Dung | | | | 2 | |  | | |
| Wood or bamboo | | | | 3 | |  | | |
| Vinyl or paraquet | | | | 4 | |  | | |
| Tiles or cement | | | | 5 | |  | | |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | 6 | |  | | |
| Q08 | Are the windows fly screened  **Ko mafafitera aneruzhowa here runodzivirira kuti mamosokito asapinde mumba** | Yes  No | | | | 1  2 | | Yes**⇨11** | | |
| Q09 | If not have they ever thought about screening them?  **Makambofungawo nezvazvo here?** | Yes  No | | | | 1  2 | |  | | |
| Q10 | What are the main reasons for not screening the windows and eaves of your house?  **Nezvipi zvikonzero zvakaita kuti musaise ruzhowa pamafafitera kana muchengo?** | I do not have money to buy the screens  I do not know how to do it  I did not know about this  Other, specify:……………… | | | | 1  2  3  4 | |  | | |
| Q11 | What type of screen is used?  **Imhandoi yeruzhowa iri pamafafitera kana muchengo** | Mosquito net material  Wire screens  Other specify…………………….. | | | | 1  2  3 | |  | | |
| Q12 | How many rooms does your household have?  **Musha wenyu une dzimba kana kuti makamuri mangani?** |  | | | |  | |  | | |
| Q13 | How many of these rooms are used for sleeping?  **Makamuri kana kuti dzimba ngani dzinoshandiswa pakurara?** |  | | | |  | |  | | |
| Q14 | How many sleeping places inside houses are used by this household (beds, mattresses, mats or rugs, etc.)? **Mune nzvimbo ngani dzamunoshandisa pakurara mumba menyu (Mubheda,bonde,etc.)** |  | | | |  | |  | | |
| Q15 | How many sleeping places inside houses are used by this household have LLINs (beds, mattresses, mats or rugs, etc.)? **Mune nzvimbo ngani dzamunoshandisa pakurara dziri mumba dzine mosikito neti?** |  | | | |  | |  | | |
| Q16 | How many sleeping places which are outside including those at field sleeping places are used by this household?  **Mune nzvimbo ngani dzamunoshandisa pakurara dziri panze kusanganisira dziri kumunda?** |  | | | |  | |  | | |
| Q17 | How many of these outside or field sleeping places have LLINs?  **Inzvimbo ngani dzokurarira dziri panze kusanganisira neidzo dziri kumunda dzine mamosokito neti?** |  | | | |  | |  | | |
| Q18 | Do you ever store food or crop in any of the rooms used for sleeping? **Munochengata zvokudya kana zvirimwa here mune imwe yedzimba dzamunoshandisa kurara?** | Yes | | | | 1 | |  | | |
| No | | | | 0 | |
| Don’t know | | | | 98 | |
| Q19 | What is the main source of drinking water?  **Mvura yekunwa munowanzoiwana kubva kupi?** |  | | | |  | |  | | |
| Surface water (stream, river, lake, pond, irrigation channel) | | | | 1 | |
| Rain water, gutter pipe | | | | 2 | |
| Protected well (public or private) | | | | 3 | |
| Public tube well or borehole | | | | 4 | |
| Public tap or standpipe | | | | 5 | |
| Piped into dwelling | | | | 6 | |
| Other, specify:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | 7 | |
| Q20 | What type of toilet facility is available to the household?  **Imhandoi yechimbudzi chinowanzoshandiswa nemhuri yepamusha uno?** |  | | | |  | |  | | |
| No facility, bush or field | | | | 1 | |
| Shared pit latrine | | | | 2 | |
| Own pit latrine | | | | 3 | |
| Shared Blair latrine | | | | 4 | |
| Own Blair latrine | | | | 5 | |
| Shared flush toilet | | | | 6 | |
