



Ecole de Santé Publique de Kinshasa

**THE ANGLICAN CHURCH OF THE PROVINCE OF CONGO
(PEAC)**



**IN COLLABORATION WITH NETSFORLIFE AND THE NATIONAL PROGRAM
AGAINST MALARIA (PNLP)**

**PILOT STUDY OF LONG LASTING INSECTICIDE- TREATED
NETS DISTRIBUTION WITH DOOR TO DOOR STRATEGY
COMBINED WITH «HANGUP» METHOD IN THE
NETSFORLIFE SUPPORTED HEALTH ZONES IN DRC**

PRELIMINARY REPORT OF THE STUDY

November 2012



TABLE OF CONTENTS

TABLE OF CONTENTS	1
MANAGEMENT TEAM.....	3
TABLE OF FIGURES	6
1. INTRODUCTION	6
a) Context and justification of the study.....	Error! Bookmark not defined.
b) The Anglican Church of the Province and NetsforLife’s Presentaiton in DRC.....	7
2. OBJECTIVE RESEARCH QUESTIONS AND HYPOTHESIS OF THE STUDY	9
2. a General target :	9
2. b. Specific goals (objective) :	9
2. c. Research questions.....	9
2. d. Hypothesis	9
3. METHODOLOGY	10
3. a. TYPE OF STUDY	10
3.b. Monitored group.....	11
3.c. Variables and indicators of the study.....	11
3.d. List of Indicators :	12
3.e. Examples.....	13
3.f Data collection of preoperative monitoring & evaluation utilization and postoperative evaluation.	14
3.g. Data management and analysis	14
3.h. Ethical considerations.....	14
4. RESULTTS	15
4.1. RESULTS OF THE PRE-OPERATIONAL EVALUATION	15
4.1.1. 1. VARIOUS HOUSEHOLDS’ SOCIO DECOMGRAPHI CHARACTERISTICS	15
a. Size of households	15
4.1.2 TARGETED POPULATIONS’ KNOWLEDGE AND PERCEPTION ON MALARIA AND ITS PREVENTION	17

a. Knowledge about the link between mosquitoes and malaria transmission.....	17
b. Perception of the severity of malaria by householdss	17
c. Most vulnerable group based on households perception.....	18
d. Knowledge of mosquito breeding sites	18
e. Knowledge of recommended drugs for the treatment of malaria	19
f. Signs of malaria according to households’ experience.....	19
g. Knowledge of malaria prevention methods.....	20
4.1.3. POSSESSION AND USE OF LLTNs PER HOUSEHOLDS	20
a. Possession of LLINs per household	20
b. Use of LLINs by householdss	20
4.2. POST-OPERATIONNAL RESULTS OF THE EVALUATION.....	22
4.2.1. CERTAINSS HOUSEHOLDS’ SOCIO DECOMGRAPHIC CHARACTERISTICS.....	22
4.2.2. TARGETED POPULATION’S KNOWLEDGE AND PERCEPTION ON MALARIA AND ITS PREVENTION	23
a. a. Knowledge about the link between mosquitoes and malaria transmission.....	23
b. . Knowledge of mosquito breeding sites	24
c. Knowledge about the group of people most vulnerable to malaria	Error! Bookmark not defined.
d. e. Knowledge of recommended drugs for the treatment of malaria.....	24
e. Knowledge of the uncomplicated signs of malaria by respondents	25
e. g. Knowledge of malaria prevention methods.....	26
4.2.3. 4.1.3. POSSESSION AND USE OF LLIN BY HOUSEHOLDS.....	27
a) Procurement of LLINs by households during the campaign.....	27
b) Possession of LLINs per household at the time of the study	29
c) LLINs used by the targeted group	30
d) Outcome of the use of LLINs on the number of malaria cases in external consultation	32
4.2.4. COST EFFECTIVE DOOR TO DOOR STRATEGY COMBINED WITH 'HUNG UP' STRATEGY FOR LLINs DISTRIBUTION.....	Error! Bookmark not defined.
5. DISCUSSION.....	35
5.1. Procurement of LLINs by households after the campaign	36

5.2. Use of LLINs by the targeted group.....	37
5.3. Impact on new cases of malaria reported	37
5.4. Cost-effectives analysis of door to door strategy combined with 'Hung up' strategy of LLINs distribution	38
6. CONCLUSION AND RECOMMENDATIONS	38

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LIST OF ABBREVIATIONS

BCZS: Central Bureau of Health Zone

CAP: Knowledge Attitude Practice

CPN: Pre-Natal Consultation

CPS: Post Consultation

CS: Health Care Center

ESP: School of Public Health

FM: Global Fund

HGR: General Referral Hospital

MI: Insecticide-treated nets

MILD: LLIN

NLF : NetsforLife

OMS: World Health Organization

PNLP: National Program against Malaria

ZS: Health Zone

LIST OF TABLES

Tableau 4.1.1.	: Central tendency and dispersion of household size in Study's health zones
Tableau 4.1.2	: Distribution of the household members surveyed by age group and gender
Tableau 4.1.2	: Cause of malaria as reported by interviewees
Tableau 4.1.3	: Target populations' perception of the severity of malaria
Tableau 4.1.4	: Reasons for the severity of malaria mentioned by households
Tableau 4.1.5	: Interviewees' perception of most vulnerable groups
Tableau 4.1.6	: Mosquito breeding sites as reported by households
Tableau 4.1.7	: Recommended drugs for the treatment of uncomplicated malaria
Tableau 4.1.8	: Occurrence of at least one case of malaria in the household
Tableau 4.1.9	: Prevention methods of malaria mentioned by households
Tableau 4.1.10	: Distribution of households by possession of at least one LLIN in the health zone of the study
Tableau 4.1.11.	: Overall use of LLIN
Tableau 4.1.12.	: LLIN Usage by Children under Five Years

Tableau 4.1.13.	: LLIN usage by pregnant women who sleep under the net
Tableau 4.1.14	: Central tendency and dispersion of the number of LLINs the households possessed
Tableau 4.2.1	: Central tendency and dispersion of household size in the health zones of the study
Tableau 4.2.2	: Distribution of members of households surveyed by age groups and by gender
Tableau 4.2.3	: Cause de la malaria selon la déclaration des personnes interviewées
Tableau 4.2.4	: Mosquito breeding sites as reported by households
Tableau 4.2.5	: Categories of the most vulnerable groups based of the interviewees' perception
Tableau 4.2.6	: Recommended drugs for the treatment of uncomplicated malaria
Tableau 4.2.7.	: Target populations' knowledge of the signs of uncomplicated malaria
Tableau 4.2.8	: Prevention methods of malaria mentioned by households
Tableau 4.2.9	: Distribution of households based on the procurement of at least one LLIN during the campaign
Tableau 4.2.10	: Central tendency and dispersion of the number of LLINs obtained during the campaign
Tableau 4.2.11	: Reasons for not obtaining LLINs during the campaign
Tableau 4.2.12	: Possession of at least one LLIN per household during the passage of of the surveyors
Tableau 4.2.13	: Difference between the numbers of LLINs received during the campaign and the number of LLINs available
Tableau 4.2.14	: Distribution of household members who slept under a LLIN the night before the passage of the surveyors
Tableau 4.2.16	: Children under 5 years who spent the night under LLINs the night Before the passage of the surveyors
Tableau 4.2.17	: Distribution pregnant women who slept under a LLIN the night before the interviewers' visit
Tableau 4.2.18	: Summary of gross costs of LLIN distribution in each of the

TABLE OF FIGURES

- Figure 1: Heads of household's highest level of schooling in Musienene
- Figure 3: Heads of household's highest level of schooling in Lubero
- Figure 3: Household members who used LLITNs the night preceding the interviewers, visit
- Figure 5: Sources of information on malaria
- Figure 6: Reasons for non-use of LLITNs
- Figure 7: Possession and use of LLITNs by pregnant women and children under five
- Figure 8: Malaria cases reported before and after LLITNs distribution

1. INTRODUCTION

Background and rationale for the study.

Malaria remains a major public health problem in the world, although significant progress has been made. In 2010, the number of malaria episodes was estimated at 216 million malaria episodes with 81% in the African Region of the WHO malaria, 174 million cases, with 655 000 deaths, 86% of children under 5 years. The WHO African region is the most affected. It is in this area that 81% of all malaria episodes and 91% of all deaths were recorded (1, 2).

In The Democratic Republic of Congo, between 21 to 27 million cases of malaria and nearly 180,000 deaths mainly among children under 5 years are estimated each year (3).

To fight against this disease, the Ministry of Public Health through the NMCP has adopted a policy based on the following four basic strategies: strengthening prevention activities through appropriate methods of individual and collective protection; Implementation of Intermittent preventive treatment of pregnant women; Improved, fast, accurate and effective management of malaria cases at all levels of the health care system and strengthening the management of malaria

In addition to intra and peri-sanitation and indoor residual spraying (IRS) of homes, promoting the use of LLINs is the main intervention used as prevention activities by the NMCP for vector control in the DRC (4).

The two distribution strategies used are: distribution through mass campaigns for large-scale coverage of all populations at risk and routine distribution through antenatal care (ANC) and Secretariat of the Pacific Community (SPC) for pregnant women and children under five years in order to maintain coverage due to loss of LLINs over the years. The mass distribution campaigns effectively increase the coverage of LLINs in the population: Thus in 2006, the distribution campaign conducted in Bas-Congo has increased the proportion of households owning at least one LLIN from 25.7% to 78.3% (5). The 2007 campaign conducted in South Kivu has to move from 19.6% to 84.8% of households with at least one LLIN after LLIN distribution per child under 5 years.

Studies have shown a positive correlation between the possession and use of LLINs; owning LLINs therefore encourage its use (6). According to WHO, household surveys report that 96% of people with access to LLINs in a home actually use them (2).

However, in the DRC, the evaluation survey of baseline indicators in the FM ZS project carried out by the ESP showed a 7% gap between ownership and effective use of LLINs (7).

The Implementation LLIN distribution through mass campaigns consist of distributing tokens to each household, identifying distribution sites where household members have to travel to receive LLINs during a set period, and effective LLINs distribution at the sites. The procedure for implementing mass campaign presents two risks: the first risk is the loss of households between token distribution and LLINs distribution per household and the second risk is the loss of LLINs after households received them because some do not install the LLINs and therefore don't use them. The difference between the possession and use and the risk of loss of households can be corrected by, among other door to door strategy combined with 'Hang up method.

This strategy has been implemented in other countries such as Sierra Leone, Kenya, Senegal and Ghana, particularly in Sierra Leone where a study by the CDC showed a clear 22% increase in LLIN use especially when this strategy is accompanied by follow-up visit within the community with the promotion of effective use (8, 9). However, it requires a large staff and logistics to achieve this.

