



# Ownership and use of Long-Lasting Insecticide Bed Nets (LLINs) in the Mbonge Health District, South West Region, Cameroon: A Community Cross-Sectional Survey

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**Abstract**

**Background:** Malaria is a major public health problem in Cameroon. Long-Lasting Insecticide Bed Nets (LLINs) proven to be effective in the prevention of malaria have been distributed to households in Cameroon. Despite this, little information is known about the use of LLINs within rural communities. This study's objective was to assess usage of LLINs and the socio-demographic factors associated to LLINs use in Mbonge Health District (MHD).

**Methods:** A cross-sectional survey was conducted among household heads/spouses in the MHD and data collected using an interviewer administered questionnaire. Systematic sampling was used to determine 633 household heads/spouses that were interviewed. Data was analysed using Epi Info version 3.5.4.

**Results:** In total, 633 participants took part in the study with a median age of 38 years (IQR: 31-46). The mean number of LLINs owned by households was 2 (SD: 2.09) and median number of LLINs hanging over sleeping places was 1 (IQR: 0-2). Over half of participants (64.1%) slept under LLINs the previous night. Only 22.1% of participants correctly hung up LLINs. For participants who did not use LLINs, 120 (50.4%) said the reason for none use was due to none reception of LLINs during the mass distribution campaign. Being in Boa Balondo health area and having no specific occupation had statistical significant associations with the usage of LLINs.

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**Keywords:** Long-lasting insecticide Nets; Use; malaria; Mbonge; Cameroon.

**Abbreviations:** Aor: Adjusted Odds Ratio; CHW: Community Health Worker; CI: Confidence Interval; COC: Chief Of Centre; CRA: Community Relay Agent; DMO: District Medical Officer; HAART: Highly Active Antiretroviral Therapy; IQR: Interquartile Range; IRB: Institutional Review Board; ITN: Insecticide Treated Net, Llins: Long Lasting Insecticide Nets, MDG: Millennium Development Goal; N: Frequency; OR: Odds Ratio; RBM: Roll Back Malaria; Ref: Reference Variable; SD: Standard Deviation; TV: Television; WHO: World Health Organisation.

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**Conclusion:** The utilization of LLINs by the community is lower than recommended, proportion of participants who correctly hung up LLINs is low and only being in Boa Balondo and having no occupation had statistical significant associations with use of LLINs. LLINs need to be made available and household heads need more education and assistance to hang up and use LLINs. More studies with larger samples and for much longer durations needs to be done to find other predictors of LLINs usage.

## Background

Malaria continues to represent a major public health problem in areas of endemicity [1]. The World Health Organization estimated that 207 million cases of malaria were reported in 2012 accounting for 627,000 deaths. Of these, 80% of cases and 90% deaths occurred in Africa [2]. Globally, the prevalence of malaria is 80% for the African region, 13% for the South East Asian region and 6% for the Eastern Mediterranean region [2].

In Cameroon, malaria is endemic nation-wide and 71% of the population live in areas of high transmission [3]. It accounts for 30% of morbidity cases, 36% of outpatient consultation, 67% of childhood death and 48% of hospital admission [4]. Children less than 5 years and pregnant women are the most vulnerable groups affected by malaria and over 80% of people who die of malaria worldwide are children less than five years [5].

To reduce morbidity and mortality from malaria, free mass distribution of LLINs to households in Cameroon and in the Mbonge Health District (MHD) was done in 2011. LLINs were distributed in the proportion of 1 LLIN to every 2 persons in the household without any verification of previous net possession. The mass LLINs distribution campaign was aimed at attaining universal coverage of LLINs ownership defined as 1 LLIN for every 1.8 people or 0.56 LLINs per person [6]. Despite this, it has been reported that ownership of LLINs does not imply the use of LLINs. In 2011, the demographic and health survey conducted in Cameroon showed that 33% of households possess at least one LLIN but only 14% of household members slept under LLINs the previous night. The percentages of children less than 5 years and pregnant women who sleep under LLINs was also low ranging from 21-43% and 20-47% respectively [6]. Over the years, with reinforcement of health education and mass sensitization Kimbi et al found that LLINs possession improved to 80% and 73.41% of children less than 5 years slept under LLINs the previous night in the Buea health district [7]. Other studies also conducted in Cameroon found similar trends [8,9].