| Own flush toilet | | | | 7 | |
| Q21 | What is the main energy source for cooking?  **Munonyanyo kushandisa mhando ipi yesimba kana moto?** | Firewood | | | | 1 | |  | | |
| Charcoal | | | | 2 | |
| Kerosene | | | | 3 | |
| Gas | | | | 4 | |
| Electricity | | | | 5 | |
| Other, specify:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | 6 | |
| Q22 | Do you ever cook in a room that is also used for sleeping? **Munombo bikira muimba yamuno shandisa pakurara here?** |  | | | |  | |  | | |
| Always | | | | 1 | |
| Sometimes | | | | 2 | |
| Never | | | | 3 | |
| Don’t know | | | | 98 | |
| Q23 | In the last 6 months, have you seen any rats or mice in your house or their traces (faeces or damage)? **Pamwedzi mitanhatu yapfuura makamboonawo here makonzo, mbeva kana zviratidzo zvadzo zvinoti nhoko kana pakarumwa?** |  | | | |  | |  | | |
| Yes | | | | 1 | |
| No | | | | 0 | |
| Don’t know | | | | 98 | |
| **We would now like to ask some questions about the mosquito nets in your household.**  **Iko zvino tavekubvunza nezvemamosikito neti amuinawo?** | | | | | | | | | | |
| Q24 | Does the household own any mosquito nets? **Mune mamosokito neti here pamusha pano?** |  | | | |  | | **No or don’t Know**  **⇨Q26** | | |
| Yes | | | | 1 | |
| No | | | | 0 | |
| Don’t know | | | | 98 | |
| Q25 | If yes, how many mosquito nets does the household have at this time including those outside or at the field?  **Mune mamosikito neti mangani parizvino kusanganisira ari panze neawo arikumunda?**  ***>> probe for any nets currently not in use*** |  | | | |  | |  | | |
| Q26 | How many nets did your household receive from the school based mini mass LLIN campaign held in September-October 2015?  **Makawana mamosikito neti mangani akauya nevana pachirongwa chekupa vana vechikoro mamosikito neti chakaitwa pakati pamwedzi ya September naOctober mugore ra 2015?** |  | | | |  | |  | | |
| Q27 | Did your household obtain any mosquito nets since the school campaign from any other source?  **Makazombowana here mamwewo mamosikito neti kubva pakaitwa macampaigns emuzvikoro?** |  | |  | | | | **No or don’t Know ⇨Q29** | | |
| Yes | | 1 | | | |
| No | | 0 | | | |
| Don’t know | | 98 | | | |
| Q28 | How many nets did your household obtain (received or bought) in total since the campaign including those you may no longer have? **Makawana mamosikito neti mangani kusanganisira neamukatenga kubva pakaitwa ma campaigns tichitarisawo nemamwe amusina kutenga?** |  | |  | | | |  | | |
| Q29 | Did you obtain any additional mosquito nets from the following sources?  **Makawana mamosokito neti mamwe here kubva kune zvinotevera?** |  | | | | |  |  | | |
|  | Yes | | | | No |
| Ante-natal care services | 1 | | | | 0 |
| Health facility/hospital | 1 | | | | 0 |
| Relatives or friends | 1 | | | | 0 |
| Shop or pharmacy | 1 | | | | 0 |
| Expanded Programme for Immunisation (EPI) | 1 | | | | 0 |
| School based campaign | 1 | | | | 0 |
| Market or hawker | 1 | | | | 0 |
| VHW Voucher system | 1 | | | | 0 |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_ | 1 | | | | 0 |
| Q30 | In the last 6 months, did you receive any information on use and care and repair of your mosquito nets from any source?  **Pamwedzi mitanhatu yapfuura makambowana mashoko anoenderana nokushandiswa pamwe nekuchengetwa kwemamosikito neti here?** | Yes | | | 1 | | | **No or don’t Know ⇨Q34** | | |