This study was proposed at the request of the NMCP and the Anglican Church with the support of NetsforLife to assess the possibility of its implementation in the DRC. It was conducted in the province of North Kivu in the health zone of Musienene as intervention and the health zone of Lubero as control.

a) The Province of the Anglican Church and NetsforLife Presentation in DR Congo.

The Province of the Anglican Church of Congo is part of the Anglican Communion which is an international association of churches (called PROVINCES) and is represented by the Primates also called Archbishops in communion with the Archbishop of Canterbury. The Anglican Church is a reformed church established in the early 16th century.

The Anglican Communion's foremost mission begins with the work in the service of God. This mission is to proclaim the Good News of the Kingdom, teach, baptize and nurture believers, respond to human need by loving service, seek to transform society and preserve the integrity of creation. Arriving in the Congo in 1896, from BOGA in the Orientale province, the Anglican Church gradually spread through the Democratic Republic of Congo under the name of the Anglican Church of Congo and was granted a NGO status based on the Presidential Order of 1 December 1960.

Today, the Anglican Church of Congo which is among one of the oldest communities members of the Church of Christ in Congo is firmly rooted in various provinces of the DRC including the Province Orientale, North Kivu, South Kivu, Maniema, Katanga, Kinshasa and the two Kasai.

As part of development and promotion of health of the communities in which it operates, the Anglican Church of Congo also organizes social activities. It is for this reason that it is an active partner of the Ministry of Public Health with a rich heritage in health facilities including 4 referral general hospitals, 3 hospital centers and 59 health centers distributed in various health areas located in the eastern part DRC.

The Province of the Anglican Church of Congo under the authority of the Archbishop, coordinates with its various departments social activities through its nine dioceses headed by bishops of the dioceses namely in Boga, Aru Kisangani, Bukavu, North Kivu, Kindu, Katanga, Kasai, Deux Kasai, and Kinshasa. Within each diocese operates a medical service that coordinates activities in the health facilities with the support of several partners, including Episcopal Relief and Development, TEAR Fund, etc. and NetsforLife. NetsforLife, NFL logo, is an international organization that works in 17 African countries, including the DRC where they have been working with the Anglican Church since 2006 in the field of malaria prevention, specifically in raising awareness and support campaigns of mass distribution of LLINs. The Health Support Program of the Province of the Anglican Church of Congo DRC with the support of NetsforLife is operational to date in two provinces respectively the Eastern Province (in the district of Ituri) and the Province of Katanga. In Oriental Province, NFL program activities began in the Diocese of Boga and are operational in six archdeaconries that are under administrative supervision of Djugu and Irumu and are part of the district of Ituri. In Djugu, the program is operational in the health zone of Tchomia, Irumu, the town of Bunia (Kindia) the health zone of Boga, Kyabwohe, Burasi, Rubingo Mugwanga, Bikima, Bukiringi and Kasenyi. In Katanga, they are operational in 4 health zones (Bunkeya, Kapolowe, Kenya and Kampemba).

Today, NetsforLife has not yet deployed any activity in the province of North Kivu. This pilot study would be a first in this province. The map below shows NetsforLife distribution across the African countries, it is ultimately an important partner in the fight against malaria.

Fig.1: NETSFORLIFE MAPPING IN AFRICA





Aim of the study: To contribute to the improvement of LLINs coverage in the communities of North Kivu and especially in the health zone of Musienene.

2. OBJECTIVE RESEARCH QUESTIONS AND HYPOTHESES OF THE STUDY

2. a. Overall objective:

To evaluate the influence of LLIN distribution with door to door strategy and "HANG UP" method coverage in terms of LLINs possession and use and cost effectiveness in health zone of MISIENENE in the North Kivu province.

2. b. Specific objectives :

1. Describe the knowledge and perceptions of the population in relation to malaria and its prevention;
2. Determine the percentage of possession and utilization of LLINs in households before and after the intervention;
3. Compare the unit cost of LLINs distributed with door to door strategy and "HANG UP" method in the targeted health zones with the distribution cost of LLINs by the traditional strategy in the control health zones after the campaign;
4. Identify practical constraints in the implementation of the door to door method and "HANG UP" strategy;
5. Determine the impact of the door to door strategy and Hang-up method on the use of LLINs in the health zones covered by the intervention compared to a control area covered by the traditional strategy;
6. Recommendations to policy makers and the community.

2. c. Research questions

1. What is the effect of the distribution of LLINs strategy combined with door to door method "HANG UP" on the use of LLINs in households?
2. What is the value of the unit cost of the LLIN distribution by the Strategy door to door combined with the method "HANG UP" compared to the fixed strategy?

2. d. Hypotheses

Distribution of LLINs by door to door strategy combined with the "HANG UP" method significantly reduces the gap between the possession and use of LLINs in households. This strategy thus increases the use of LLINs in households

Indeed, the possession and installation of LLINs on the beds encourage their use by households. The utilization of LLINs improved significantly, so close that it teaches the ownership rate.

3. METHODOLOGY

3. a. Type of study

It is a quasi-experimental evaluation design along with design such as:

Study's health zone: O_1 X O_1'
Health zone observed: O_2 O_2'

With:

- O_1 = Evaluation pre-interventional (observation) in the health zone of Musienene (intervention health zone) prior to the effective implementation of the intervention;
- O_1' = Evaluation post-interventional in the health zone of Musienene (health zone intervention) after intervention implementation
- O_2 = Evaluation pre-interventional (observation) in the health zone of Lubero (health zone observed) Prior to the implementation of the intervention in the study health zone
- O_2' = Evaluation in post-interventional health zone of Lubero (health zone control) after the implementation of the intervention in the study's health zone
- X = Intervention in the study group.

The intervention was carried out with the contribution of the health zone management teams, with the support of partners: the Anglican Church and UNICEF along with Netsforlife.

In mass distribution campaigns of LLINs, the following activities are usually carried out:

- ✓ Advocacy with policy makers and leaders in the area of health for their full involvement for the success of the campaign;
 - ✓ Community mobilization on the importance and use of LLINs for malaria prevention;
 - ✓ Strengthening providers and community outreach's capacity of the for the implementation of the campaign;
 - ✓ Pre-registration and enumeration of households;
 - ✓ The actual distribution of LLINs which is usually done by a fixed strategy to achieve the following:
- Teams previously defined at the micro-planning stage, taking into account the realities in the field; have mapped the health zone range depending on the proximity of the households' distribution area.

- Nets are deposited at fixed distribution points selected as benchmarks in the health zone, namely: Central Bureau of Health Zone, health centers, schools, churches etc.
- The inventory made in advance by the community relays when LLINs are already available in the health zone, helps to identify the household as well as its characteristics; it is made from door to door through the health zone where the mass distribution is to take place.
- The information collected for households identification is reported on the identification registry and on the badges of the latter. (cf. household's pre-registration form in the appendix).
- After inventory, stickers or coupons are distributed to the beneficiaries (households) who will come to retrieve the LLINs from fixed distribution sites that are indicated to them
- After receiving LLINs, beneficiaries return to install them in their households themselves

Unlike the fixed strategy, the intervention consisted of the LLIN distribution strategy by door to door combined with the "HANG UP" method in the intervention health zone.

This strategy includes all the above steps as in the fixed strategy, with the difference that instead of the recipients just retrieving the LLINs at fixed locations and go to install them themselves, it's the agents that retrieve the LLINs from the sites where they are pre-positioned and distribute them door to door and hang them on the beneficiaries' beds of.

One month after the distribution, follow-up visits post-surveys were conducted in the health zone of Musienene. Every house in the health zone was visited. The effective use of LLINs has been verified and household members have been aware of the use of LLINs.

3. b. Target population

- Target Population of the HANG UP Strategy

Distribution of LLINs with door to door strategy combined with the "HANG UP" method had affected all households selected for the intervention in the health zone of Musienene. The Lubero health zone was used as control health zone where LLINs were distributed through mass campaign following the traditional method used by the NMCP (National Malaria Control Programme).

- Target of the survey

Children under 5 years of age were the main target of the study. Secondly, households were also targeted to evaluate the possession and use of LLINs

Heads of household or their representatives were asked about the use of LLINs by household members, namely pregnant women and children 0-59 months.

3. c. Variables and indicators of the study

Variables:

- Socio-demographic characteristics of households
- Knowledge and perceptions of the target population about malaria and its prevention;
- Possession of LLINs in households;
- Possession of LLINs by pregnant women and children under 5 years;
- Use of LLINs by households;
- Use of LLINs by pregnant women and children under 5 years;
- Comparison of rates of ownership and use of LLINs in households before and after the implementation of door to door strategy combined with the "HANG UP" method on the one hand in the test area and the other in the control area;
- Unit cost of LLINs distributed after door to door strategy combined with the "HANG UP" method compared to the unit cost of the LLINs distributed in the control area (traditional approach);
- Practical constraints to the implementation of the

3.d. List of Indicators:

- Proportion of households with at least one LLIN;
- Proportion of households with a pregnant woman who has at least one LLIN;
- Proportion of households with a child under 5 years of age has at least one LLIN;
- Proportion of total household population who slept under an LLIN the previous night;
- Percentage of pregnant women who slept under an LLIN the previous night;
- Percentage of children under 5 years who slept under an LLIN the previous night;
- Proportion of target population who believe or know that mosquitoes cause malaria;
- Proportion of target population who believe or know that malaria can be prevented in the house;
- Proportion of target population who believe or know that malaria is a serious /fatal;
- Proportion of the population experiencing signs of uncomplicated malaria;
- Proportion of target population who believe or know that children under 5 years and pregnant women are most vulnerable;
- Proportion of target population who know the breeding sites of mosquitoes;
- Proportion of target population who know the recommended drug for the treatment of uncomplicated malaria;
- Proportion of target population who know at least two ways to prevent malaria;
- Proportion of people who believe or know that malaria can be prevented by sleeping under LLINs;
- Percentage of heads of households who have heard or seen messages on malaria;
- Unit cost of LLINs distributed with door to door strategy combined with the "HANG UP" method;
- Percentage of households who accepted with door to door strategy combined with the "HANG UP" method of the LLINs;
- Proportion of households using LLIN on those who have them;
- List of practical constraints to the implementation of the door to door strategy combined with the "HANG UP method".

3.e. Sample

« "Sleeping under an ITN is one of the most effective ways to protect against the transmission of malaria." In national surveys, the use of LLINs is often assessed by two indicators: the proportion of children under 5 years and pregnant women who slept under LLIN the night before the survey.

In the DRC, in the province of North Kivu, DRC-MICS (2010), and the Report of the NMCP (2010), show that there were, respectively, 32% of children under 5 years and 39% of pregnant women who slept under LLIN the night before the survey (10, 11). Because children under 5 years are the main target of our study, the proportion of children under 5 years using the LLIN was used to calculate the sample size in our study.