Nonetheless, most studies done in Cameroon were carried out in urban settings. Thus, the actual situation on the utilization of LLINs in a typical rural setting like Mbonge was not known. It is for this reason that this study was carried out to assess the ownership and utilization of LLINs and factors associated to LLINs use in the MHD.

## Methods

### Study design and setting

This was a cross-sectional analytical survey carried out among household heads/spouses in the Mbonge Health District (MHD) of the South West Region (SWR) of Cameroon.

The MHD is one of the Eighteen Health district of the SWR of Cameroon. The district has five health areas with a population of 74996 inhabitants. Inhabitants' main occupations are

farming, trading and fishing. The vegetation of the district is made up of a dense equatorial forest through which many rivers and streams flow. There are also many swamps within the district which constitute a good breeding ground for the anophel mosquitoes which transmits malaria. Settlement patterns in communities of this district is linear and inhabitants live in semi-permanent buildings made up of plank which usually have many holes through which mosquito easily go in to bites household members.

### Study population, participants and sampling

The study population involved household heads/spouses living in the MHD. To be eligible for the study, a participant had to be of aged 21 or above, living in the MHD and must have received a LLIN during the 2011 mass distribution of LLINs in Mbonge. Household heads/spouses that were seriously ill, mentally or physically unable to complete the study and who were unable to give their consent and provide responses to the questions in English, were excluded from the study.

The sample size was calculated using the formula for estimating a single population proportion for a cross-sectional survey [10]. We used a prevalence of net ownership of 50%, margin of error of 5%, a 95% level of confidence and a design effect of 1.5 [11] to calculate the required sample size of 576. We also calculated a non-response rate of 10% and added to this sample size and had an overall sample size of 633.

The various household heads to be interviewed were determined using probability proportionate to size of each health area. We calculated the proportion of the total number of households per health area and multiplied by the sample size to determine the households to include per health area. Within the health area, the household register was used to determine the households to be interviewed using a systematic sampling approach. The effective number of households interviewed in each health area as calculated was; Boa Balondo 45, Bokosso 43, Kombone 249, Kotto Barombi 122 and Mbonge 174 (Table 1).

### Data collection

Data was collected by five trained nurses using an interviewer administered questionnaire adapted from two previous studies [12,13]. The questionnaire was pre-tested in the Ekondo Titi health area before using it in the MHD to collect data. It captured information on participants' socio-demographic characteristics and their ownership and use of LLINs.

### Data management and statistical analysis

Data from the questionnaire were entered into an Epi Info 2000 database (WHO/CDC Atlanta, USA) and analysed using Epi Info version 3.5.4. Participants' socio-demographic characteristics have been described using means, medians, standard deviations and inter-quartile ranges for continuous variables and using frequencies for categorical variables.

To determine ownership and usage of LLINs, all items in the questionnaire addressing LLINs use were grouped together. The frequencies and percentages of categorical items were computed while mean, median, standard deviation and interquartile ranges were computed for continuous items.

To assess how socio-demographic characteristics are associated with usage of LLINs, bivariate analysis and multivariate analysis were done. The bivariable analysis was done by considering usage of LLINs as a binary outcome variable and socio-

demographic characteristics as predictors, then computing the odds of using LLINs between participants using unadjusted odds ratios and 95% CI. A P-value  $\leq 0.25$  was set as the determining point for a variable to be considered as appearing to have an association with use of LLINs in the bivariate analysis and be included in the multivariate logistic model [14]. The multivariate analysis comprised computing adjusted odds ratios using a multiple logistic regression model with use of LLINs as the binary outcome variable and participants' socio-demographic characteristics as predictors. All variables that had p-values  $<0.05$  in the multivariate logistic regression model were considered as having a statistically significant association with use of LLINs.

### Ethical considerations

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of the Faculty of Health Sciences (FHS) of the University of Buea (UB). Administrative authorisation was obtained from the FHS of UB, the regional delegation of Public Health for the South West Region and the MHD.

## Results

### Demographic characteristics

Table 2 shows the demographic characteristic of the 633 participants that took part in this study. The median age of participants was 38 years (IQR: 31-46 years) and more than half of the participants (50.4%) were males. Most participants (39.3%) were from Kombone health area. Four hundred and sixty-one (72.9%) participants were married and over half of the participants (58.9%) attained primary level of education. Many participants (71.2%) had farming as occupation and majority (95.4%) were Christians. Most of the participants (82.6%) lived in semi-permanent buildings made of timber.