| No | | | 0 | | |
| Don’t know | | | 98 | | |
| Q31 | What were the sources of that information?  **Mashoko aya makaawana nenzira dzipi**  ***>> multiple answers possible*** | Village Health Worker | | | 1 | | |  | | |
| Radio message or talk show | | | 2 | | |
| Song on the radio | | | 3 | | |
| Drama performance | | | 4 | | |
| Health worker | | | 5 | | |
| Community leader | | | 6 | | |
| Town announcer | | | 7 | | |
| Pharmacy or shop attendant | | | 8 | | |
| Family or friends | | | 9 | | |
| Mosque or church | | | 10 | | |
| Newspaper or TV | | | 11 | | |
| Other, specify: | | | 12 | | |
| Q32 | What was the content of the messages you heard/saw?  **Mashoko aya aitaura nezvei?**  ***>> multiple answers possible*** | Use your net | | | 1 | | |  | | |
| Care for your net | | | 2 | | |
| Hang up your net | | | 3 | | |
| Sleep under your net every night | | | 4 | | |
| Nets prevent malaria | | | 5 | | |
| Repair your net | | | 6 | | |
| Other, specify: | | | 7 | | |
| Q33 | Did you discuss caring for or repairing your nets with your family?  **Makakurukura here maererano nokugadzirisa kwemamosikito neti anenge abvaruka?** | Yes | | | 1 | | |  | | |
| No | | | 0 | | |
| Q34 | During which seasons are nets used by this household?  **Ko maneti ane mushonga munoashandisa mumwaka ipi?** |  | | |  | | |  | | |
| Equally in rain and dry season | | | 1 | | |
| Mainly during the rain periods, at times also dry season | | | 2 | | |
| Only during the rain season | | | 3 | | |
| Not used at all | | | 4 | | |
| Don’t know | | | 98 | | |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| I am going to ask you about a series of actions you could take and I would like you to tell me how confident you are that you could actually do that action successfully.  For each action, please tell me if you think you definitely could, probably could, probably could not or definitely could not do each action successfully.  **Iko zvino ndavekukubvunzai pamusoro pezvinhu zvamunogona kuita muchindiudza kuti munehushingi hwakadii kuita zvinhu izvi.Pachinhu chimwe nechimwe ndinoda kuti mundiudze kuti munokwanisa,kana kuti mungango kwanisa, kana kuti mungango tadza kana kuti hamukwanise zvachose** | | | | | | |
|  |  | Definitely could | Probably could | Probably could not | Definitely could not | **Skip** |
| Q35 | Obtain enough bed nets for all your children  ***Kuwana* mamosikito neti akakwana e*vana venyu vese*** | 1 | 2 | 3 | 4 |  |
| Q36 | Hang a bed net above your children’s sleeping spaces  **Kuisa mosikito neti pamusoro penzvimbo dzinorarwa nevana** | 1 | 2 | 3 | 4 |  |
| Q37 | Obtain enough bed nets for pregnant women in my household  **Kuwana mamosikito neti akakwana emadzimai akazvitakura mumba menyu.** | 1 | 2 | 3 | 4 |  |
| Q38 | Would you hang a net outside including at field to sleep under?  **Mungasungirira here neti renyu panze kana kumunda?** | 1 | 2 | 3 | 4 |  |
| Q39 | Protect yourself and your children from getting malaria  **Kudzivirira imi pamwe chete nevana venyu kuchirwere chemalaria** | 1 | 2 | 3 | 4 |  |