The literature review also shows that, where LLINs were distributed along with “Hang Up” strategies, the utilization rate was increased by more than 20% (22% in Sierra Leone and Ghana) (8 , 9).

To calculate the sample size of our study, we used the statistical formula for comparing two proportions along with P1 and P2 respectively: utilization percentage and percentage of theoretical use

The formula therefore is:

$$n \geq \frac{[Z_{1-\alpha/2} \sqrt{2p(1-p)} + Z_{1-\beta} \sqrt{p_1(1-p_1) + p_2(1-p_2)}]^2}{(p_1-p_2)^2} \quad \text{or :}$$

- P1= percentage of children under 5 who slept under LLIN the night before the survey = 32% (percentage of current use).
- Assuming that the implementation of the strategy in the intervention health zone increase by at least 20% the use of LLINs among children less than 5 years, the percentage of theoretical use (p2) will be 52%.
- The degree of accuracy is given by the difference between p1 and p2, ie: 52% - 32% = 20%.
- The sample size is estimated in order to detect, with a certainty of 90%, a 20% difference between the rate of use of LLINs distributed with the fixed strategy (controlled health zone) and the rate of use of LLINs distributed with the strategy Hang up (health zone intervention) so it is the comparison of two proportions.
- Therefore using the statistical formula:

$$n \geq \frac{[Z_{1-\alpha/2} \sqrt{2p(1-p)} + Z_{1-\beta} \sqrt{p_1(1-p_1) + p_2(1-p_2)}]^2}{(p_1-p_2)^2}$$

$$Z_{1-\alpha/2} = 1,96 \quad (\alpha=0,05)$$

$$p_1 = 52\% = 0,52$$

$$Z_{1-\beta} = 1,28 \quad (\beta = 0,1)$$

$$p_2 = 32\% = 0,32$$

$$\bar{p} = \frac{p_1 + p_2}{2} = \frac{0,52 + 0,32}{2} = \frac{0,84}{2} = 0,42$$

$$n \geq \frac{[(1,96\sqrt{2(0,42)(1-0,42)} + 1,28\sqrt{(0,52)(1-0,52)} + (0,32)(1-0,32))]^2}{(0,52 - 0,32)^2}$$

$$n \geq 125,8$$

By adding 10% of non-respondents, the sample size may be increased to 138.4 we rounded to 140 households by ZS. The sample size has been estimated at 140 households in the intervention ZS and ZS 140 households in the control. , Ie a total of 280 households surveyed for the entire study.

3. f. Data collection of the pre-operational monitoring and post-operative evaluation.

Data collection of pre-operational assessment was conducted during the mission from 9 to 18 January 2012. To ensure quality data collection, two supervisors and 20 investigators from the Anglican Church of Butembo, 10 (ten) community relays from the health zone of Musienene and 10 (ten) from Lubero were formed from 13 to 14 January 2012 and data collection itself took place from January 15 to 16.

The LLIN distribution campaign took place from 24 to 28 April 2012 in Musienene and 22 to 26 April 2012 in Lubero. Follow-up visits in the household were held on 14 and 15 May 2012.

The post-operative evaluation was organized from 1st to 10th October 2012.

3. g. Processing and analysis of data

After verification and encoding the questionnaires were entered using the EpiData 3.0, by a team of experienced and trained encoders. Data were analyzed using SPSS version 19.0.

During the analysis of data collected, we tried to synthesize all the information by leveraging statistical methods given frequency, mean, median, standard deviation etc.. The proportions of possession and use of LLINs by households between the preoperative evaluation and post-operational evaluation were compared using the Student's t test with SPSS version 19.0. All analyzes were performed considering a significance level of 5%.

3.h. Ethical considerations

The study protocol was submitted to the Ethics Committee of the School of Public Health at the University of Kinshasa and obtained approval for its realization.

Since human beings were involved in this action research, ethical precautions were taken. Indeed, the three ethical principles have been met: **namely respect for persons, goodwill and justice.**

The selection of participants was done randomly among households that have at least one child under 5 years. Participation in the study was voluntary and informed consent of participants was sought on the basis of the consent form in Swahili (cf. Appendix).

The study involves no risk to the participants since respondents were not subjected to any clinical procedure

The information collected was generally limited to data collected during the survey on the knowledge, attitudes and practices (KAP). The confidentiality of information provided by the participants and the principle of non-nuisance were guaranteed. The names of interviewees have not been on any of the evaluation report

4. RESULTS

4.1. PRE-OPERATIONAL EVALUATION RESULTS

4.1.1. SOME HOUSEHOLDS' SOCIO DEMOGRAPHIC

a. Household size

Table 4.1.1. : Central trends and size dispersion of households in the health zone of the study

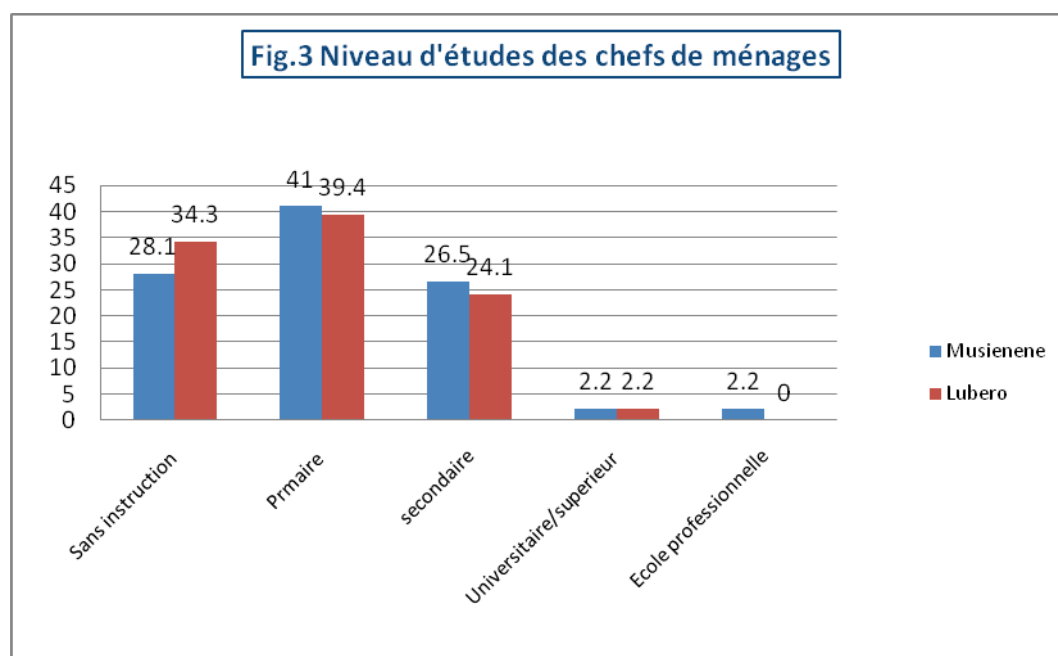
	Number of households surveyed	Minimum	Maximum	Total number of individuals living in the 140 households selected	Average number of individuals per household	Standard Deviation
MUSIENENE HEALTH ZONE	140	2	19	960	6,86	2,925
LUBERO HEALTH ZONE	140	2	20	899	6,42	2,866

Table 4.1.2: Division of surveyed household members by age and gender

Age	Health Zone					
	MUSIENENE		LUBERO		TOTAL	
	Number	%	Number	%	Number	%
Under 5 years	248	25,8	238	26,5	486	26,1
5 ans and over	712	74,2	661	73,5	1373	73,9
Total	960	100,0	899	100,0	1859	100,0
Sexe						
Men	468	48,8	423	47,1	891	47,9
Women	492	51,3	476	52,9	968	52,1
Total	960	100	899	100	1859	100

b. Level of education of heads of households

In each household, the level of highest education attained by the head of household was collected. The results are shown in Figure 3 below:



4.1.2. KNOWLEDGE AND PERCEPTION OF THE TARGET POPULATION ON MALARIA AND ITS PREVENTION

a. Knowledge about the link between mosquitoes and malaria transmission

The proportion of the target population who believes or knows that mosquitoes cause malaria is one of the indicators to be determined. To assess this indicator, the cause of malaria was collected from interviewees. Table 4.1.2 below shows the results.

Table 4.1.2: Cause of malaria as reported by interviewees

Cause of malaria	MUSIENENE		LUBERO		TOGETHER	
	Number	%	Number	%	Number	%
Mosquito bite	108	77,1	118	84,2	226	80,7
Lack of hygiene	23	16,4	11	7,9	34	12,1
Presence of stagnant water	11	7,9	18	12,9	29	10,4
Contaminated drinking water	13	9,3	2	1,4	15	5,4
Food	7	5	1	0,7	8	2,9
Environmental change	2	1,4	3	2,1	5	1,8
Do not know the cause	10	7,1	6	4,3	16	5,7

Overall, 80.7% of households know that malaria is caused by mosquito bites.

b. Perception of the severity of malaria by households

Table 4.1.3 shows the proportion of the target population who believes that malaria is a serious disease

Table 4.1.3: Target populations' perception of the severity of malaria in

Is malaria a serious disease?	MUSIENENE		LUBERO		ENSEMBLE	
	Number	%	Number	%	Number	%
Yes	135	96,4	122	87,1	257	91,8
No	5	3,6	18	12,9	23	8,2
Total	140	100	140	100	280	100

This table shows that the majority of households (91.8%) knew that malaria is a serious disease. To the question of why they believe the disease is severe, four main reasons were cited by most interviewees as presented in the table below:

Table 4.1.4: The causes of the severity of malaria mentioned by households

Why malaria is perceived as a serious illness?	MUSIENENE		LUBERO		TOGETHER	
The group most vulnerable to malaria	MUSIENENE		LUBERO		TOGETHER	
	Number	%	Number	%	Number	%
Children < 5 years	93	66,4	81	57,9	174	62,1
Women in general	24	17,1	27	19,3	51	18,2
Pregnant women	22	15,7	20	14,3	42	15,0
Everyone	10	7,1	17	12,1	27	9,6
Men	17	12,1	4	2,8	21	7,5
The elderly	3	2,1	7	5,0	10	3,6
	Number	%	Number	%	Number	%
Because it kills	32	22,9	46	32,9	78	27,9
Weakened body a lot	33	23,6	17	12,1	50	17,9
Due to pain/soreness felt by the affected person	12	8,6	14	10,0	26	9,3
Because the neurological effects it may have	8	5,7	6	4,3	14	5,0

A minority of interviewees estimated that malaria is not a serious illness. These people argued that malaria is a temporary illness, and can be cured without drugs.

c. The most vulnerable according to perception of households

The percentage of the target population who knows or believes that children under 5 years and pregnant women are most vulnerable was determined by collecting the opinion of the interviewees on the issue. The results are presented below:

Table 4.1.5: Groups of most vulnerable people as perceived by the interviewees:

The majority of households have confirmed that children under 5 years are the most vulnerable (62.1%). Few interviewees recognized that pregnant women are also vulnerable (15%).

d. Knowledge of mosquito breeding sites

The results obtained in this regard (Table 4.1.6) show that the majority of households (60.7%) cited stagnant water as breeding sites for mosquitoes

Table 4.1.6: Mosquito breeding sites as reported by households

Mosquito breeding sites	MUSIENENE		LUBERO		TOGETHER	
	Number	%	Number	%	Number	%
Stagnant water	79	56,4	91	65,0	170	60,7

Waste/garbage	33	23,6	35	25,0	68	24,3
Poorly maintained Banana trees	17	12,1	14	10,0	31	11,1
WC / Shower	12	8,6	8	5,7	20	7,1
Streams	9	6,4	10	7,1	19	6,8
Do not know	8	5,7	5	3,7	13	4,6

e. Knowledge of recommended drugs for the treatment of malaria

The results obtained in this regard (Table 4.1.7) show that populations in the 2 health zones concerned not know the drugs currently recommended for the treatment of uncomplicated malaria.