### Hang up and usage of LLINs among participants

Table 3 shows the proportion of participants who hang up and used LLINs correctly and consistently. The median number of people per household was 6 (IQR=4-9) and the mean number of beds/sleeping places was 4 (SD=3.70). The mean number of LLINs owned by households was 2 (SD=2.09). The median number of nets hanging over sleeping places was 1 (IQR=0-2). The mean number of community relay agents/community health workers who helped household heads to hang up LLINs was 0.25 (SD=0.49). The mean number of children less than 5 years in household was 1.27 (SD=1.72) while that of pregnant women was 0.20 (SD=0.52). Overall, 406 participants (64.1%) slept under LLINs the previous night. Of these, the mean number of children less than 5 years who slept under LLINs the previous night was 0.81 (SD=1.24) while that of pregnant women who slept under LLINs the previous night was 0.15 (SD=0.49). The median number of people other than children less than 5 years and pregnant women who sleep under LLINs the previous

night was 1 (IQR=0-3). While the mean number of times LLINs were washed yearly was 1.31 (SD=1.63), the major reason why people did not use LLINs was that they were not given nets as reported by 120 (50.4%) of participants who did not use LLINs. When asked if LLINs could be sold at pharmacies in community, 196 (31.1%) participants said they were not willing to buy LLINs from their community pharmacy and more than half of the participants 434 (68.9%) said they were only looking forward for mass distribution campaign by the ministry of public health to replenish their stock of nets.

### Correlates of the usage of LLINs

Table 4 and 5 shows the predictors of use of LLINs. In the bivariable analysis, the factors that appeared to be associated with sleeping under LLINs included being in all health areas, being a Christian, having farming/trading as occupation and being separated/widow/divorced. In fact, the odds of sleeping under LLINs in participants in Bokosso health area was 0.36 times (95%CI: 0.11, 1.15) that in Boa Balondo health area. The odds of sleeping under LLINs in participants of Kombone health area was 0.13 times (95%CI: 0.05, 0.35) that in Boa Balondo health area. The odds of sleeping under LLINs in participants in Kotto Barombi was 0.22 times (95%CI: 0.08, 0.60) that in Boa Balondo health area and the odds of sleeping under LLINs in participants of Mbonge health area was 0.35 times (95%CI: 0.13, 0.93) that in Boa Balondo health area. Also, the odds of sleeping under LLINs in married/cohabiting participants was 1.34 times (95%CI: 0.82, 2.20) that of single participants while the odds of sleeping under LLINs in divorced/separated/widowed participants was 0.60 times (95%CI: 0.31, 0.93) that in single participants.

The odd of sleeping under LLINs comparing farming/trading participants to participants with no occupation was 0.34 times (95%CI: 0.07, 1.56). Finally, the Odds of sleeping under LLINs in participants who were Christians was 2.17 times (95%CI: 0.98, 4.78) that in participants who are animist/others in their religion (Table 4).

After controlling for all possible confounding by each of the socio-demographic variables, only being in Kombone, Kotto Barombi and Mbonge and having farming/trading as occupation had statistical significant associations with sleeping under LLINs. Actually, the odds of sleeping under LLINs in participants in Kombone was 0.13 times (95%CI: 0.05, 0.35) that of participants in Boa Balondo. The odds of sleeping under LLINs in participants in Kotto Barombi was 0.22 times (95%CI: 0.08, 0.60) that of participants at Boa Balondo while the odds of sleeping under LLINs in participants in Mbonge was 0.35 times (95%CI: 0.13, 0.94) that of participants at Boa Balondo. Finally, the odds of sleeping under LLINs in participants who had farming/trading as occupation was 0.19 times (95%CI: 0.04, 0.94) that of participants with no occupation (Table 5).

**Table 1:** Households to be interviewed determined by probability proportionate to size.

| S/N | HEALTH AREA   | Total Population | N° Household | Proportion | Proportion Sampled |
|-----|---------------|------------------|--------------|------------|--------------------|
| 1   | Boa Balondo   | 5385             | 1077         | 0.072      | 45                 |
| 2   | Bokosso       | 5166             | 1033         | 0.069      | 43                 |
| 3   | Kombone       | 29469            | 5894         | 0.393      | 249                |
| 4   | Kotto barombi | 14413            | 2883         | 0.192      | 122                |
| 5   | Mbonge        | 20563            | 4113         | 0.274      | 174                |
|     | Total         | 74996            | 15000        | 1          | 633                |