| Q40 | Save enough money to obtain bed nets for all your children  **Kuchengeta mari inokwana kuti muwane mamosokito neti anokwana vana venyu vose** | 1 | 2 | 3 | 4 |  |
| Q41 | Sleep under a bed net every night of the year  **Kurara mumosikito neti usiku hwese gore rese** | 1 | 2 | 3 | 4 |  |
| Q42 | Get all of your children to sleep under a bed net every night of the year  **Kuita kuti vana vese varare mumosikito neti usiku umwe neumwe kwenguva dzose** | 1 | 2 | 3 | 4 | **Skip** |

**SECTION3: Net care and repair**

| **No** | **Question** | | **Categories** | | | | | **Skip** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| I would now like to ask some questions about the care for your nets  **Ndave kuda kukubvunzai nekuchengetedzwa kwemamosikito neti** | | | | | | | | |
| Q43 | Have you ever experienced any holes in the nets you own?  **Ko mamosokito neti enyu akamboita maburi here?** | Yes | | | | | 1 | **No⇨Q49** |
| No | | | | | 0 |
| Q44 | How did the hole(s) happen?  **Maburi aya akavapo sei?**  ***>> check “1” for all options that apply, “0” if they don’t*** |  | | | | Yes | No |  |
| Tore when got caught on edge or nail | | | | 1 | 0 |
| Was pulled and torn on corner | | | | 1 | 0 |
| Was burned by a candle or sparks | | | | 1 | 0 |
| Was caused by rats or mice | | | | 1 | 0 |
| Don’t know | | | | 1 | 0 |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | |  |  |
|  | | | |  |  |
| Q45 | Over the **last 6 months**, have you ever tried to repair any of these holes or get them repaired by someone else?  **Pamwedzi mitanhatu yapfuura makamboedza kuvhara kana kusonesa maburi aya here?** | Yes | | | | | 1 | **No⇨Q48** |
| No | | | | | 0 |
| Q46 | How were the holes repaired?  **Maburi aya akagadziriswa sei?**  ***>> check “1” for all options that apply, “0” if they don’t*** |  | | | | Yes | No |  |
| Stitched | | | | 1 | 0 |
| Knotted or tied | | | | 1 | 0 |
| Used a patch | | | | 1 | 0 |
| In another way | | | | 1 | 0 |
| Q47 | Over the last 6 months, who made repairs to the holes in your net?  **Pamwedzi mitanhatu yapfuura ndiani akagadzira kana kusona maburi aive paneti renyu?**  ***>> check “1” for all options that apply, “0” if they don’t*** |  | | | | Yes | No | **all⇨Q49** |
| Household member | | | | 1 | 0 |
| Tailor | | | | 1 | 0 |
| Friend or relative ( Not household member | | | | 1 | 0 |
| Community volunteer | | | | 1 | 0 |
| Other, specify | | | | 1 | 0 |
|  | | | |  |  |
| Q48 | What was the **main** reason holes were not repaired?  **Chikonzero chipi chakaita kuti mosikito neti renyu raive rave nemaburi risagadzirwe kana kusonwa?** | No time for this | | | | | 1 |  |
| It is not necessary | | | | | 2 |
| Don’t know how | | | | | 3 |
| Do not have materials to repair | | | | | 4 |
| Holes are not big enough to repair | | | | | 5 |
| It is not possible to repair holes | | | | | 6 |
| Other, specify | | | | | 7 |
|  | | | | |  |
| Don’t know | | | | | 98 |
| Q49 | What if anything do you do at home to prevent nets from tearing or getting holes?  **Ndezvipi zvinhu zvamunoita pamusha penyu kuti mamosokito neti asabvaruke kana kuita maburi?**  ***>>Do not read the responses aloud. Probe twice with “Any other ways?”***  ***Usaverenge mhinduro shandisa dzimwe nzira***  ***Mark “1” for each response mentioned and “0” for those not*** |  | | | | Yes | No |  |