Table 4.1.7: recommended drugs for the treatment of uncomplicated malaria

Recommended drugs	MUSIENENE		LUBERO		TOGETHER	
	Number	%	Number	%	number	%
Must go to a health center	34	24,3	25	17,9	59	21,1
Quinine	26	18,6	22	15,7	48	17,1
SP (sulfadoxine-pyrimethamine)	18	12,9	7	5,0	25	8,9
Chloroquine	11	7,9	5	3,7	17	6,1
Paracetamol /Aspirin	11	7,9	3	2,1	14	5,0

This situation can be explained by the lack of availability of ASAQ in these health zones. In fact, this combination is made available in health zones that are benefiting from the support of partners such as the Global Fund, USAID etc.

f. Signs of malaria according to the experience of households

Malaria morbidity was collected indirectly by asking interviewees if at least one household member had malaria during the two weeks that preceded the interviewers' visit. The results are shown in Table 4.1.8.

Table 4.1.8: Occurrence of at least one case of malaria in the household

Occurrence of at least one case of malaria	MUSIENENE		LUBERO		TOGETHER	
	Number	%	Number	%	Number	%
Yes	61	43,6	58	41,4	119	42,5
No	79	56,4	82	58,6	161	57,5
Total	140	100	140	100	280	100

Overall, 42.5% of households said they had had at least one malaria cases in their household during the 2 weeks prior to the interviewers' visit.

When asked how they knew it was malaria, fever has been cited by the majority of the households (46%) followed by chill (15.1%), according to the diagnosis at the hospital (15.1%) and following headaches reported by the patient (13.4%).

The treatment administered was also collected. 50.4% of households reported having led the patient to the hospital and 37% said they had resorted to self-medication or using drugs purchased at the pharmacy (86%) or using medicinal plants (14%).

g. Knowledge of malaria prevention methods

Malaria prevention methods were collected from

Table 4.1.9: Malaria prevention methods mentioned by households

Malaria prevention methods	MUSIENENE		LUBERO		TOGETHER	
	Number	%	Number	%	Number	%
Sleep under LLINs	61	43,5	101	72,1	165	58,9
Sanitation	60	42,8	31	22,1	91	32,5
Insecticide use	17	12,1	11	7,8	28	10,0
Do not know	11	7,8	9	6,4	20	7,1

The use of LLINs and sanitation were the main methods cited by households.

4.1.3. POSSESSION AND USE OF LLINs BY HOUSEHOLDS

a. Possession LLINs BY HOUSEHOLDS

Table 4.1.10: Distribution of households by possession of at least one LLIN in the study health zones

Possession of at least one LLIN by household	MUSIENENE		LUBERO		TOGETHER	
	Number	%	Number	%	Number	%
Yes	42	30,0	42	30,0	84	30,0
No	98	70,0	98	70,0	196	70,0
Total	140	100,0	140	100,0	280	100,0

Coverage of LLINs ownership by households is statistically the same in both health zones of the study ($p > 0.05$). Overall, three out of 10 households have at least one LLIN. Coverage were statistically identical.

b. LLIN use by the target populations

The results relating to the use of LLINs by the target populations are presented in Tables 4.1.11 to 4.1.13.

Table 4.1.11. Overall use of LLINs

People who spent the night under LLINs	Health zone:					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Yes	124	12,9	113	12,6	237	12,7
No	835	87,1	786	87,4	1622	87,3
Total	960	100,0	899	100,0	1859	100,0

Table 4.1.12. LLIN use by children under 5 years

q334. Did he/she sleep under the net? Age < 5 years	Zones de Santé					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Yes	38	15,3	35	14,7	73	15,0
No	210	84,7	203	85,3	413	85,0
Total	248	100,0	238	100,0	486	100,0

Table 4.1.13. LLIN use among pregnant women who spent nights under a mosquito net

Réponses	Health zones:					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Yes	3	25,0	2	16,7	5	20,8
No	9	75,0	10	83,3	19	79,2
Total	12	100	12	100	24	100

There is a low usage of LLINs for both the general population and for children under 5 years and pregnant women

The observed proportions on the use of LLINs by household members represent about half of the proportion of households owning at least one LLIN. This

reflects the fact that LLINs exist in the households are not used by all household members. This prompted us to determine the average number of LLINs that these households have to establish household members' rate of coverage in LLINs. Table 4.1.14 presents the measures of central tendency and dispersion of LLINs in the households.

Table 4.1.14: Central tendency and dispersion of LLINs owned by households

Central tendency and dispersion of LLINs owned by households	N	Minimum	Maximum	Sum	Average	Standard Deviation
MUSIENENE HEALTH ZONE	42	1	5	62	1,47	0,846
LUBERO HEALTH ZONE	42	1	3	64	1,52	0,744
Together	84	1	5	126	1,50	0,792

In households that reported having at least one LLIN, the average number of LLINs per household is 1.5. Considering the average size of 6 to 7 members per household (Cf Table 4.1.1), the number of registered LLINs represents 1 LLIN for 4 household members.

4.2. RESULTS OF THE POST OPERATIONAL EVALUATION

4.2.1. SOME SOCIO-DEMOGRAPHIC CHARACTERISTICS OF HOUSEHOLDS

Table 4.2.1. Central tendency and dispersion of household size in the study's health zones

	Number of households surveyed	Minimum	Maximum	Total number of individuals living in the 140 households selected	Average number of individuals per household	Standard deviation
MUSIENENE HEALTH ZONE	140	2	15	947	6,9	2,4
LUBERO HEALTH ZONE	140	2	15	877	6,1	2,6

ZONE						
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Table 4.2.2: Distribution of surveyed household members by age and gender

Age	Health zone					
	MUSIENENE		LUBERO		TOTAL	
	Number	%	Number	%	Number	%
Under 5 years	250	26,4	243	27,7	493	27,0
5 years and over	697	73,6	634	72,3	1331	73,0
Total	947	100	877	100	1824	100
Gender						
Men	464	49,0	404	46,1	868	47,6
Women	483	51,0	473	53,9	956	52,4
Total	947	100	877	100	1824	100

The proportion of children under 5 years recorded in the households was 27.0%. There are slightly more women (52.4%) than men in the entire study population. Of pregnant women, a total of 64 were recorded with 38 in Musienene and 26 in Lubero

4.2.2. KNOWLEDGE AND PERCEPTION OF POPULATION ON MALARIA AND ITS PREVENTION

a. Knowledge about the link between mosquitoes and malaria transmission

Table 4.2.3. Cause of malaria as reported by interviewees

Mode of transmission cited by interviewees	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Mosquito bites	125	89,2	116	82,9	241	86,1
Lack of hygiene	9	6,4	13	9,3	22	7,8
Germs	9	6,4	8	5,7	17	6,0
Stagnant water	7	4,9	8	5,7	15	5,3
Do not know	1	0,7	10	7,1	11	3,9
Insects	1	0,7	1	0,7	2	0,7
Other	23	13,4	5	3,1	28	8,4

It is clear from this table that about 8 out of 10 interviewees mentioned mosquito bites as the cause of malaria. The lack of hygiene has been cited as the second cause.

b. Knowledge of mosquitoes breeding sites

Table 4.2.4. Mosquito breeding sites as reported by households

	Health zone					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Stagnant water	125	89,2	107	78,1	232	82,2
Waste/Garbage	39	28,1	13	9,5	52	18,8
On grass/trees	8	5,8	19	13,9	27	9,8
Poorly maintained Banana trees	19	13,7	8	5,8	27	9,8
Do not know	3	2,1	14	10,2	17	6,1
Streams	3	2,1	12	8,8	15	5,4
In WC/shower	3	2,1	1	0,7	4	1,4
Other	45	20,2	5	2,8	50	12,5

The majority of interviewees cited stagnant water (82.2%) as a breeding place for mosquitoes, followed by waste/garbage (18.8%).

c. Knowledge about the types of people most vulnerable to malaria

Table 4.2.5 The categories of people most vulnerable to malaria according to the participants

Categories	Health zone					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Children under 5 years	102	72,9	84	60,9	186	66,4
Pregnant women	74	53,6	37	26,8	111	39,6
Men	21	15,1	31	22,5	52	18,6
Women	21	15,1	24	17,4	45	16,2
Everyone	21	15,1	21	15,2	42	15,2
Do not know	2	1,4	12	8,7	14	5,0
Others	13	6,8	22	9,5	35	8,3

For the majority of households, children under 5 years are most vulnerable to malaria, followed by pregnant.

d. Knowledge of recommended drugs for the treatment of malaria

Table 4.2.6: recommended drugs for the treatment of uncomplicated malaria

Recommended medication at home	Health zone					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Quinine	29	20,9	43	31,2	72	26,0
Fansidar	17	12,2	16	11,6	33	11,9
Chloroquine	8	5,8	9	6,5	17	6,1
Paracétamol	5	3,6	2	1,4	7	2,5
Artésunate-amodiaquine	4	2,9	2	1,4	6	2,2
Do not know	91	31,7	77	26,8	168	29,2
Other	10	6	13	8	23	7

This table shows that 3 respondents reported ignored the recommended antibiotic for the treatment of uncomplicated malaria. Quinine is the drug most frequently cited followed fansidar. The recommended ASAQ (fixed dose combination of Artesunate & Amodiaquine) was only cited by 2.2% of interviewees.

e. Knowledge of the signs of uncomplicated malaria by interviewees

Table 4.2.7. Knowledge of the signs of uncomplicated malaria by the population

Signs/symptoms of uncomplicated malaria	Health zone					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Fever (high temperature)	122	87,1	83	59,3	205	73,2
Headaches	100	71,4	97	69,3	197	70,4
Vomiting	23	16,4	16	11,4	39	13,9
Extreme fatigue	13	9,3	22	15,7	35	12,5
Stiffness	14	10,0	12	8,6	26	9,3
Loss of appetite	3	2,1	16	11,4	19	6,8
Diarrhea/abdominal pain	6	4,3	6	4,3	12	4,3
Do not know	3	2,1	9	6,4	12	4,3
Sore on the mouth	10	7,1	0	0,0	10	3,6
Weakening of the body	5	3,6	1	0,7	6	2,1
Other	24	17,1	4	2,9	28	10,0

Signs of malaria most frequently cited are: fever (73.2%), followed by headache (70.4%).

e. Knowledge of malaria prevention methods

Table 4.2.8: Methods for the prevention of malaria mentioned by households.