**Table 2:** Characteristics of study participants (N (%) or mean (SD) or Median (IQR)).

| Characteristic    | N or mean or median | % or SD or IQR |
|-------------------|---------------------|----------------|
| Age               | 38                  | 31-46          |
| Sex               |                     |                |
| Male              | 319                 | 50.4           |
| Female            | 314                 | 49.6           |
| Health area       |                     |                |
| Boa Balondo       | 45                  | 7.1            |
| Bokosso           | 43                  | 6.8            |
| Kombone           | 249                 | 39.3           |
| Kotto Barombi     | 122                 | 19.3           |
| Mbonge            | 174                 | 27.5           |
| Marital status    |                     |                |
| Single            | 78                  | 12.3           |
| Married           | 461                 | 72.9           |
| Cohabiting        | 28                  | 4.4            |
| Divorced          | 11                  | 1.7            |
| Separated         | 8                   | 1.3            |
| Widow/widower     | 46                  | 7.3            |
| Education         |                     |                |
| None              | 22                  | 3.5            |
| Primary           | 372                 | 58.9           |
| Secondary         | 216                 | 34.2           |
| University        | 21                  | 3.3            |
| Others            | 1                   | 0.2            |
| Occupation        |                     |                |
| None              | 12                  | 1.9            |
| Farming           | 451                 | 71.2           |
| Trading           | 68                  | 10.7           |
| Civil service job | 27                  | 4.3            |
| Others            | 75                  | 11.8           |
| Religion          |                     |                |
| Animist           | 17                  | 2.7            |
| Christian         | 603                 | 95.4           |
| Muslim            | 4                   | 0.6            |
| Others            | 9                   | 1.4            |
| Type of building  |                     |                |
| Cement brick      | 95                  | 15.0           |
| Timber            | 523                 | 82.6           |
| Thatch            | 9                   | 1.4            |
| Mud brick         | 6                   | 0.9            |

N: Frequency, %: Frequency in percent; SD: Standard Deviation; IQR: Interquartile Range.

**Table 3:** Hang up and use LLINs by participants (N (%) or mean (SD) or median (IQR)).

| Indicator   | N or Mean or median | % SD or IQR |
|---|---------------------|-------------|
| No. people in household   | 6                   | 4-9         |
| No. beds/sleeping places in household   | 4                   | 3.70        |
| No. nets received in household  | 2                   | 2.09        |
| No. nets hanging over beds/sleeping places  | 1                   | 0-3         |
| CRA/CHW helped to hang LLINs  | 0.25                | 0.49        |
| No. children less than 5 years in household   | 1.27                | 1.72        |
| No. pregnant women in household   | 0.20                | 0.52        |
| Households slept under LLINs the previous night                                       |                     |             |
| Yes   | 406                 | 64.1        |
| No  | 227                 | 35.9        |
| No. children <5 who slept under LLINs previous night                                  | 0.81                | 1.24        |
| No. pregnant women who slept under LLINs previous night                               | 0.15                | 0.49        |
| No. persons other than children & pregnant women who slept under LLINs previous night | 1                   | 0-3         |
| No. nets received still being used  | 1                   | 0-2         |
| No. times nets are washed yearly  | 1.31                | 1.63        |
| Reasons why LLINs are not used  |                     |             |
| Old   | 11                  | 4.6         |
| Torn with holes   | 75                  | 31.5        |
| Dirty   | 10                  | 4.2         |
| Generates heat  | 15                  | 6.3         |
| Was not given LLINs   | 120                 | 50.4        |
| Could not find LLINs to buy   | 7                   | 2.9         |
| Advocate that LLINs be sold   |                     |             |
| Yes   | 196                 | 31.1        |
| No  | 434                 | 68.9        |

No: Number; N: Frequency; %: Frequency in percent; LLINs: Long Lasting Insecticide Nets, TV: Television; CRA: Community Relay Agent; SD: Standard Deviation; IQR: Interquartile Range.