| Keep away from children | | | | 1 | 0 |
| Keep away from pests | | | | 1 | 0 |
| Roll up or tie up when not in use | | | | 1 | 0 |
| Handle nets with care | | | | 1 | 0 |
| Do not soil with food | | | | 1 | 0 |
| Keep away from flame or fire | | | | 1 | 0 |
| Wash gently | | | | 1 | 0 |
| Wash only when dirty | | | | 1 | 0 |
| Inspect nets regularly for holes | | | | 1 | 0 |
| Repair small holes quickly | | | | 1 | 0 |
| It is not possible to prevent holes | | | | 1 | 0 |
| Do nothing | | | | 1 | 0 |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | 1 | 0 |
|  | | | |  |  |
| Q50 | What is the recommended way to wash a mosquito net?  **Ndeipi nzira inokuridzirwa kuti muwache mamosokito neti nayo?**  ***>>Do not read the responses aloud. Probe twice with “Any other ways?”***  ***Mark “1” for each response mentioned and “0” for those not*** |  | | | | | |  |
|  | | | | Yes | No |
| Gently | | | | 1 | 0 |
| In a basin | | | | 1 | 0 |
| With mild soap | | | | 1 | 0 |
| Only when dirty | | | | 1 | 0 |
| No more than once every 3 months | | | | 1 | 0 |
| Not in the stream | | | | 1 | 0 |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | 1 | 0 |
|  | | | |  |  |
|  | | | | | |
| I am going to read a series of statements to you and I would like you to tell me how much you agree with them. For each statement, please tell me if you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with it.  **Ndichaverenga mashoko akateedzana,ndonikumbira kuti mundi udze kuti munowirirana nepfungwa iyi zvakanyanya,munowiririrana nepfungwa iyi,hamuwirirane nepfungwa iyi, kana kuti hamuwirirane nepfungwa iyi zvakanyanya** | | | | | | | | |
|  |  | | | Strongly agree | Somewhat agree | Somewhat disagree | | Strongly disagree |
| Q51 | Mosquito nets are valuable.  **Mamosikito neti akakosha.** | | | 1 | 2 | 3 | | 4 |
| Q52 | There are actions I can take to make my net last long.  **Pane zvinhu zvandinogona kuita kuti mosikito neti rangu rirarame kwenguva yakareba.** | | | 1 | 2 | 3 | | 4 |
| Q53 | It is not possible to repair holes in nets.  **Hazvigoneke kusona kana kugadzira neti rinenge rabvaruka kana kuti rave nemaburi.** | | | 1 | 2 | 3 | | 4 |
| Q54 | A repaired net can still be effective against mosquitoes.  **Mosikito neti yakagadziriswa inokwanisa kudzivirira mamosikito.** | | | 1 | 2 | 3 | | 4 |
| Q55 | Other people in this community can fix holes in their mosquito nets.  **Vamwe vanhu vemunharaunda ino vanogadzira kana kusona maburi ari pama mosikito neti avo.** | | | 1 | 2 | 3 | | 4 |
| Q56 | I do not have time to repair a hole in my net.  **Handina nguva yokusona buri rinenge raitika pamosikito neti yangu.** | | | 1 | 2 | 3 | | 4 |
| Q57 | I can help protect my family from malaria by taking care of my net.  **Ndinokwanisa kudzivirira mhuri yangu kubva kuchirwere chemalaria nokuchengetedza mosikito neti rangu.** | | | 1 | 2 | 3 | | 4 |
| Q58 | I am confident I can repair holes immediately.  **Ndinovimbao kuti ndinokwanisa kugadzira kana kusona nokuchimbidza buri kana pakabvaruka pemosikito neti rangu.** | | | 1 | 2 | 3 | | 4 |

**SECTION 5: Campaign net included in monitoring**

We would now like to inspect the mosquito net from the mini school campaign and ask some questions about it.