Control methods	Musienene		Lubero		Total	
	Numbers	%	Numbers	%	Numbers	%
Sleeping under an LLIN	130	92,9	100	76,9	230	82,1
Sanitation within the home and its surroundings	108	77,1	37	20,8	145	51,8
Do not know	2	1,4	6	4,6	8	2,9
Insecticides or fumigants	2	1,4	6	4,6	8	2,9
Boiling water (drinking water)	1	0,7	2	1,5	3	1,1
Medical care at the Health Center	1	0,7	0	0	1	0,4
Other	10	7,1	10	6,2	20	7,1

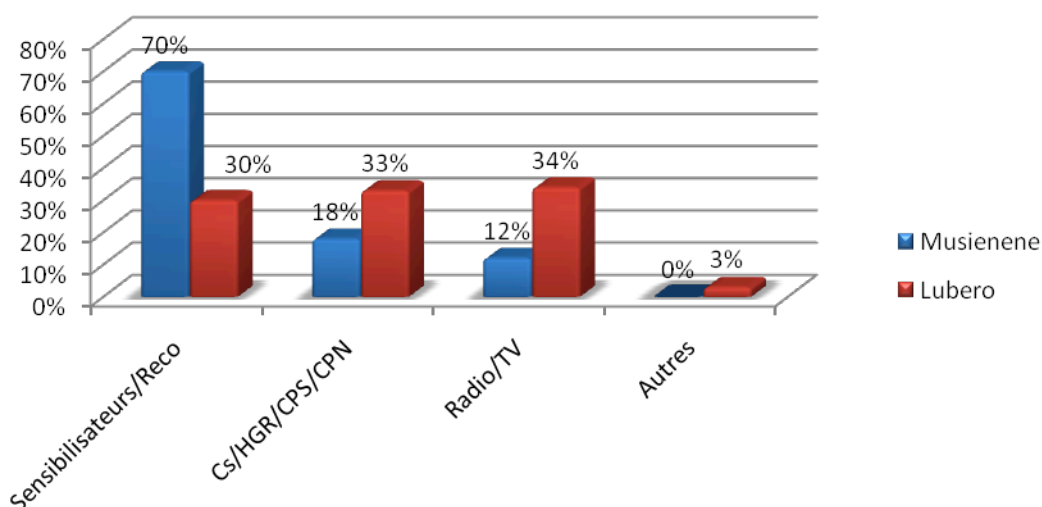
As in the pre-operational evaluation of malaria prevention methods were collected from households. Table 4.2.8 above shows that the LLINs and sanitation were cited as the main methods by households. However, in the post operational evaluation the proportion of people who cited the LLIN (82.1%) was significantly higher ($p < 0.05$) than in the pre-operational evaluation (58, 9%).

h) Sources of information on malaria following the statement of the interviewees

Different sources to which households have access to information on malaria are shown in Figure 4.

Fig. 5: Main source of information on malaria

Fig. 5: Principale source d'information sur la paludisme



In health zone of Musienene, awareness by community outreach was the main source of information on malaria monitoring followed by health centers/referral general hospitals. For the health zone of Lubero sources of information are shared almost equally between health centers/ referral general hospitals, community outreach and radio/TV.

4.2.3. POSSESSION AND USE OF LLIN BY HOUSEHOLDS

a) Procurement of LLINs by households during the campaign

Table 4.2.9 Distribution of households based procurement of at least one LLIN during the campaign

LLIN Procurement	Health zone					
	Musienene		Lubero		Total	
	Numbers	%	Numbers	%	Numbers	%
Yes	137	97,9	128	91	265	94,3
No	3	2,1	12	9	16	5,7
Total	140	100	140	100	281	100

This table shows that 97.9% of households in Musienene were acknowledged to have received at least one LLIN against 91% of households in Lubero. The proportion obtained in Musienene is significantly higher than Lubero ($p < 0.05$). Distribution strategy applied to Musienene has achieved a better coverage of LLINs ownership by households after the distribution campaign.

For health zone of Musienene, the results confirm that those obtained during the monitoring conducted in the month of May, one month after the distribution by the BCZS

team as part of this study (Cfr Monitoring Report attached). Indeed, the results obtained during this monitoring showed that of the 140 selected households, 137 (97.9%) had at least one LLIN.

In order to assess the relationship between the number of LLINs received and the number of persons in these households, central tendency and dispersion of LLINs obtained were calculated. The results are presented in Table 4.2.10 below:

Table 4.2.10 Central trends and dispersion number of LLINs received during the campaign

parameters	Health zone		
	MUSIENEN E	LUBERO	TOGETHER
Minimum	1	1	1
Maximum	6	4	6
Sum	396	336	732
Average	2,8	2,6	2,7
Standard diviation	0,9	0,9	0,9
Number of households that obtained at least one LLIN	137	128	265
Average number of persons in the household	6,9	6,1	6,5

The ratio between the average number of persons per household and the average number of LLINs gives a rate of 2 LLINs for 5 people in LLIN each 2 health zones.

The reasons why some households did not obtained LLINs during the campaign were also collected. The results are shown in Table 4.2.11.

Table 4.2.11: Reasons for not obtaining LLINs during the campaign

Reasons	Health zone					
	Musienene		Lubero		Total	
	Fréquence	%	Fréquence	%	Fréquence	%
Trip / absent the campaign period	3	100,0	8	66,7	11	73,3

Out of stock at the distribution point	0	0,0	4	33,3	4	36,7
Together	3	100,0	12	100,0	15	100,0

The absence of household members during the campaign was cited as the main reason for not obtaining LLINs.

b) Possession of LLINs per household at the time of the survey

Possession of LLINs per household has been verified during the interviewed' visit. The results are presented in the following table.

Table 4.2.12: Possession of at least one LLIN per household during the interviewers' visit

Possession of LLINs	Health zone					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Yes	138	98,6	124	88,6	262	93,6
No	2	1,4	16	11,4	18	6,4
Together	140	100,0	140	100,0	280	100,0

This table shows that during the interviewers' visit, 98.6% of households in Musienene owned at least one LLIN. This proportion is higher than that of the households that received LLINs at the time of the distribution (97.9%). This situation is justified by the fact that a household that has not received LLINs, had already own one. For households in Lubero, 88.6% of households had at least one LLIN during the interviewers' visit while 91% of households had acknowledged having had at least one. The reasons for loss of LLINs observed in 4 households were collected: Two of these households (50%) reported that their LLINs were removed by their children who are studying at boarding school, one interviewee(25%) stated his/her LLINs were stolen and another interviewee (25%) reported having made a gift to someone.

The number LLINs obtained by households were compared to the number of LLINs available during the interviewers' visit. In the majority of households (77.5%), the number of LLINs observed corresponded to the number of LLINs received during the campaign. In the remaining 22.5% of households, there was either more or less LLINs in the household compared to the number received. These results are detailed in Table 4.2.13.

Table 4.2.13. Difference between the numbers of LLINs received during the campaign and the number of LLINs available

	Health zone					
	Musienene		Lubero		Total	
	Number	%	Number	%	number	%
Same number of LLINs observed compared to the number of LLINs received campaign	118	85,5	85	68,5	203	77,5
LLINs observed exceeds the number of LLINs received campaign	14	10,1	32	25,8	46	17,6
LLINs observed less than the number of LLINs received campaign	6	4,3	7	5,6	13	5,0
Total	138	100	124	100	262	100

This table shows that the proportion of households that have kept the same number of LLINs is significantly higher in Musienene than in Lubero. The fact the LLINs that are installed at the time of the distribution in Musienene has reduced the flow of LLINs, unlike Lubero where this flow is more important.

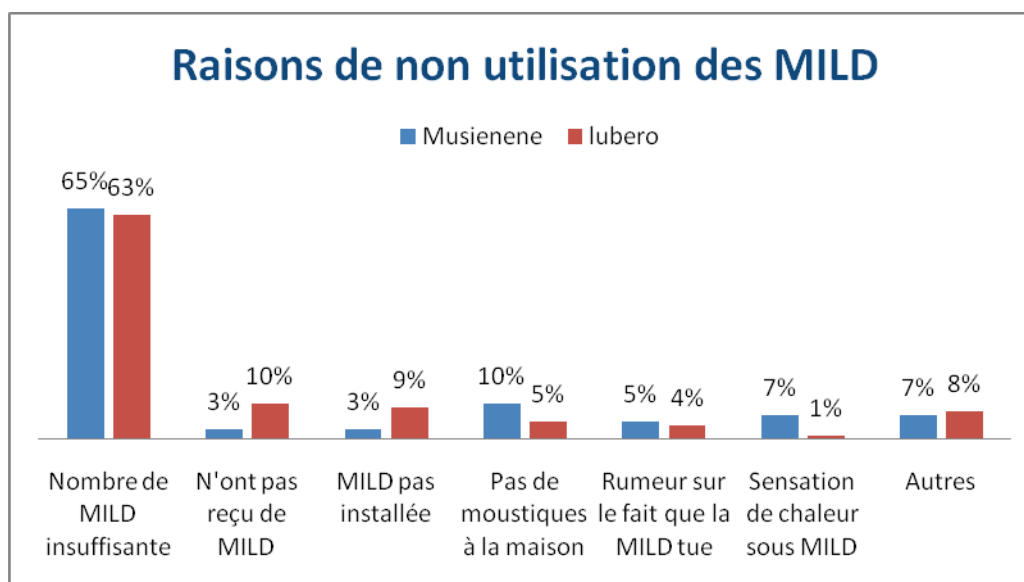
b) Use of LLINs by the target populations

Table 4.2.14. Distribution of household members as whether they slept under LLIN the night before the interviewers' visit

	Health zone					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Yes	853	90,1	668	76,2	1521	83,4
No	94	9,9	209	23,8	303	16,6
Total	947	100	877	100	1824	100

Overall 83.4% of those registered in the households used the LLIN the night before the survey. These results show a great disparity between the 2 health zones. The proportion of use in Musienene (90.1%) was significantly higher than that obtained in Lubero (76.2%) ($p < 0.05$). The reasons for non-utilization of LLINs were collected. The results are shown in Figure 5.