**Table 4:** Correlates of the usage of LLINs, bivariate analysis.

| Characteristic           | N   | %    | OR*  | 95% CI    | P-value |
|--------------------------|-----|------|------|-----------|---------|
| Age                      |     |      |      |           |         |
| 21-30                    | 98  | 63.6 | Ref  |           |         |
| 31-40                    | 159 | 66.5 | 1.14 | 0.74-1.74 | 0.56    |
| 41-50                    | 85  | 64.4 | 1.03 | 0.64-1.68 | 0.89    |
| 51+                      | 64  | 59.8 | 0.85 | 0.51-1.41 | 0.53    |
| Sex                      |     |      |      |           |         |
| Male                     | 210 | 65.8 | Ref  |           |         |
| Female                   | 196 | 37.6 | 0.86 | 0.62-1.19 | 0.37    |
| Health area              |     |      |      |           |         |
| Boa Balondo              | 45  | 7.1  | Ref  |           |         |
| Bokosso                  | 43  | 6.8  | 0.36 | 0.11-1.15 | 0.09    |
| Kombone                  | 249 | 39.3 | 0.13 | 0.05-0.35 | 0.00    |
| Kotto Barombi            | 122 | 19.3 | 0.22 | 0.08-0.60 | 0.00    |
| Mbonge                   | 174 | 27.5 | 0.35 | 0.13-0.93 | 0.04    |
| Marital status           |     |      |      |           |         |
| Single                   | 47  | 60.3 | Ref  |           |         |
| Married/cohabiting       | 328 | 67.1 | 1.34 | 0.82-2.20 | 0.24    |
| Divorced/separated/widow | 31  | 47.7 | 0.60 | 0.31-1.17 | 0.13    |
| Education                |     |      |      |           |         |
| None/primary             | 253 | 64.2 | Ref  |           |         |
| Greater than primary     | 153 | 35.7 | 1.00 | 0.72-1.40 | 0.99    |
| Occupation               |     |      |      |           |         |
| None                     | 10  | 83.3 | Ref  |           |         |
| Farming/trading          | 326 | 62.8 | 0.34 | 0.07-1.56 | 0.16    |
| Civil service/others     | 70  | 68.6 | 0.44 | 0.09-2.11 | 0.30    |
| Religion                 |     |      |      |           |         |
| Animist/others           | 12  | 46.2 | Ref  |           |         |
| Christian                | 392 | 65.0 | 2.17 | 0.98-4.78 | 0.05    |
| Muslim                   | 2   | 50.0 | 1.17 | 0.14-9.59 | 0.89    |
| Type of building         |     |      |      |           |         |
| Cement/mud brick         | 69  | 68.3 | Ref  |           |         |
| Timber/thatch            | 337 | 63.3 | 0.80 | 0.51-1.26 | 0.34    |

\*OR: Unadjusted Odds Ratio; OR: Odds Ratio; N: Frequency; %: Frequency In Percent; CI: Confidence Interval.

**Table 5:** Correlates of the usage of LLINs, multivariable analysis.

| Characteristic | N   | %    | aOR* | 95% CI    | P-value |
|----------------|-----|------|------|-----------|---------|
| Health area    |     |      |      |           |         |
| Boa Balondo    | 45  | 7.1  | Ref  |           |         |
| Bokosso        | 43  | 6.8  | 0.44 | 0.14-1.43 | 0.17    |
| Kombone        | 249 | 39.3 | 0.13 | 0.05-0.35 | 0.001   |



|                          |     |      |      |           |       |
|--------------------------|-----|------|------|-----------|-------|
| Kotto Barombi            | 122 | 19.3 | 0.22 | 0.08-0.60 | 0.003 |
| Mbonge                   | 174 | 27.5 | 0.35 | 0.13-0.94 | 0.04  |
| Marital status           |     |      |      |           |       |
| Single                   | 47  | 60.3 | Ref  |           |       |
| Married/cohabiting       | 328 | 67.1 | 1.60 | 0.92-2.78 | 0.10  |
| Divorced/separated/widow | 31  | 47.7 | 0.70 | 0.34-1.44 | 0.33  |
| Occupation               |     |      |      |           |       |
| None                     | 10  | 83.3 | Ref  |           |       |
| Farming/trading          | 326 | 62.8 | 0.91 | 0.04-0.94 | 0.04  |
| Civil service/others     | 70  | 68.6 | 0.25 | 0.05-1.27 | 0.09  |
| Religion                 |     |      |      |           |       |
| Animist/others           | 12  | 46.2 | Ref  |           |       |
| Christian                | 392 | 65.0 | 1.56 | 0.67-3.63 | 0.30  |
| Muslim                   | 2   | 50.0 | 0.93 | 0.10-8.47 | 0.95  |

\*aOR=Adjusted Odds Ratio; OR: Odds Ratio; N: Frequency; %: Frequency In Per Cent; CI: Confidence Interval.