| **No** | **Question** | **Mosquito net 1 (LLIN Given to Sixth Grader)** | | | |
| --- | --- | --- | --- | --- | --- |
| Q59 | Is the net still present?  **Richipo here mosikito neti iri?** |  | |  | |
| Yes | | 1 | |
| No | | 0 | |
|  | | If yes, skip to Q64 | |
| Q60 | How long did you have this net? **Makanga mave nenguva yakadini muine mosikito neti iri?**  **>> 00 for below 1 month**  **>> 98 for “do not know”** | Months  Don’t know | | 98 | |
| Q61 | (If the net is missing) Can you tell me what happened to the net?  **Mungandiudzawo here kuti chii chakaitika kumosikito neti iri?** |  | |  | |
| Net was stolen | | 1 | |
| Net was destroyed accidentally | | 2 | |
| Net was sold | | 3 | |
| Net was given away to relatives | | 4 | |
| Net was given away to others | | 5 | |
| Net was thrown away | | 6 | |
| Material used for other purpose | | 7 | |
| Used by family members elsewhere | | 8 | |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | 9 | |
|  | |  | |
| Don’t know | | 98 | |
| **If not 7⇨Q63**  If 8, end the survey | |  | |
| Q62 | What was this material used for?  **Ko jira reneti iri makarishandisa kuitei**  ***>>Do not read the responses aloud*** |  | |  | |
| Window/door/eave covering | | 1 | |
| Protecting plants/seedlings | | 2 | |
| Fishing | | 3 | |
| Drying fish | | 4 | |
| Bedding/padding | | 5 | |
| Around latrine | | 6 | |
| Patch other nets | | 7 | |
| Cut up and used for various purposes | | 8 | |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | 9 | |
|  | |  | |
| Don’t know (DK) | | 98 | |
| Q63 | Why did you not keep this net?  **Sei musina kuchengeta mosikito neti iri?**  ***>> enter first reason mentioned*** |  | |  | |
| Too many holes | | 1 | |
| Too dirty | | 2 | |
| Not needed | | 3 | |
| Did not like the net | | 4 | |
| Needed the money | | 5 | |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | 6 | |
|  | |  | |
| Don’t know | | 98 | |
| **All ⇨End Interview** | |  | |
| Q64 | Where was the net found?  **Mosikito neti iri ranga riri pai?** | Outside hanging loose over a sleeping place | | 1 | |
| On the washing line | | 2 | |
| Inside house hanging loose over sleeping place | | 3 | |
| Inside house hanging and folded up or tied | | 4 | |
| Not hanging but not stored | | 5 | |
| Stored away unpacked | | 6 | |
| Stored away still in package | | 7 | |
| Q65 | What type of sleeping place has this net been used for mostly? **Imhandoi yenzvimbo yekurara inowanzo shandiswa kana kuti inoshandiswa mosikito neti iri?** |  | |  | |
| Bed and mattress | | 1 | |
| Bed frame (sticks) | | 2 | |
| Foam mattress | | 3 | |
| Reed mat | | 4 | |
| Grass | | 5 | |
| Ground | | 6 | |
| Never used | | 7 | |
| Outside | | 8 | |
| Q66 | Was this net slept under by any person last night? **Pane munhu here akarara pasi pemosikito neti iri husiku hwapfuura?** |  | |  | |
| Yes | | 1 | |
| No | | 0 | |
| Don’t know | | 98 | |
| **Yes⇨Q68** | |  | |
| Q67 | If no, why not?  **Sei risina kushandiswa?** | The net is at the field | | 1 | |
| No mosquitoes | | 2 | |
| There is no malaria | | 3 | |
| Too hot | | 4 | |
| Don’t like smell | | 5 | |
| Feel “closed in” | | 6 | |
| Net too old or torn | | 7 | |
| Net too dirty | | 8 | |
| Net not available last night (washing) | | 9 | |
| Usual user(s) did not sleep here last night | | 10 | |
| Net was not needed last night | | 11 | |
| Other | | 12 | |