(Reasons for non-utilization of LLINs)



Insufficient number of LLINs in the household was the main reason for the 2 health zones. It should also be noted that in Lubero, 9% of households stated that the LLINs is not yet installed against 3% in Musienene.

Table 4.2.16. Children under 5 years who spent the night under LLINs the night before the interviewers' visit

	Health zone					
	Musienene		Lubero		Total	
	Number	%	Number	%	Number	%
Yes	232	94,7	195	82,6	427	88,8
No	13	5,3	41	17,4	54	11,2
Total	245	100	236	100	481	100

This table shows that the coverage of LLINs was 88.8% across two health zones and is significantly higher in Musienene than in Lubero ($p < 0.05$).

Table 4.2.17. Distribution of pregnant women according to whether they slept under LLINs the night before the interviewers' visit

Answers	Health zone					
	Musienene		Lubero		Total	
	Number	%	number	%	number	%
Yes	34	94,4	9	81,8	43	91,5
No	2	5,6	2	18,2	4	8,5
Total	36	100	11	100	47	100

Overall, 91.5% of pregnant women slept under LLINs.

Possession and use of LLINs by the target populations before and after the mass distribution campaigns are summarized in Figure 6 below.

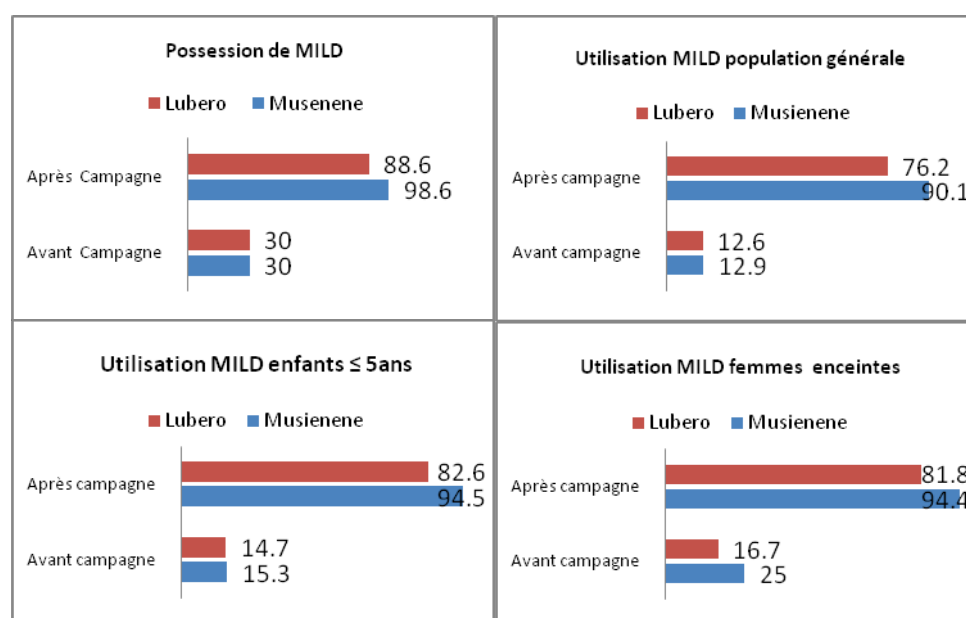


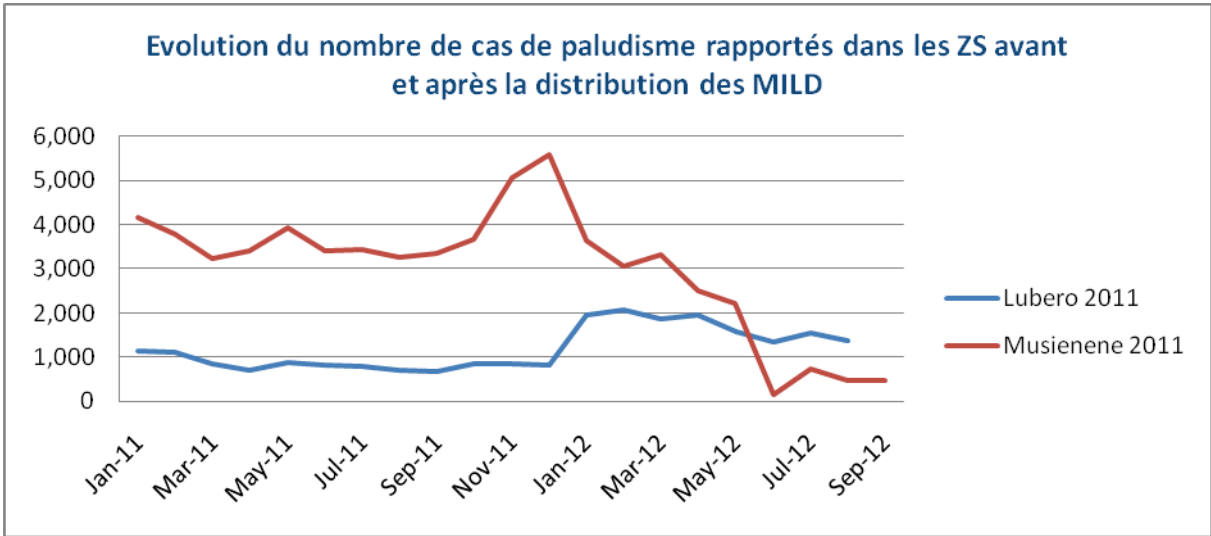
Fig. 6: Possession and use of LLINs campaigns before and after mass distribution in Musienene and Lubero.

d) Effect of LLIN on the number of malaria cases in outpatient

The total numbers of malaria cases reported from January 2011 to December 2012 by 2 health zones were collected. Figure 6 below shows the curves describing the evolution of these numbers. It should be noted that the distribution of LLINs occurred in April in these 2 health zones.

Considering the cases reported in 2012, it is clear that the number of reported cases began to decline after LLIN distribution campaign which occurred towards the end of April in the 2 health zones. This decrease was more pronounced in Musienene than in Lubero. However, it should be noted that in addition to the LLIN campaign organized in Musienene

there was an introduction of RDTs (rapid diagnostic tests) for malaria diagnosis. This may have improved the case definition.



4.2.4. COST ANALYSIS OF THE DOOR TO DOOR STRATEGY COMBINED WEH THE 'HUNG UP' METHOD FOR LLINs ISTRIBUTION

We need to clarify that the costs that was analyzed in this work do not take into account the expenses incurred at the health zone for the distribution of LLINs. Other expenses incurred ahead have not been considered including: expenditures for supply storage for planning and other preparatory activities.

Apart from the usual expenses incurred for the organization of LLIN mass distribution campaigns, NFL made specific expenses include: Advocacy and preliminary technical activities to support micro-planning meetings for the production of awareness tools for monitoring activities by the NFL team etc..

Detailed budgets of LLINs distribution in 2 health zones of the study are presented in the appendix. Table 4.2.18 summarizes the gross costs of distribution in both health zones of the study.

Table 4.2.18. Summary of gross costs of LLINs distribution at the study’s health zones

	ZS Musienene	ZS Lubero
Total cost of the LLIN distribution campaign	45.358,94\$*	24.933,34\$

Number of LLINs distributed	102.047 LLINs	145.783 LLINs
Average cost for LLINs distribution	0,44\$	0,17\$

* Sum of 28,358.94 (budget Musienene) + 17,000 (purchase nails and hammers)

This table shows that at the level of the health zones, LLIN has cost an average of \$ 0.44 in Musienene as opposed to \$0.17 in Lubero. The cost of Musienene is 2.6 times the cost of Lubero.

To identify items responsible for the difference in LLIN distribution costs in the 2 health zones, similar budget lines of the 2 health zones' LLIN distribution budgets were compared and analyzed. The results of the analysis showed that the high cost of LLINs distribution of in health zone of Musienene originated from costs related to the purchase of hammers and nails for fastening the LLINs and the cost of snack for the members involved in the distribution and pointers. These results are summarized in the table below.

Table 4.2.20. Summary of costs combined and compared by budget lines similar in the 2 health zones.

	Health zone of Musienene	Health zone of Lubero
Costs allocated to logistics, supervision of the campaign and snacks for members involved in the distribution (apart from buying nails and hammers)	12451,89\$ (27,5%)	20193,34\$ (81,0%)
Costs allocated as a snack for members involved in the distribution, pointers and sites mobilizers	15907,05\$ (35,0%)	4740,00\$ (19,0%)
Purchase nails and hammers	17000 (37,5%)	0 (0.0%)
Total cost of the distribution campaign without supervision costs at the intermediate level	45358,94\$ (100,0%)	24933,34\$ (100,0%)

This table shows that in the health zone of Musienene about 70% of the campaign budget was allocated to the snack for the members involved in the distribution team and pointers (35.0%) and the purchase of nails and hammers for placing the LLINs.

We also calculated and compared the unit cost allocated for LLINs distribution by considering the 3 costs sections together as expenses in the table above. The results are presented in Table 4.2.21.

Table 4.2.21. Summary of costs combined and compared by similar budget lines of the 2 health zones.

	Health zone of Musienene	Health zone of Lubero
Number of LLINs distributed	102047	145783
Cost by LLINs' costs allocated to logistics, supervision of the campaign and snacks for the members involved in the distribution	12451,89\$/102047 = 0,12\$	20193,34\$/145783 = 0,14\$
Costs allocated for snacks for distribution team, pointers and sites mobilizers	15907,05\$/102047 = 0,16\$	4740,00\$/145783 = 0,03\$
Purchase nails and hammers	17000/102047 = 0,16	0
Cost per LLINs distribution campaign without supervision costs at an intermediate level	0,44	0,17

It is clear from this table that the average cost allocated for logistics, supervision and snacks for other members of the distribution team is almost the same in the 2 health zones (\$ 0.12 and \$ 0.14) per LLIN. However, costs affected by snacks for the distributors and pointers is 5 times higher in Musienene than in Lubero \$0.16 against \$ 0.03. This fact is justified by the large number of staff required for the distribution and hanging of LLINs in the households. Indeed, the implementation of the door to door strategy combined with the “Hang up” method in the health zone of Musienene required the use of 869 distributors and pointers for 5 working days while the application of the traditional method required 79 distributors, 79 pointers and 79 sites mobilizers for 7 working days. In addition, the purchase of hammers and nails for hanging the LLINs has added to the \$ 0.16 average charge of LLINs distribution in Musienene.

5. DISCUSSION

Discussion of the results will focus on indicators related to the possession and use of LLINs and the evaluation of the cost-benefit of door to door to hang up strategy

combined with the hang up method compared to the traditional approach.

The results relating to the possession and use of LLINs obtained in Musienene broke the record of all results obtained during previous campaigns.