## Discussion

Malaria is a serious public health problem in resource limited setting and most especially in sub-Sahara African countries [4]. Evidence has suggested that when large numbers of people use LLINs to protect themselves while sleeping, the burden of malaria can be reduced, resulting in a reduction in child mortality among other benefits [15].

In this study, we assessed the mean number of LLINs per household, the proportion of community dwellers that correctly hung up and consistently used LLINs and also assessed how usage of LLINs is associated to socio-demographic characteristics of community dwellers. We document that the median number of persons per household is 6, which is greater than the estimate given in the demographic and health survey of 2011-estimating an average of 5 persons per household in Cameroon [6]. In addition, the average number of beds/sleeping places recorded in this study is 4 while the mean number of nets received per household is 2. We also document that the proportion of people who slept under LLINs the previous night is just above average (64.1%) but still less than the recommended (>80%) level of use. However, reasons for none use of LLINs such as none reception of LLINs during distribution campaign, having old and torn LLINs, inability to find and buy LLINs and complains that LLINs generate heat have also been documented. In the study participants, available socio-demographic characteristics, both individually and as a group, did not accurately distinguish participants who used LLINs and those who did not. Nevertheless, being in Boa Balondo health area and having no specific occupation had statistically significant associations to usage of LLINs.

while the mean number of nets per household is small for the median number of persons per household documented in this study, it is slightly greater than the 1.6 mean number of nets per household reported in a study in Ethiopia [16]. Also, the level of utilization of LLINs documented in this study is closely similar to the 65.7% utilization level reported in another study in Cameroon [8], and falls within the range of 51% to 73% utilization levels reported in other sub-Saharan African countries such as Rwanda [17] and Uganda [18,19].

The level of utilization of LLINs in this study could be influenced by participants giving false information about their usage of LLINs or sleeping under LLINs the previous night. Though we sampled participants in the MHD, the sample may not have been representative of all the inhabitants of the MHD that use LLINs. We do not however expect the difference in LLINs utilization levels to be substantial as we used systematic random sampling to select participants in all the five health areas of the MHD. Potential errors due to bias in data collection or poor data collection could also mean that our level of LLINs utilization is overestimated and that our not finding a significant association between LLINs usage and some participants' socio-demographic characteristics is misleading. Nevertheless, the quality of our data was assured by investigators training data collectors and monitoring daily collection of data.

Though our sample size was adequate for estimating the level of LLINs utilization, only a few variables appeared to have an association with the use of LLINs and could be considered as potential predictors. This was similar to the results of studies in Ethiopia [16] and Uganda [18,19], that showed that there was no association between use of LLINs and characteristics like gender, education and occupational status, but dissimilar with studies done in Rwanda [17] and Ethiopia [16,20] that found associations with some factors such as low wealth status of households, marital status of households heads, residence, number of nets in households, number of sleeping places and household size.

Since only a very low proportion of participant (12.8%) could correctly hang up LLINs and use them, the average bed/sleeping places in households was 4 with only 2 available nets and the proportion of children and pregnant women (those most vulnerable to malaria) who slept under LLINs the previous night were respectively 1.72% and 0.52%, and given that some participants who did not sleep under LLINs said they were not given LLINs (50.4%), their LLINs were old and torn (31.5%), LLINs generate heat (6.3%) and that they could not find LLINs to buy (2.9%), this indicates a lack of knowledge of the importance of using LLINs and reiterates the need for health education and

continuous sensitization of community dwellers on importance of LLINs, the need to make LLINs available in the community for those who need to buy and the need to encourage children less than 5 years and pregnant women to sleep under LLINs as a means to prevent malaria.

### Conclusion

The utilization of LLINs by the community is lower than recommended, proportion of participants who correctly hung up LLINs is low and only being in Boa Balondo and having no occupation had statistical significant associations with use of LLINs. LLINs need to be made available and household heads need more education and assistance to hang up and use LLINs. More studies with larger samples and for much longer durations needs to be done to find other predictors of LLINs usage.

### Ethics approval and consent to participate

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of the Faculty of Health Sciences (FHS) of the University of Buea (UB). Written consent was obtained from all participants prior to their participation in the study.

### Availability of data and materials

The authors declare that data and materials shall be available only on request.

### Authors' contributions

DSN, KKI, PJN and AWB contributed to the conception and design of the article and revising it critically. KKI did the acquisition of data. KKI and AWB drafted the manuscript. KKI and AWB conducted the statistical analysis and interpreted the original results. All authors wrote or reviewed and approved the final manuscript.

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