| Don’t know | | 98 | |
| **All⇨Q69** | |  | |
| Q68 | Who used the net last night? **Ndiani akashandisa mosikito neti iri usiku hwapfuura?** |  | | **yes** | **No** |
| Infant (<1 yr) | | 1 | 0 |
| Young child (1-4 yrs) | | 1 | 0 |
| Older child (5-9 yrs) | | 1 | 0 |
| Adolescent (10-19) | | 1 | 0 |
| Adult | | 1 | 0 |
| Don’t know (DK) | | 98 | |
| Q69 | How many nights has this net been used in the last week? **Mosikito neti iri rashandiswa husiku hungani pavhiki radarika?** |  | |  | |
| Every night (7 nights) | | 1 | |
| Most nights (5-6) | | 2 | |
| Some nights (1-4) | | 3 | |
| Not used last week | | 4 | |
| Net is not used at all | | 5 | |
| Don’t know | | 98 | |
| Q70 | Has this net ever been washed?  **Mosikito neti iri rakambowachwawo here?** |  | |  | |
| Yes | | 1 | |
| No | | 0 | |
| Don’t know | | 98 | |
| **0 or 98⇨Q74** | |  | |
| Q71 | How many times has it been washed in the last 6 months?  **Mosikito neti iri rakawachwa kangani pamwedzi mitanhatu yadarika?**  ***>> enter “00” if none*** | Don’t know | | 98 | |
| Q72 | For the last wash, what soap was used?  **Parapedzisira kuwachwa imhandoi yesipo yakashandiswa** |  | |  | |
| Soap bar | | 1 | |
| Detergent ( paste or powder etc) | | 2 | |
| Bleach | | 3 | |
| Washing soap | |  | |
| Bathing soap | | 4 | |
| None | | 5 | |
| Don’t know | | 98 | |
| Q73 | Where was the net dried?  **Mosikito neti iri rakayanikwa pai?** |  | |  | |
| Outside on the ground | | 1 | |
| Outside on line | | 2 | |
| Outside bush or fence | | 3 | |
| Outside in a shade place | | 4 | |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | 5 | |
| Q74 | Has this net ever had any holes?  **Mosikito neti iri rakamboitawo maburi here?** |  | |  | |
| Yes | | 1 | |
| No | | 0 | |
| Don’t know | | 98 | |
| **0 or 98⇨Q76** | |  | |
| Q75 | (The net has problem) How did that happen?  Izvi zvakaitika sei?  ***>>tick all that apply*** |  | |  | |
| Torn on object | | 1 | |
| Pulled and tore | | 2 | |
| Burned by flame | | 3 | |
| Rats or mice | | 4 | |
| Seam came open | | 5 | |
| In another way | | 6 | |
| Don’t know | | 98 | |
| Q76 | Number of holes size 1 (0.5-2 cm) |  | | | |
| Q77 | Number of holes size 2 (2-10 cm) |  | | | |
| Q78 | Number of holes size 3 (10-25 cm) |  | | | |
| Q79 | Number of holes size 4 (larger than 25 cm) |  | | | |
| Q80 | Number of repairs (hole fully closed) |  | | | |
| Q81 | Number of partial repairs (hole reduced but still there)  **Huwandu hweburi rakasonwa asi richiripo** |  | | | |
| Q82 | Has the net been modified in any way?  **Ko neti iri raka shandurwa magadzirirwo aro here?** |  |  | | |
| Yes | 1 | | |
| No | 0 | | |
| Don’t know | 98 | | |
| **0 or 98⇨Q84** |  | | |
| Q83 | How was it modified?  **Rakashandurwa sei?** | Shape was changed | 1 | | |
| Added to lengthen | 2 | | |
| Added to reinforce | 3 | | |
| Other, specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | 4 | | |
| Q84 | Brand of Net | Dawa | 1 | | |
| DuraNet | 2 | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\* END OF QUESTIONNAIRE \*\*\*\*\*\*\*\*\*\*\*\*\*\*

***Thank the respondents for their time and cooperation.***

**Record time of starting interview : [ ] Record time of ending interview : [ ]**

**Total time taken for the interview : [ ] minutes**

**INTERVIEWER NOTES:** Please note any problems you had with completing the interview for this household.