Table 5.1 below summarizes the results of various pre and post campaign evaluations conducted in the DRC

Table 5.1: Summary of results related to the coverage of LLINs by households and target populations obtained during the pre and post assessments campaigns in DRC

Campaign	Coverage	Before the campaign	After the campaign
Bas-Congo (2006) Campaign that targeted children aged 6 to 36 months	Possession of at least one LLIN per household	25,7%	78,2%
	Use by children under 5 years	21,7%	65,2%
	Use by pregnant women	24%	70%
	Use by the general population	-	-
Sud-Kivu (2007) Campagne ayant ciblé les enfants de Under 5 years	Possession of at least one LLIN per household	19,6%	84,8%
	Use by children under 5 years	18,6%	81,6%
	Use by pregnant women	43,4%	92,6%
	Use by the general population	-	-
Kinshasa (2008) Universal coverage campaign	Possession of at least one LLIN per household	-	78,7%
	Use by children under 5 years	-	64,7%
	Use by pregnant women	-	83,1%
	Use by the general population	-	-
Ecuador (2008) Campaign that targeted children under 5 years	Possession of at least one LLIN per household	-	71,9%
	Use by children under 5 years	-	61,0%
	Use by pregnant women	-	77,3%
	Use by the general population	-	-
North Kivu, Lubero health zone (2012) Campaign with universal coverage by traditional strategy	Possession of at least one LLIN per household	30,0%	88,6%
	Use by children under 5 years	14,7%	82,6%
	Use by pregnant women	16,7%	81,8%
	Use by the general population	12,6%	76,2%
North Kivu, Musienene health zone (2012) Campaign with universal coverage and door to door strategy combine with 'Hang up' method	Possession of at least one LLIN per household	30,0%	98,6%
	Use by children under 5 years	15,3%	94,5%
	Use by pregnant women	25,0%	94,4%
	Use by the general population	12,9%	90,1

5.1. LLINs procurement and possession by households post campaigns

The mass distribution campaigns of LLINs are the most effective means for achieving universal coverage of LLINs. Two distribution strategies have been applied to campaigns carried out in Musienene and Lubero ie door to door strategy combined the 'Hang Up' method and the traditional method, consisting of a fixed strategy.

Concerning LLINs procurement by households during the campaign, both methods have achieved satisfactory coverage exceeding the level of 80% ownership of LLINs per household. However, the door to door strategy combined the 'Hung up' strategy significantly gave more satisfactory results ($p < 0.05$) in Musienene (97.9%) compared to the results achieved in Lubero (91.0%). This situation can be explained by the fact that some households do not go to the distribution site or go there late. Thus, a significant proportion of households who lacked LLIN in Lubero (36.7%) cited as reason, LLINs being out of stock at the time of their trip to the distribution sites.

LLIN ownership by households has been evaluated during the post-interventional evaluation which was performed 5 months after the campaign. The proportion of households having obtained at least one LLIN were not significantly different ($p < 0.05$) than those who still owned one LLIN in the post-operative evaluation within the 2 health zones. However, a trend towards a reduction of the coverage of ownership by households has been observed in the health zone of Lubero (from 91% to 88.6%). The comparison between the number of LLINs received during the campaign and the number of LLINs available in households during the post-operative evaluation revealed a large circulation of LLINs among households in Musienene compared to Lubero. In fact, 85.5% of households had the same number of LLINs in Musienene compare to 68.5% of households in Lubero ($p < 0.05$). The 'Hung Up' method systematically performed in Musienene households has helped reduce the loss and circulation of LLINs among households.

In addition, the door to door strategy combined the hang up method performed in Musienene has helped to obtain the proportions in possession of LLINs better than those obtained during previous campaigns conducted in other provinces of the DRC (Cf Table 5.1).

5.2. LLIN use by the target populations

The proportion of LLINs use by target populations was significantly higher in the health zone of Musienene than in Lubero. Compared to the results of previous campaigns in the country, the door to door strategy combined with the hang up method applied in Musienene gave significantly higher proportions of usage. The best proportions of usage obtained in Musienene are subsequent to the best proportion in possession of LLINs by the households. Indeed, according to Lengeler (2000) and WHO (2011) LLIN use by households is proportional to their possession by these households (2, 6). In addition, the hanging of LLINs in households has increased the incentive to its use by the target populations.

5.3. Effect on new cases of malaria reported

Widespread use of LLINs in an area reduces the density of the local mosquito population. This leads to a reduction in the intensity of malaria transmission and the number of new cases of malaria in the area (6). This phenomenon, called 'mass effect' has been

observed in large scale tests of LLINs from 1991 to 1993 in several African countries (6, 12). It is therefore necessary to achieve high coverage of LLIN use by the target population. Thus the NMCP, referring to the recommendations global fight against malaria, set the threshold of 80% use by the different targets for the DRC. The significant reduction of new cases of malaria recorded in the care facilities in the health zone of Musienene can partly be explained by the high proportion of use of LLINs by different target populations. However, the simultaneous introduction of RDTs may have changed the case definition.

5.4. Cost-effectiveness analysis of the distribution of LLINs by door to door strategy combined the 'Hang up' method

The budget analysis performed for the realization of LLIN distribution campaigns within the 2 health zones clearly showed that the door to door strategy coupled with the 'Hang up' method as applied in Musienene, is approximately 2.6 times more expensive than the traditional method or \$ 0.44 per LLIN in Musienene compare to \$ 0.17 per LLIN in Lubero. The costs of snacks for the members of the distribution team and the pointers have been identified as the main reason for this expenditure demarcation. Indeed, the distribution strategy of door to door strategy coupled with the hang up method requires a large number of staff for its realization. Thus the health zone of Musienene had to use 869 distributors and pointers compare to 79 retailers, 79 pointers and 79 mobilization sites in the health zone of Lubero. The purchase of hammers and nails for hanging the LLINs has also increased the cost of the distribution of LLINs in Musienene. It is better to encourage people to use the resources available to hang of LLINs. Offering hammers and nails to households is not encouraged unless it is already included in the packaging of each LLIN from the factory by the manufacturer. Their removal from the budget would reduce the cost of distribution to \$ 0.28 per LLIN. This represents a cost of about 1.6 times higher than the strategy applied in Lubero.

6. CONCLUSION AND RECOMMENDATIONS

The effectiveness of the LLIN distribution campaign strategy consisting of the door to door strategy coupled the hang up method was compared to the traditional method which consists of a fixed LLIN distribution strategy. The results showed significantly important gains on the proportions of LLINs possession and usage in the households by the target populations. The application of the method has achieved record proportions: more than 95% of households owning at least one LLIN, more than 90% of the general population and children under 5 years using the LLINs.

The more important the proportions of LLINs use by the target population are, the more effective is the intervention obtained by mass effect, resulting in the reduction of entomological and parasitological evidence of malaria transmission.

However, its implementation has necessitated such a large number of staff that the cost was about 2.6 times more than the traditional method because of the costs incurred for snacks for the agents committed to the distribution (Distributors and pointers). Nails and hammers for neat hanging purchased also increased the cost. If these were removed, the distribution of LLINs hang up would cost \$ 0.28 per LLIN which is about 1.6 times more than the strategy applied in Lubero..

In terms of important coverage achieved in both possession and the use of LLINs, this strategy is worth being adopted at a national level. To circumvent the high cost of distribution as applied to Musienene, we recommend on the one hand, the removal of nails and hammers to encourage the use of available resources in the community, and secondly, that the strategy is applied in the EU directive like CDTI (Community Directed Treatment with Ivermectin) applied by APOC (African Programme for Onchocerciasis Control) for the prevention of Onchocerciasis

Community involvement in the distribution of LLINs by door to door strategy coupled with the strategy 'Hung up' will reduce the cost of distribution while maintaining the benefits. However, the distribution of LLINs under community directive has not yet experienced, its feasibility should be assessed.

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ANNEXE

1. Questionnaires (data collection tools) ANNEXE

ANGLICAN CHURCH OF THE CONGO



PILOT STUDY ON LLIN DISTRIBUTION WITH DOOR TO DOOR & 'HANG UP' COMBINATION METHOD STRATEGY IN THE MUSIENENE HEALTH IN THE PROVINCE OF NORTH

Households Survey

- : 1. Questionnaire No:
- 2. Interview date: (day / month / year): on / __ / __ / __ /
- 3. Start time of the interview: hr min
- 4. Province: North Kivu.
- 5. Health Zone:
- 6. Health area:
- 7. Village of:
- 8. Address household

8.1. Sector	
8.2. locality	
8.3. Village	
8.4. City	
8.5. Neighborhood/district	
8.6. Avenue/ Number	

9. Task Force	First name and last name	Date of survey	Signatures	Codes
Supervisor				
Interviewer				
Input officer				

MODULE I : Economic and socio-demographic characteristics of the household.

N°	Questions	Answers	Codes
Q10	First name of the head of household		
Q11	Gender the head of household Sexe du chef de ménage	1. M 2.F	
Q12	Age the head of householdyears.	
Q13	Highest level of education achieved	1. Uneducated 2. Primary 3. Secondary 4. University /Higher 6. Vocational school 8. Others specify	
Q14	Your status in the plot?	1. Owner 2. Tenant 3. Housed under (by family, friends, society, etc.). 4. Other	
Q15	How much do you usually spend on food per day? (AMOUNT in FC)	
Q16		Number.....	
Q17	Number of children 0 to 5 years in the How many people live in the household?	Number.....	
Q18	Number of pregnant women in the household?	Number.....	

MODULE II. Knowledge and perceptions of households about malaria and its prevention

N°	Questions	Answers	Codes
Q19	In your opinion, what causes malaria? Instruction: Do not suggest	1. Mosquitoes 2. Dirt 3. Stagnant water 4. Germs 5. Other (specify):.....	
Q20	In your opinion, is it possible to prevent malaria at home?	1. Yes 2. No	
Q21	If yes, how ?	

Q22	Can you tell me what you know about malaria prevention?	<ol style="list-style-type: none"> 1. Sleeping under LLINs 2. Sanitation intra and peri-home 3. Weeding and destruction of breeding sites 4. Insecticides /fumigants 5. Other specify : 	
Q23	Have you heard or seen educational messages on malaria during the past 3-6 months?	<ol style="list-style-type: none"> 1. Yes 2. No 	
Q24	If yes, through what means or channel did you hear or seen these messages?	<ol style="list-style-type: none"> 1. Radio / TV 2. Health center/referral hospital 3. Sensitizers / RECO 4. Radio/ TV 5. Sensitizer/ RECO 4. Other(specify): 	

Q24a	What are the signs / symptoms of uncomplicated malaria?	<ol style="list-style-type: none"> 1. Fever (high temperature) 2. Headaches 3. Polyarthralgia (joint pain) 4. Extreme tiredness 5. Vomiting 6. No appetite 7. Diarrhea / abdominal pain 8. Do not know 9 Other (specify) 	
Q24b	What are the types of people most vulnerable to malaria (those in which malaria is more serious)?	<ol style="list-style-type: none"> 1. Women 2. Men 3. Children under 5 years 4. Pregnant women 5. Malnourished people 6. People living with HIV 7. Do not know 8. Other (specify): 	
Q24c	Where do mosquitoes breed?	<ol style="list-style-type: none"> 1. On grass /on trees 2. Still waters 3. Streams 4. Clear stagnant water 5. Clear running waters 	

		6. Waste /garbage 7. Do not know 8. Other (specify):	
Q24d	What is the recommended drug for malaria treatment at home?	1. Artesunate-Amodiaquine 2. Quinine 3. Fansidar 4. Chloroquine 5. Do not know 6. Other (specify)	
Q24e	Has a member of your family has malaria since the beginning of this year?	1. Yes 2. Non	
Q24f	If yes, how did you know that it was malaria?	1. Fever / increased temperature 2. Diagnosed at the hospital / health center 3. Presence of other signs other than a fever (Specify the sign:) 4. Other (specify):	
Q24g	What treatment did she/he receive?	1. Modern treatment prescribed at the hospital / health center 2. Modern treatment at home (self) 3. Traditional treatment at a traditional healer 4. Medical herbs at home 5. no treatment 6. Other (specify):	
Q24h	If modern treatment at home or in the hospital, what medications was prescribed	(specify the /drug/s : 1. 2. 3. 4.	
Q24i	How long after did this treatment start?	1. The same day 2. The 2nd day 3. the 3rd day 4. the 4th day 5. Other (specify :) 6. Do not know	
Q24j	Is malaria a serious disease?	1. Yes 2. No	
	Why? (justify your answers)		

Q24k			
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MODULE III: Information on the possession and supply of LLIN in households

Questions	Answers	Codes
Q25.	1. Yes 2.No	
INSTRUCTION		
If Q25= No. ask only Q29 then proceed to Module IV.		
Q26.If yes, how many LLIN?	Number :.....	
	Number.....	
Do you have at least one LLIN in your household?	Do you have at least one LLIN in your household?	Do you have at least one LLIN in your household?
Q29. If not why ?	1. No money to buy a LLIN 2. No LLIN in the health zone area 3. I do not like it 4. Do not know about the LLIN 5. Others specify	
Q30. How did you get this LLIN?	1. Free of charge 2. By purchase 3. Do not know	
Q31. If by purchase, at what price did you buy?	MONTANT EN : FC :..... \$:	
Q32. Where did you get it?	1. At the health center 2. During pre natal consultation 3. During post consultation 4. At a pharmacy in the central health zone 5. At a private pharmacy 6. At the market 7. From a travelling merchant 8. At the store/shop 9. At the community center 10. Other (specify).....	
Do not suggest the answer		

MODULE IV: INFORMATION ON THE USE OF LLIN BY HOUSEHOLD MEMBERS.

a)

N°	Q.33.1 First name	Q.33.2 Age (Specify whether the number is in months or years)	Q.33.3 Sex	Q.33.4 Did he/she sleep under a mosquito net last night ?a	Q.33.5 If yes was it an insecticide treated net?
1			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
2			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
3			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
4			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
5			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
6			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
7			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
8			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
9			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
10			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know

b) Pregnant women

N°	Q.34.1 Pregnant woman's first name	Q.34.2 Age (in years)	Q.34.3 Did the pregnant woman sleep under a mosquito net last night?	Q.34.4 If yes, was it an ITN?
1			1. Yes 2. No	1. Yes 2. No

				3. Do not know
2			1. Yes 2. No	1. Yes 2. No 3. Do not know
3			1. Yes 2. No	1. Yes 2. No 3. Do not know
4			1. Yes 2. No	1. Yes 2. No 3. Do not know
5			1. Yes 2. No	1. Yes 2. No 3. Do not know
Q.35.9 Total of pregnant women in the household:..... Nunmber			Q.36. 10 Total of pregnant women sleeping under ITNs: Number	

THANK YOU FOR YOUR PARTICIPATION

ANGLICAN CHURCH OF THE CONGO



PILOT STUDY ON LLIN DISTRIBUTION WITH HANG UP STRATEGY IN THE MUSIENENE/ PROVINCE OF NORTH KIVU HEALTH ZONE

MONITORING AND EVALUATION FRAMEWORK OF THE DOOR TO DOOR "HANG UP" COMBINATION METHOD STRATEGY.

N.B ask the respondent permission to enter the house, where children aged 0-5 years and pregnant women sleep and observe the following:

N°	Items	Answers	Code
Q1	Presence of a bed	1. Yes 2. No	
Q2	Presence of an ITN hanging over a bed / a mat.	1. Yes 2. No	
Q3	If not, why did you remove it?	
Q4	Are you satisfied with this LLIN?	1. Very satisfied 2. Satisfied	

	3. No satisfied	
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a) Record in the first table all household members except pregnant women. These will be stored in the following table

N°	Q.5.1 First name	Q.5.2 Age (Specify whether the number is in months or years)	Q.5.3 Sex	Q.5.4 Did he/she sleep under a mosquito net last night?	Q.5.5 If yes was it an insecticide treated net?
1			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
2			1. M 2. F	1. Yes 2. No	1. Yes 2. Non 3. Do not know
3			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
4			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
5			1. M 2. F	1. Yes 2. No	1. Yes 2. No 3. Do not know
Q.6. Total children under 5 years in the household:Number				Q.7. Total children under 5 years sleeping under ITNs. Number	

a) For pregnant women

N°	Q.8.1 Pregnant woman's first name	Q.8.2 Age (by years)	Q.8.3 Did the pregnant woman sleep under a mosquito net last night?	Q.8.4 If yes is it an insecticide treated net?
1			1. Yes 2. No	1. Yes 2. No 3. Do not know
2			1. Yes 2. No	1. Yes 2. No 3. Do not know
3			1. Yes 2. No	1. Yes 2. No 3. Do not know
4			1. Yes 2. No	1. Yes 2. No 3. NSP
5			1. Yes 2. No	1. Yes 2. No

				3. Do not know
Q.9 Total of pregnant women in the household:..... Number		Q.10 Total of pregnant women sleeping under ITNs: Number		

This is a study that compares two methods of LLINs distribution, to see which better protects people against malaria. One of the methods recommended so far by the program against malaria is the LLIN distribution by a set strategy; the other is the distribution of LLINs with door to-door and « Hang up » method where the distributor hangs the net on the bed. The latter is a new strategy for us, but it has been tried in other countries and showed better results than the one we usually used at home.

We ask for your cooperation for participation in this pilot study.

This form is presented to you so that you read and understand everything about this study and that you agree to participate freely, you also have the right not to participate and this will not be a problem for you, now or in the future. While you read the information contained in this document, you are free to ask any questions you want and we will respond.

A. INFORMATION ON THE STUDY:

In our country, the campaign of mass distribution of LLINs is made on set sites that is to say; we usually invite the target population at a specific location (usually the health center for distributing LLINs. In this study, we test a new strategy: the door to door distribution with the hang-up method, which consist of hanging the LLIN on the bed of the beneficiaries.

Why are we doing this study?

Many studies show that people who have LLINs don't always use them. Those who have LLINs outnumbered those who use them, and yet to protect against malaria, it is recommended that one sleeps under LLINs every day especially for children under 5 years and pregnant women who are the most vulnerable to malaria

To help the target population to easily use LLIN for protection against malaria, we want to test this new "Hang up" strategy which is not limited only to distributing LLINs to the people, but also to go up hang it on their beds and follow up with awareness and monitoring advice.

This strategy has been used in some African countries such as Ghana, and has facilitated the improvement of LLIN utilization and therefore the protection of the target population.

This study aims to experiment with us to make recommendations for policy makers to better contribute to the fight against malaria.

This is a pilot study, which is why it conducted only in the ZS MISIENENE, and it is not supported by the Global Fund to accurately measure the contribution of this strategy. If the findings show a real benefit to using this strategy, it may be adopted by the country as a strategy against malaria.

The study is conducted by NetsforLife, an international NGO that works within the Anglican Church to support its health program, in collaboration with the National Programme for the Fight against Malaria.

Why we are conducting this study?

The aim is to contribute to improving the coverage and use of LLINs in the communities of the DRC by the adoption of a new strategy for the mass distribution of LLINs, and the "Hang up." method.

How will the study be conducted?

At time of the LLIN distribution in the households, we will first collect baseline data to know where we started; the peculiarity is that the distributor will help the household to hang the LLIN on the bed to facilitate its use. At the end there will then be a monitoring and evaluation of the use which will consist of collecting the same data as those that were originally collected to measure the contribution of the strategy.

Your role in the study:

You are the head of household or the spouse of the head of the household; if you agree to that you have voluntarily agreed to answer our questionnaire and that our distributor will hang our LLIN on your bed. In addition, you also agree that health workers from the ZS can stop by your home once a month to monitor the use of ITNs distributed to you this day. Also, you agree to use it according to the instructions you are given,

Benefits, cost and risks of the study:

Any household in the AS randomly selected from the MISIENENE Zs is eligible for participation in the study. The selected household will receive two free LLINs for protection against malaria especially the most vulnerable: children under 5 years and pregnant women. . However the presence of the latter in the household will not be a requirement for distribution under the principle of universal protection recommended by the WHO.

The use of LLINs is not subject to major health risks, sometimes during the first night of use, the recipient may feel a burning sensation in the face, which is due to irritation caused by the insecticide impregnation of the LLIN. This adverse event is minor and transient.

Confidentiality:

All information collected through your cooperation in this study will be kept confidential; your name will not be published in any report.

Questions:

For any concerns or questions about the study, you can contact the organizers of the study and the interviewers through the contact numbers below:

CONTACT NUMBER: 0813396059 (Director of the National Program against Malaria), 0995226359 (Rév. Pastor SUBI), 0997120044 (Dr Charlotte), et 0998903346 (Paul Mansiangi).

B. WRITTEN CONSENT :

I was told what the study is about and I understand the objectives and conditions of participation in this study. I was given the opportunity to ask questions and they answered all my questions. I understand that my participation in this study is voluntary and that I am free at any time to withdraw from the study and this will not be a problem for me, now or in the future.

All information provided by me in connection with this study will remain confidential and my name will not appear at all in any publications. I understand that if I have additional questions about the study, or if I'm going to stop my participation in the study, I can contact the organizers by their contact numbers that are available to me.

I understand all this information and I freely agree to participate in this study:

Name and signature of participant:

Name:

Signature:

Date:

Time:

Name and signature of the person who explained this well-informed consent form:

Name:

Signature:

Place

Date:

Time: