

**Mosquito net ownership and factors  
associated with net usage, among children 0-12 years  
and their parents/caretakers, coming to  
Kasangati Health Centre, Uganda.**



Mosquito net ownership and factors associated with net  
usage among children 0-12 years and their  
parents/caretakers coming to Kasangati Health Centre,  
Uganda.

Master thesis in Medicine

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# Abstract

Master thesis, Programme in Medicine

Mosquito net ownership and factors associated with net usage, among children 0-12 years and their parents/caretakers, coming to Kasangati Health Centre, Uganda.

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**Background:** Malaria is a leading cause of death in Uganda, especially among children < 5 years. One of the most effective ways of protecting against malaria is a consistent use of an insecticide treated mosquito net (ITN). It has been shown in studies that community-level use of mosquito nets significantly reduces malaria transmission in children < 5 years.

**Aim:** To map the frequency of net ownership and net usage among children 0-12 years and their parents. To see if there are any factors associated with net usage.

**Methods:** Semi-structured interviews were conducted with randomly selected respondents who met inclusion criterias.

**Results:** 100 % of the households owned at least one mosquito net. Over 90 % of both the children and the parents had slept under a mosquito net the previous night. Some factors associated with net usage were; age of the child, the highest level of education of the mother and the way of sleeping. The majority of respondents reported there had been a mass campaign in their local area less than six months ago.

**Discussion and conclusions:** Mosquito net usage is very high, both among the children and their parents. Mass campaigns have most likely had a significant impact on the uptake of net usage in the study population. The usage of mosquito nets tends to decrease in the months following such a campaign. Earlier studies have shown follow up campaigns to be important in maintaining the high usage after a mass campaign

**Key words:** ITNs (insecticide treated bed nets), LLINs (long-lasting insecticide treated bed nets), IRS (indoor residual spraying), WHO (World Health Organization), MIS (Malaria indicator survey), RBM (The roll back malaria), NMCP (Uganda national malaria control).

# Background

## General about malaria

In 2012, there was an estimated 207 million cases of malaria worldwide, of which 80 % occurred in sub-saharan Africa (61).

Female anopheline mosquitoes transmit malaria while feeding on the blood of humans; this activity occurs mainly at night. The mosquitoes enter homes through doors, windows, ventilators, ceilings (3, 27). Closing doors and windows early in the evening is therefore important in reducing the risk of mosquito bites and, consequently the risk of malaria.

Mosquitoes breed in water; eliminating pools of water close to homes also reduces mosquito populations (28). Mosquitoes are known to use vegetation as grass and bushes as resting places (29, 30), from where they can enter houses, usually in the evening (31). Vegetation in the area around the home open on to many mosquitoes in the home due to those resting places. Clearing a space around the home by cutting down unnecessary bushes and grass is thus an important step towards reducing the risk of malaria transmission.

Uganda has a particularly large burden of malaria. In populations in endemic areas, the incidence and severity of malaria decreases after the first years of life. (1)

## Malariaprevention

The World Health Organization (WHO) recommends a usage of several approaches to control malaria, known as the integrated approach to malaria prevention (4). This integrated approach includes several prevention methods that can be used in the households which have been shown to contribute to a lower number of mosquito bites and reduce mosquito populations, which in turn prevent the spread of malaria. These prevention methods includes sleeping under insecticide treated bed nets, indoor residual spraying, body mosquito repellents. Other

methods include removal of stagnant water by draining puddle and marsh areas and taking away cans, tyres and other water accumulating items and slashing bushes and grass around the compound to reduce mosquito breeding sites. To reduce mosquitoes entering the house, they recommend using ventilators and closing windows and doors early in the evening (59, 60). One of the most effective ways of protecting against malaria is to sleep under an insecticide treated bed net (ITN). To use the ITN systematically, the transmission of malaria can be reduced by up to 90 % (2) and avert up to 44 % of deaths due to malaria in children under five years (32, 33). Even untreated nets protect against malaria, though it is important to be aware of that the ITNs are twice as protective as untreated nets (34, 35). The Roll Back Malaria (RBM, a project by among others WHO, to reduce malaria) definition of an ITN is "a net that is 'permanently' treated or long-lasting insecticide bed net (a LLIN), or is pre-treated and has been purchased within the last 12 months or has had insecticide put on it up to and including the last 12 months" (36).

### **Mass campaigns**

In recent years the coverage of LLINs has increased in many African countries and a large part of this is due to mass distribution campaigns (9).

The first mass distribution of LLINs took place in 2010. At this time, the target groups were pregnant women and children under five years (5). The LLIN is not only a physical barrier against the mosquito, but also has important effects on vector density through the toxicity and repellency from the pyrethroid insecticide impregnation in the LLINs (37, 38, 39). It has been shown that LLINs reduce the morbidity in malaria, particularly in the most vulnerable groups such as children aged 0-5 years and pregnant women (40, 41). It has even been shown that usage of LLINs is one of the most cost effective ways of preventing malaria, especially in areas with a high malaria transmission (42). The previous guidelines from the World Health Organization (WHO) focused on increasing the provision of nets among those two most

vulnerable groups. The Uganda National Malaria Control (NMCP, was established to support the implementation of the National Malaria Control Strategy) adopted this policy in 2002 and started to work with strategies that, among other things, included free distribution of nets to pregnant women during antenatal visits (5). Despite all these efforts, the LLIN ownership in Uganda was 46 % in 2009 according to Malaria Indicator Survey (MIS) (MIS collects national, regional or provincial data from a sample of respondents of household surveys). The lowest ownership was found in the Central region of Uganda with a rate of only 22 %. The LLIN usage among children under 5 years was 32 % in Uganda and only 11 % in the central region (43). In 2007, the same year, NMCP made a decision of organizing a mass distribution campaign of mosquito nets, starting in Central Uganda. This mass campaign was funded by the Global Fund to fight Aids, Malaria and Tuberculosis. The aim with this mass campaign was to achieve a LLIN coverage among children 0-5 years and pregnant women with at least 90 % by the end of 2010 (5). This campaign was divided into two phases. During the first phase, the target groups were pregnant women and children 0-5 years. During the second phase the aim was to fill in the gaps and reach universal coverage, as best they could. All the households were registered and enumerated by village health teams and all households were supposed to receive one net for every child under five years, and one net for every pregnant woman. To estimate the impact this campaign had in net ownership and net use a survey was conducted in Central Uganda after the first phase in this campaign. According to this study, the bed net ownership increased from 40.7 % in 2009 to 78.3 % in 2011. LLIN ownership increased from 22.3 to 69.2 % (5).

During many previously mass campaigns, target groups have been pregnant women and children 0-5 years (9). In 2007, universal coverage of LLINs to prevent malaria was adopted by NMCP. As the definition of universal coverage means, according to WHO; “universal coverage with effective vector control for everyone at risk of malaria. The two key indicators



for this target are: (a) the percentage of people who have access to LLINs in the household (assuming that 1 LLIN covers two persons); and (b) the percentage of people reporting having slept under an LLIN the previous night. Operational success (as opposed to a target of 100% universal coverage) is defined as the observation in surveys of at least 80% coverage in terms of these indicators” (22). Nowadays, purpose of LLIN mass campaigns is to increase the ownership of mosquito nets in the entire population that hopefully can lead to a decreased level of malaria transmission at community level (44, 48, 49). Since the nets naturally does not last forever due to the nets becoming worn out and loss of insecticide effect over time, countries that has reached almost universal coverage of nets must continue net distribution to maintain these levels (9). Still, even though the mosquito net ownership has increased significantly in the last years due to mass campaigns, there is a gap between net ownership and net usage in many areas. In a study in five different countries, there was shown that the levels of ownership was higher than use in all of those countries (20).

One of the most important difficulties in maintaining a high level of ITNs coverage has been the need to retreat the net every 6-12 months. In studies it has been shown that the rates of retreatment is between 2-20 % and rarely reach 40 % unless the retreatment is free of charge, carried out by Public Health Services (50, 51). Hence, the conception of the LLINs was a big breakthrough aiming to solve this problem (52).

### **Malaria among school-aged children**

An increasing success in decreasing the levels of malaria transmission in areas that earlier were high endemic areas, will lead to an achieved immunity against malaria later in life than has been the case in the past (13). Consequently, it can be expected in the following years that a higher number of school-age children will be afflicted with both uncomplicated and severe malaria. Several studies have shown that school-aged children are less likely to use LLINs than other population groups (11, 12, 18, 19). In 2010, 200 million school-aged children were

estimated as having a risk of being infected with malaria (53). In Uganda, 14-64 % were parasitaemic at any one time depending on season and transmission setting (54, 55, 56). It is not clear how many school-age children who die from malaria each year. A study, carried out in 2003, estimated that, at that time, malaria was a cause of 214 000 deaths per year among school-age children in Africa. This represents up to 50% of all deaths among this age group (57). In 2010 it was estimated that 6-9 % of all malaria deaths afflict children 5-14 years (58).

### **Study settings**

Kasangati is a small village situated about 1,4 kilometers north of Kampala with a total population of 146,400 people. Kasangati belongs to the Wakiso district that covers an area of 2,808 square kilometers, according to the district profile document received from Dr Ivan Nyenje, Kasangati Health Centre, Uganda. The climate in this district is warm and wet and with a quite high humidity which favours disease outbreaks. There are two rainy seasons, one from March to May and one during November and the cases of malaria tends to go up during those rainy seasons. The total population in the Wakiso District is 2,007,700 people and the growth rate is 7 %. Ninety-two % of the population in Wakiso district live in rural areas. The health centres are divided into four different levels, level I-IV. A health centre level I is comprised of community health workers. A health centre level II has no maternal ward, but does have an outpatient department. This means they can only supply antenatal care. A health centre level III can conduct deliveries and a health centre level IV has an operational theatre for emergency obstetric care. Kasangati Health Centre is a governmental health centre level four and has patients coming from both periurban and rural areas. The treatment and drugs are for free for all the patients. However equipment, for example needles are running out of stock and the government does not provide the health centre with more needles. In those cases the clinician/doctor has to buy the needles himself and the patients then must pay for this. The health centre has around 44 employees and some volunteers. Those volunteers

are people with different levels of education within health care, but due to the difficulties in securing a job without any experience, are forced to work for free. To support their livelihoods they can earn a minor salary by participating in outreaches conducted in villages and schools for HIV testing. Some can have a small salary by working at the health centre at evenings and weekends.

At the health centre there is access to basic treatment, drug dispensing, maternity services, an HIV clinic and a small theatre. The theatre performs mainly emergency obstetric surgery. At the health centre, there is also a ward with around twenty beds. Every day around 100 children come with their parents for immunization. Most of them are under one year old; the number of children below 1 year in Kasangati is 6,295. The immunization given at the health centre is haemophilus B, hepatitis B, whooping cough, diphtheria, tetanus, polio, measles and tuberculosis (BCG). The child gets BCG immunization at birth. All children have routine deworming during their childhood years 1-5. Between the ages 6 months-5 years they have vitamin A once a year. The number of children below 5 years in Kasangati is 29,573. The number of women in childbearing age is 29,573 and the number of pregnancies in the area is 7,320. Every day around 100 pregnant women come to the maternity service at Kasangati Health Centre for check-ups and deliveries. The maternity health service receive mosquito nets from Wakiso district to distribute to all pregnant women. These mosquito nets are always treated with a long-lasting treatment and the women also have some information from the health workers about malaria and the purpose with the mosquito net use. Unfortunately, the mosquito nets sometimes are running out of stock and during the period of 19th of February-19th of April, there were no mosquito nets to hand out.

## **Aim**

To map the frequency of mosquito net ownership and net usage among children 0-12 years and their parents/caretakers coming to Kasangati Health Centre. To investigate if there are any factors associated with mosquito net usage, regarding to income in the household, the educational attainment of the parents/caretakers, residence (rural or urban), attitudes and beliefs about malaria and the way of sleeping.

## **Specific objectives**

- To map how the mosquito net ownership is in the households of the parents coming with their children to Kasangati Health Centre.
- To define the mosquito net usage among children 0-12 years and their parents/caretakers coming to Kasangati Health Centre
- To investigate if there are any differences between children < 5 years and children 5-12 years and if there are any differences between the children and their parents regarding to mosquito net usage
- To analyze if there are any factors associated with mosquito net usage regarding to income in the household, the educational attainment of the parents/caretakers, residence (rural or urban), attitudes and beliefs about malaria and the way of sleeping.

## **Medical relevance/significance**

Malaria is a leading cause of death in Uganda especially among children < 5 years. One of the most effective ways of preventing malaria is to consistently sleep under an insecticide treated bed net. In several studies it has been shown that there is a gap between net ownership and net usage. Previously, the target groups for malaria prevention have been groups with highest risk

of contracting malaria; that is, children < 5 years and pregnant women. In the last few years there has been a shift to universal coverage which means every household should own at least one mosquito net/ 2 members of the family. This is based on the conception that a community wide protection only will be achieved when a significantly high portion of the community is covered. It has been shown in studies that a community-level use of mosquito nets is significantly associated with a decreased risk of malaria transmission and anemia in children < 5 years. To map the frequency of mosquito net ownership and usage of children and their parents coming to Kasangati Health Centre, will give a picture of how good the malaria prevention is at community-level in Kasangati. Studying children aged 0-12 years and even their parents will cover a big part of different age groups in the population. The study will also investigate factors associated with mosquito net usage. This kind of study could give a picture of what challenges that must be battled in Kasangati to reach a universal coverage and a high community-level usage of mosquito nets and thereby decrease the level of malaria transmission.

## **Methods**

### **Study design**

A cross-sectional semi-structured interview.

### **Sampling technique**

Together with the interpreter, the interviewer ensured that the participant coincided with the inclusion criteria in the study as follows:

- Children < 5 years coming with their parent/caretaker to Kasangati Health Centre for immunization
- Children 5-12 years coming with their parent/caretaker to Kasangati Health Centre for some other reason than fever

- In those cases when the caretaker not was the parent, the caretaker could only participate in the study if all of following were attuned
  - The caretaker was the primary caretaker of the child
  - The child stayed with the caretaker for not only an occasional visit
  - The parent of the child did not stay with the child

The respondents within this sampling frame were randomly chosen. The participants were asked to participate on voluntary basis and could choose to refuse without giving a reason. Before the interview started, the participant had to give a verbal consent.

Children coming for immunization is an unselected group and thereby increases the likelihood that the household will reflect the general population. Unfortunately there were no health check-ups or immunization for children above the age of 5. Children 5-12 years coming for some other reason than fever were chosen. This was to make sure they did not have malaria, though an another study was conducted during the same period of the children suffering from malaria at the clinic.

### **Data collection**

The data from parents/caretakers to children < 5 years was collected at the immunization point at the clinic in connection to the visit. The data from parents/caretakers to children 5-12 years was collected in connection to a visit at the clinic. The interviews were based on a structured questionnaire concerning among others, age and sex of the child/respondent, socioeconomic status, some basic knowledge about malaria, the mosquito net usage in the child/respondent in the last night/last seven nights, more detailed information about the used nets, reasons for non-usage and ways of sleeping.

## **Pre-testing**

During the days before the study started, a pilot questionnaire was administered to some parents at Kasangati Health Centre. After testing, discussions with the interpreters and supervisors formed the basis of necessary adjustments to the questionnaire.

## **Data analysis**

Data collected from the questionnaires were coded and analysed using IBM, SPSS, version 22.

## **Statistics**

Pearson Chi square test or Fischer's test was used to identify associations between categorical variables. P-values < 0.05 were considered statistically significant.

# **Ethical considerations**

Ethical approval for this study was obtained from Dr. Mukisa Emmanuel, district health officer of Wakiso district. The study participants were informed about the study and they participated on voluntary basis. No data allowing for identification of the respondents outside the clinic was recorded.

# **Results**

## **Characteristics of the respondents in regard to socioeconomic factors and living conditions**

In total, the mean age of the parents/caretakers was 28 years (range 17-69 years) and 95.6 % of them were women.

In the group with parents/caretakers to children < 5 years the mean age was 25.5 years and in the group with parents/caretakers to children 5-12 years the mean age was 34 years. There

was a significantly difference in age between the groups ( $p < 0.001$ ). There were more mothers in the group with children  $< 5$  years whose level of highest education was secondary school/tertiary school/university ( $p = 0.044$ ). There were also more fathers in the group with children  $< 5$  years whose highest level of education was secondary school/tertiary school/university ( $p < 0.001$ ). The majority in both of the groups had a monthly income of 200,0001-500,000 USH.

Table 1 Socioeconomic factors of the respondents in the two different groups; Children  $< 5$  years and children 5-12 years

<b>Socioeconomic characteristics of the respondents</b>							
Category		Group with children $< 5$ years (n=106)		Group with children 5-12 years (n=54)		In total (n=160)	
		Frequency	%	Frequency	%	Frequency	%
<b>Sex</b>	Women	103	97.2 %	50	92.6 %	153	95.6 %
	Men	3	2.8 %	4	7.4 %	7	4.4 %
<b>Age</b>	18-25 years	61	57.5 %	9	16.7 %	70	43.8 %
	25-35 years	41	38.7 %	30	55.6 %	71	44.4 %
	35-50 years	4	3.8 %	9	16.7 %	13	8.1 %
	$> 50$ years	0	0 %	6	11.1 %	6	3.8 %
<b>Highest level of education of the mother/caretaker</b>							
Never been to school		3	2.8 %	2	3.7 %	5	3.1 %
Primary school		24	22.6 %	23	42.6 %	47	29.4 %
Secondary school		54	50.9 %	22	40.7 %	76	47.5 %
Tertiary school/University		25	23.6 %	7	13 %	32	20 %
<b>Highest level of education of the father</b>							
Never been to school		1	0.9 %	1	1.9 %	2	1.3 %
Primary school		11	10.4 %	13	24.1 %	24	5 %
Secondary school		54	50.9 %	18	33.3 %	72	45 %
Tertiary school/University		33	23.6 %	9	16.7 %	42	26.3 %
There is no father		0	0 %	6	11.1 %	3	36.8 %
Do not know		7	6 %	7	1.4 %	14	8.8 %
<b>Total income of the household/month (USH)</b>							
$< 50,000$		11	10.4 %	3	5.6 %	14	8.8 %
50,001-100,000		17	16 %	13	24 %	30	18.8 %
100,001-200,000		20	18.9 %	10	18.5 %	30	18.8 %
200,001-500,000		31	29.2 %	17	31.5 %	48	30 %
500,001-1,000,000		16	15 %	8	14.8 %	24	15 %
$> 1,000,000$		4	3.8 %	2	3.7 %	6	3.8 %
Do not know		7	6.6 %	1	1.9 %	8	5 %



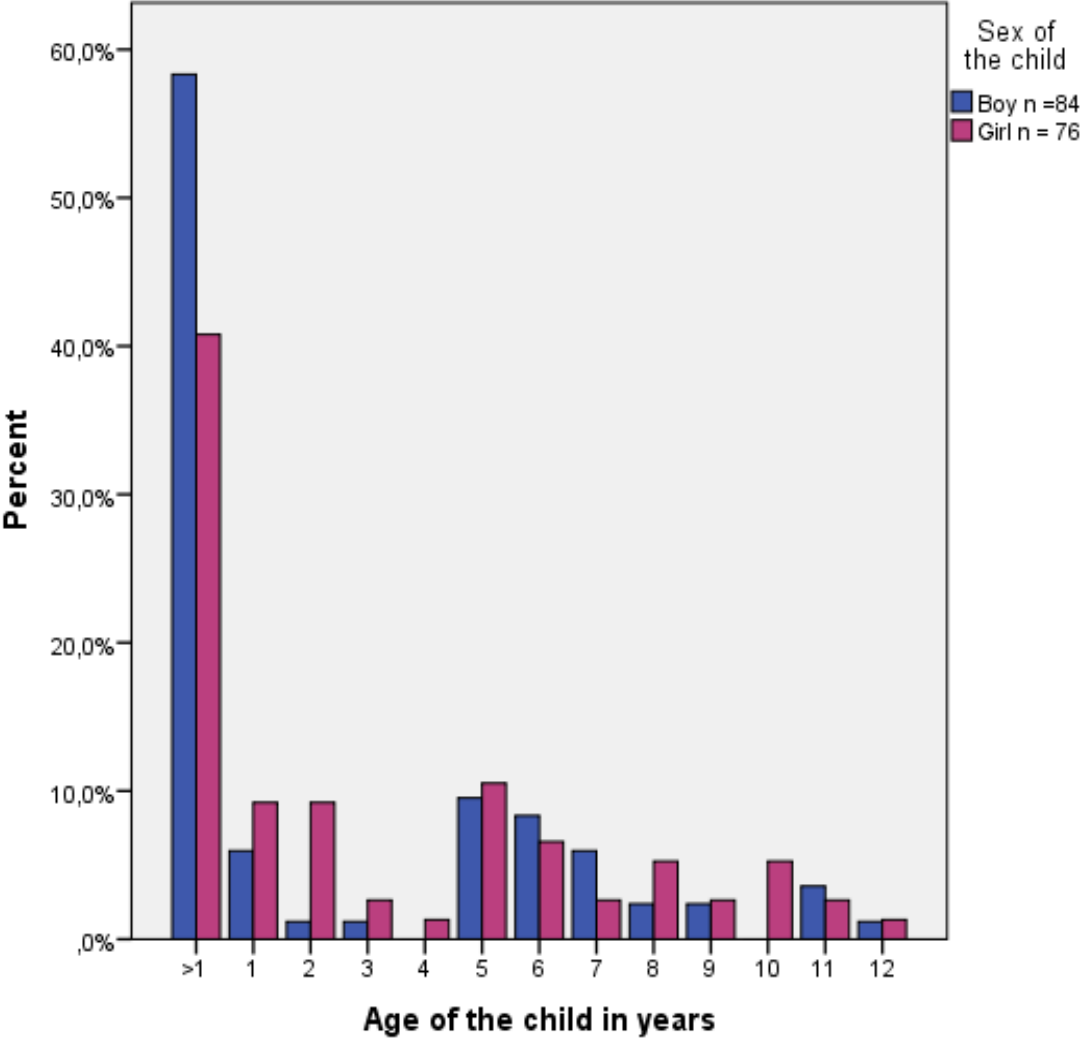
*Table 2 Living conditions of the respondents*

Living conditions of the respondents in the total group, in the group with parents/caretakers to children < 5 years and in the group with parents/caretakers to children 5-12 years			
Category		Frequency in total (n=160)	% in total (n=160)
<b>Form of housing</b>	Hut	1	0.6 %
	Brick house	134	83.8 %
	Apartment	15	9.4 %
	With relatives/friends	7	4.4 %
	Other	3	1.9 %
<b>Living area</b>	Rural	29	18.1 %
	Periurban	103	64.4 %
	Urban	21	17.5 %
<b>Distance from that health centre the respondent visits when he/she or the child gets sick</b>	<1 km	33	20.6 %
	1-5 km	105	65.6 %
	6-12 km	17	10.6 %
	12-15 km	3	1.9 %
	>15 km	2	1.3 %

The majority lived in a brick house, in a periurban area, 1-5 km from that health centre they visit when their children or themselves fall ill.

**Characteristics of the children**

Out of all the children, 50 % were below 1 year and 65 % were < 5 years. The boys made up 52 % and the girls made up 48 % of the sample population.



*Fig.1. Age and sex of the child*

**Characteristics of the household in regard to number of children, number of persons and number of mosquito nets**

*Table 3. Number of mosquito nets in the household in relation to the size of the household.*

Category	% Households with members < 6, n = 127	% Households with members > 6, n = 32	p-value
Households with enough mosquito nets to cover all the children	85.7 %	40.6 %	< 0.001
Households with at least one mosquito net/2 persons	83.5 %	53.1 %	0.001

All of the households in this study had at least one mosquito net. A household with 6 or less members had more often enough mosquito nets to cover all the children than a larger household ( $p < 0.001$ ). A smaller household had also more often at least one mosquito net/2 persons in the household ( $p = 0.001$ ) see table 3. There was no significant correlation between whether a household had enough mosquito nets to cover all the children < 5 years and the size of the household. Neither was there any significant relation to the number of mosquito nets in the household and whether the household was situated in a rural area or not. Out of the households, 70.4 % had fewer of mosquito nets than number of persons in the household, but only 3.8 % households had a fewer number of mosquito nets than the number of children < 5 years. The number of children in the household increased with a lower level of highest education of the mother ( $p < 0.001$ ). No mother that had been to university had more than 3 children. Most of the households with more than 3 children had a mother who had solely went to primary school or that never had been to school. Out of all the total 159 respondents, 60 % reported that they slept under the same mosquito net as their child.

**Knowledge about malaria among the parents/caretakers to the children**

Almost two thirds in both of the groups reported a health centre or a hospital as one of the sources where they had most of their knowledge about malaria. The second most reported

source where they had most of their knowledge about malaria was school (37.5 %) in both of the groups. Media was also a common reported source of knowledge (20 %). Other less common mentioned alternatives (less than 7 %), were sources as neighbours, friends, village health workers and different kinds of seminars in villages, working places and in the mosque/church. It must be noted that the parents/caretakers were allowed to mention more than one alternative.

*Table 4. The most commonly mentioned symptoms of malaria among the parents/caretakers*

<b>The most commonly mentioned symptoms of malaria among the parents/caretakers</b>	
Category	% Of the parents/caretakers in total (n = 160)
Fever	78.1 %
Vomiting	59.4 %
Headache	20.6 %
Diarrhoea	25 %
General body weakness	19.4 %
Loss of appetite	15 %
Stomach pain	14.4 %

The most commonly mentioned symptoms of malaria given by the respondents is listed in table 4. Over two thirds of the respondents in both of the groups mentioned fever as a symptom of malaria.

There were no significant differences between the two groups in symptoms mentioned (listed in table 7). Symptoms mentioned by 4-8 % of the parents/caretakers were inability to feed/drink, skin rash, joint pain, general body pain, dizziness, chills and cough. There were also several other symptoms mentioned by less than 4 % of the parents/caretakers. The respondents were supposed to mention as many symptoms of malaria as they knew, thus most of the respondents mentioned more than one symptom.

Table 5. The most common mentioned high risk groups by the respondents/caretakers

<b>The most common mentioned high risk groups by the respondents/caretakers</b>				
Category	% of the parents/caretakers to the children < 5 years	% of the parents/caretakers to the children 0-5 years n = 54	% of the parents/caretakers in total n = 160	p-value
People who do not sleep under mosquito nets	32.1 %	46 %	36.9 %	0.086
Pregnant women	36.1 %	20 %	30.8 %	0.047
Infants	34.9 %	19 %	29.6 %	0.047
Children 0-5 years	14.2 %	17 %	15.1 %	0.649
People staying in places with stagnant water	14.2 %	17 %	15.1 %	0.649
People drinking unboiled water	7.5 %	20 %	12 %	0.022

In table 5, six of the most mentioned perceived high risk groups is listed. “ People who do not sleep under mosquito nets” is the most common mentioned high risk group. There were significant differences between the two groups in four of the six most mentioned high risk groups. There were also many other believed high risk groups mentioned by less than 9 % of the parents/caretakers. The respondents were supposed to mention as many high risk groups as they knew which resulted in most of the respondents mentioning more than only one believed high risk group.

Table 6. Mentioned causes of malaria among the respondents

<b>The most common mentioned causes of malaria among the parents/caretakers</b>	
Category	% in total, n=160
Mosquitoes	76.9 %
Stagnant water	30 %
Living with bushes around	21.3 %
Drinking unboiled water	21.3 %
Not sleeping under a mosquito net	16.9 %

In table 6, five of the most believed causes of malaria the respondents mentioned are listed. Above 75 % of the respondents in both of the groups mentioned mosquitoes as a cause of malaria. There were no significant differences between the two groups in the mentioned causes of malaria. There were several other believed causes of malaria, mentioned by less than 3 % of the respondents.

Among the total number of the respondents, 24 % believed that a person could be completely immune against malaria. However, no significant correlation could be seen between the tendency of neither the children nor the parents of sleeping under a mosquito net in the last night/every night in the last seven nights and beliefs about immunity against malaria. Out of the respondents who believed somebody could be completely immune against malaria, 3.1 % mentioned that "people that sleep under mosquito nets" as the only condition to becoming immune.

### Mosquito net usage among the children

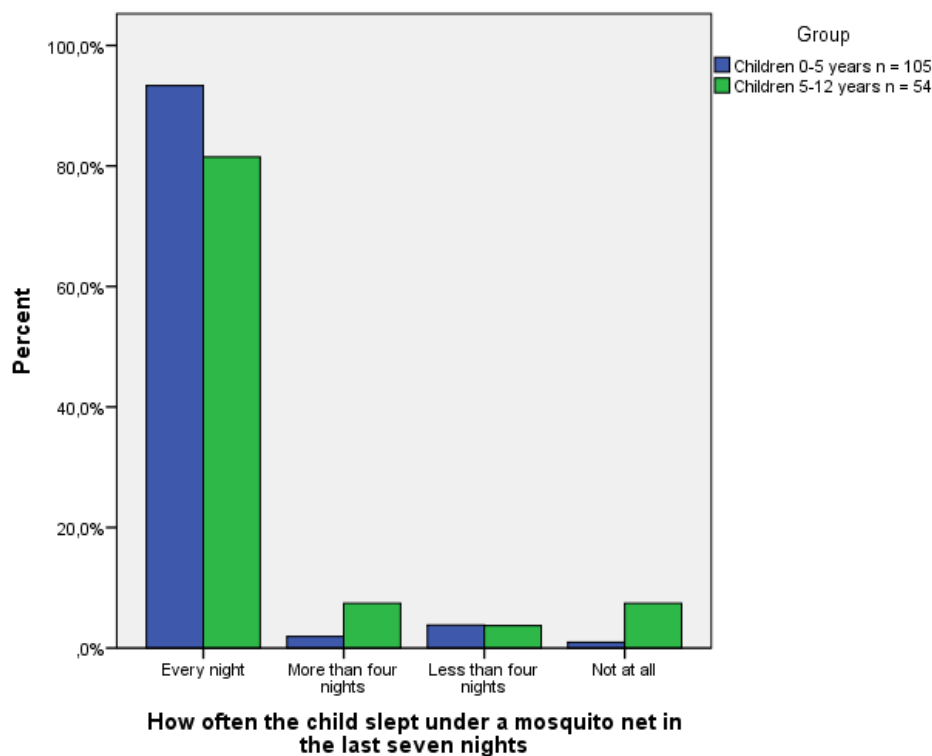


Fig. 4. How often the child slept under a mosquito net in the last seven nights

Children were more likely to have slept every night under a mosquito net in the last seven nights if they were under five years compared to if they were 5-12 years old, (see figure 4) (OR = 3.18; 95 % CI 1.14-8.91). Out of the children 5-12 years, 7 % did not sleep under a mosquito net at all, as compared to 1 % of the children below five years (p = 0.035).

Table 7 How often the child slept under a mosquito net every night in the last seven nights related to the age of the child

<b>How often the child slept under a mosquito net in the lasts even nights, related to the age of the child</b>		
Age of the child in years	Number of children	% of the children in total that slept under a mosquito net every night in the last seven nights (n=105)
< 1	79	94 %
1	12	92 %
2	8	88 %
3	3	100 %
4	1	100 %
5	16	94 %
6	12	83 %
7	7	71 %
8	6	67 %
9	4	100 %
10	4	25 %
11	5	100 %
12	2	100 %

Children at an age of 7, 8 and 10 years old were less likely to have slept under a mosquito net every night, in the last seven nights ( $p = 0.026$ ). On the contrary, there was no significant difference between the age and the children that did not sleep under a mosquito net at least one night/not at all.

If the number of mosquito nets were less than the number of persons in the household, 48 % would prioritise the infants or younger children and 50 % would give the net to the pregnant mother.

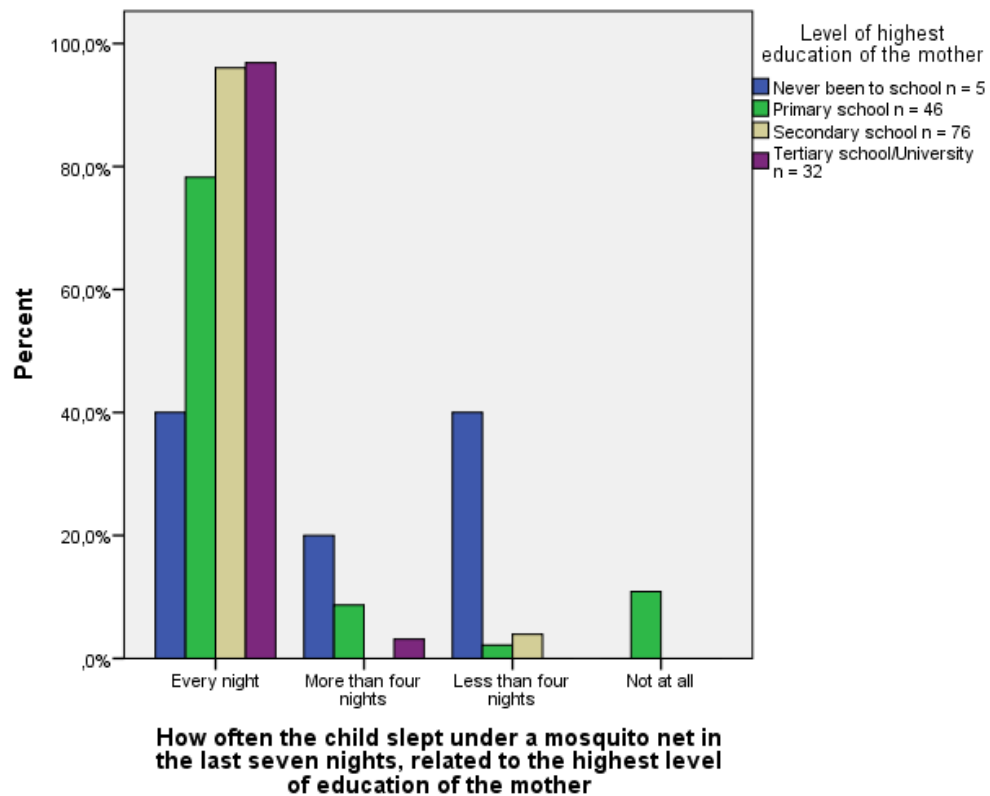
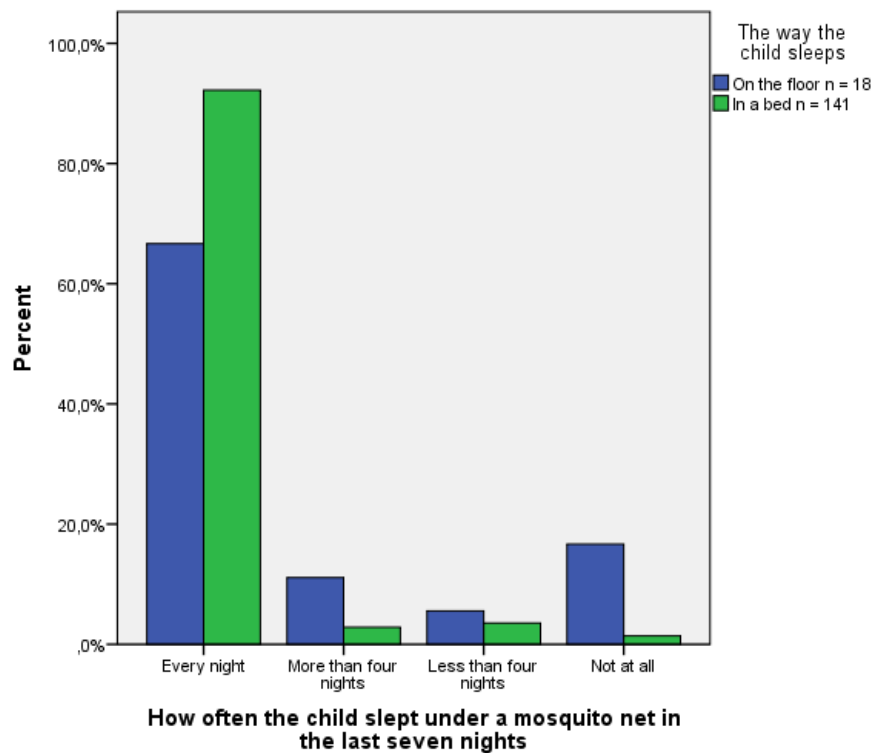


Fig. 3. If the child slept under a mosquito net last night and the highest level of education of the mother

A larger proportion of children with a mother whose highest level of education was at least secondary school had slept under a mosquito net every night ( $p = < 0,000$ ) (OR = 2.5; 95 % CI 1.26-5.03) compared to the children with mothers whose level of highest education was primary school or that never had been to school (see figure 3). Almost twice as many children with mothers that had been to primary school slept under a mosquito net every night in the last seven nights, compared to children with a mother that never had been to school. However, no significant correlation could be seen neither between how often the child slept under a mosquito in the last even nights and the monthly income in the household nor between how often the child slept under a mosquito net in the last seven nights and the age of the mother. Neither was there any significant difference between boys and girls and the tendency to sleep under a mosquito net in the last seven nights. No significant correlation could be seen between the age of the parents/caretakers and the use of the mosquito nets among the children.





*Fig. 7. How often the child slept under a mosquito net in the last seven nights related to the way the child sleeps*

Out of the children that slept in a bed 92.2 % had slept under a mosquito net every night in the last seven nights, compared to 67 % of the children that slept on the floor ( $p = 0.005$ ) (OR = 3.58;95 % CI 1.30-9.86)

A larger proportion of the children that sleep on the floor did not sleep under a mosquito net at all in the last seven nights, compared to children that slept under a mosquito net at least one night or more ( $p = 0.011$ ),

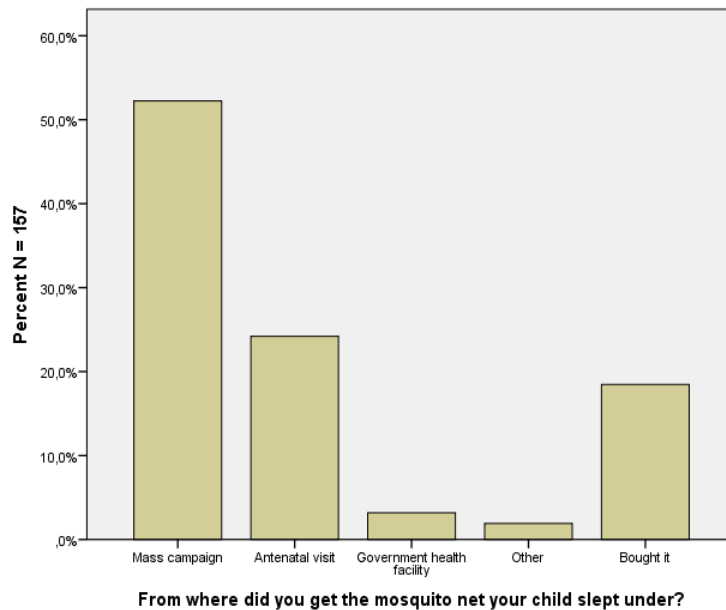


Fig. 9. From where the mosquito net the child slept under comes

The main sources of the mosquito nets the children used were from mass campaigns. No significant relation could be seen between the source of the net and the mosquito net usage among the children. The main source of the nets children 5-12 years used was mass campaigns and the main source of the nets the children < 5 years used was an antenatal visit ( $p < 0.001$ ). A bigger proportion of the households that owned more than one mosquito net/2 persons had got the net the child slept under from a mass campaign than households that did not receive one from a mass campaign ( $p = 0.033$ ). A bigger proportion of the households that did not have at least one mosquito net/two persons in the household had bought their nets compared to the households that did.

Out of of the parents/caretakers to the children <5 years, 52.4 % got the mosquito nets less than six months ago and 31.4 % 6-12 months ago. No significant difference could be seen between the groups regarding this.

Out of the children, 67.5 % had not had malaria in the last twelve months, 22 % had it 1-2 times and 10 % had it three or more times. No significant relation could be seen between the child's tendency to sleep under a mosquito net every night in the last seven nights and how many times the children had contracted malaria.

## **The mosquito net usage among the parents/caretakers**

The higher level of education a mother/female caretaker had, the more often she had reported herself to have slept under a mosquito net every night in the last seven nights ( $p < 0.001$ ).

As much as 20 % of the mothers that never had been to school and 9 % of the mothers whose highest level of education was primary school did not sleep under a mosquito net at all in the last seven nights, compared to 0 % of the mothers whose highest level of education were secondary school/tertiary school/university ( $p = 0.005$ ).

Neither significant correlation could be seen in the tendency of the parents of have been sleeping under a mosquito net every night in the last seven nights and what group the parents belonged to (the group with the children  $< 5$  years and the group with the children 5-12 years), nor between the mothers/female caretakers tendency of been sleeping under a mosquito net last night and the monthly income in the household.

Out of the respondents, 23 % reported themselves to sleep under a mosquito net more often during rainy season.

As much as 95.6 % of the respondents reckoned it "very important" to sleep under a mosquito net to protect against malaria and no one in this study found it "not important at all". No significant difference could be seen in the tendency of neither the children nor the respondents of have been sleeping under a mosquito net every night in the last seven nights and the respondents considered importance of sleeping under a mosquito net to protect against malaria.

Out of the respondents, 80 % considered themselves to be "very worried" about malaria, 12 % "not very worried" and 8 % "not worried at all". No significant correlation could be seen in the tendency of neither the parents/caretakers nor the children of been sleeping under a

mosquito net last night/every night in the last seven nights and how worried the respondents reported themselves to be about malaria.

Out of the respondents, 77 % mentioned mosquitoes when they had the question of what they think causes malaria, though there was no significance in the relation between neither the childrens nor the respondents tendency of have been sleeping under a mosquito net last night/every night in the last seven nights and whether they mentioned mosquitoes or not.

Just over half of the respondents, 56 % reported there had been a mosquito net mass distribution campaign in their living area less than 6 months ago and 34 % that there had been a mass distribution campaign 6-12 months ago. No significant relation could be seen between how long time ago the last mosquito net mass distribution campaign in the respondents living area took place or neither the childrens nor the respondents usage of mosquito nets.

No significant correlation could be seen between the respondents usage of mosquito nets and the number of children in the household, nor the respondents usage of mosquito nets and the number of children < 5 years in the household.

In the group with the children <5 years, 63 parents/caretakers got the question; "How often did you sleep under a mosquito net before you were pregnant with this child?" Out of these 63 respondents, 14 % answered they did not sleep under a mosquito net at all before the pregnancy with their child.

In both of the groups, 151 parents/caretakers got the question "How often did you sleep under a mosquito net before you had any children?" Out of these 151 respondents, 31.2 % answered they did not sleep under a net at all before they had any children and 7 % answered they did sleep under a net less than four nights a week, before they had any of their children.

## Reasons for not sleeping under a mosquito net among the children

Table 8. The reasons that the children did not sleep under a mosquito net every night in the last seven nights.

<b>Reasons that the children did not sleep under a mosquito net in the last night/every night in the last seven nights</b>			
Category	% of the parents/caretakers to the children < 5 years	% of the parents/caretakers to the children 5-12 years	% of the parents/caretakers in total
It was too hot	0 %	22 %	12.5 %
There was some technical problems hanging up the net	0 %	11 %	6.3 %
The child does not have any net	0 %	33 %	18.8 %
Had just washed the net	28.6 %	11 %	18.8 %
I am a pastor moving around often and then do not bring the nets	0 %	11 %	6.3 %
Visited someone	57.1 %	0 %	25 %
Forgot to put it up	14.3 %	11 %	12.5 %

More of the children 5-12 years, compared to the children < 5 years did not sleep under a net every night in the last seven nights because it was too hot or because they did not have a net. More of the children < 5 years did not sleep under a mosquito net in the last night/last seven nights because the net was just washed or because they had visited someone (  $p = 0.04$ ).

## Reasons for not sleeping under a mosquito net among the parents/caretakers

Table 9. Reasons that the parents/caretakers did not sleep under a mosquito net every night in the last seven nights.

<b>Reasons that the parents/caretakers did not sleep under a mosquito net in the last night/every night in the last seven nights</b>	
Category	% Of the parents/caretakers in total n = 24
Too hot	33 %
Visited someone	25 %
Forgot to put the net up	8 %
Had just washed the net	8 %
Sometimes I sleep somewhere else in my work	8 %
Technical problems to hang up the net	4 %
Do not have a net	4 %
Had to give the net to the kids	4 %
There are no mosquitoes where I live	4 %

### **Mosquito net treatment among the children**

Out of the children, 84 % slept under a mosquito net that was treated and 10.9 % of the parents/caretakers did not know whether the net of their child was treated or not. No significant difference between the groups could be seen due to the treatment of the nets. No any significant correlation could be seen between net treatment and the highest level of education of the mother, nor between net treatment and the monthly income in the household. Out of the respondents, 99.1 % in the group with children < 5 years considered treated nets to protect better against malaria than untreated bed nets in comparison to 93 % in the group with the children 5-12 years (  $p = 0.02$ ). However, no significant correlation could be seen between the usage of a treated mosquito net and the consideration that the treated mosquito net protected better. The majority of the respondents had got the nets already treated and had not treated it since then.

### **Mosquito net treatment among the parents/caretakers**

Out of the parents/caretakers, 58.1 % slept under the same mosquito net as their child. Out of the 67 respondents that did not sleep under the same mosquito net as their child, 69 % answered that the net they used for themselves was treated.

Out of the 69 respondents that did not sleep under the same mosquito net as their child, 42 % had got their net less than six months ago.

Out of the 69 respondents that did not sleep under the same mosquito net as their child, 51 % got their net from a mass distribution campaign and 26 % had bought it.

### **Household protections**

Over 50 % in both of the groups mentioned that they removed stagnant water and slashed nearby bushes to prevent malaria. Out of the total respondents, 30.6 % answered they sprayed the interior walls and 23 % answered wrong they boiled water for drinking.

Out of the parents/caretakers, 10.6 % reported someone to have come into their house to spray the interior walls with repellent against mosquitoes in the last twelve months. However, there was no significant difference between those groups. There was no significant correlation between spraying the walls and monthly income in the household, nor spraying the walls and level of highest education of the mother.

## **Discussion**

### **Mosquito net ownership**

All the households owned at least one mosquito net. Households that had 6 or less number of members had more often enough mosquito nets to provide for all the children in the household ( $p = 0.001$ ). Smaller households were more often found to have at least one mosquito net/2 members ( $p < 0.001$ ). A significant correlation to an decreased net ownership in larger households is also seen in other studies (14, 23). The higher the education of the mother was, the higher the chance that the household would have enough mosquito nets for all of the children ( $p=0.001$ ). However, it must be noted that no mothers who had been to the university had more than 3 children and the number of children in the household increased with a lower education of the mother ( $p < 0.001$ ). There was no significance between mosquito net ownership and whether the household was situated in a rural area or not. However, a significance was found between an increased net ownership and more rural areas in the study in Burkina (14). The opposite is shown in another study, where urban households were more likely to own nets (17). Neither was there, in our study, any significance between the net ownership and the total income in the household.

### **Mosquito net usage in comparison with age**

Children  $< 5$  years had more often slept under a mosquito net every night in the last seven nights compared to children 5-12 years ( $p = 0.035$ ). This significant difference between

children < 5 years and children 5-12 years has also been shown in another study in Uganda (25). In a study to investigate the mosquito net usage in all ages in 18 malaria endemic African countries, it was shown that children going to school (5-19 years) were least likely to sleep under a mosquito net , (11). There was a tendency towards lower usage of mosquito nets every night in the last seven nights in children at an age of 7, 8 and 10 years ( $p = 0.067$ ). In a study in Ethiopia it was shown that school-age children and young adults (people 5-24 years) were less likely to use a mosquito net (12). People 5-18 years has shown to be least likely to sleep under a net, even after a mass campaign (18). In another study, people between the ages of 15-24 years were least likely to sleep under mosquito nets. Thus, it seems like in many places, teenagers and young adults are the ones that are least protected by mosquito nets. However, in our study in Kasangati there was on the other hand no significant differences in usage of the mosquito nets among parents 17-25 years and parents older than 25.

### **Mosquito net usage associated to residence**

No significant difference was seen between the mosquito net usage neither among the children nor the parents and whether they lived in a rural area or not. It must be stated that the parents sometimes had difficulties with determining whether their residence was situated in an urban/periurban/ rural area and this information must therefore be challenged. Other studies have indicated a higher net usage in urban areas compared to rural areas (12, 16).

### **Mosquito net usage associated to household size**

Children in larger households, (in our study a household more than six members counts as a large household) were less likely to have slept under a mosquito net in the last night ( $p < 0.001$ ). The similar thing has been seen in Burkina, where children < 5 years living in larger households were less likely to sleep under a net compared to children in smaller households



(14). It has been shown that smaller households are more likely to achieve universal coverage of bed nets after mass campaigns. Reduced mosquito net usage is associated with an increased number of sleeping spaces (12). It is not inconceivable to assume that a larger household has more sleeping spaces.

Children in households that had mosquito nets to cover all the children < 5 years had more often slept under a mosquito net last night ( $p = 0.019$ ). No significance could be seen between the children's usage of mosquito net last night and the coverage of mosquito nets for all members/all children or households with at least 2 nets per person. However, in a study in Burkina, it has been shown that persons with at least one ITN/ 2 household members were more likely to have used an ITN (14).

#### **Mosquito net usage associated to the age of the net**

There was no significant relation to the usage of mosquito nets in the last night/in the last seven nights and how long time ago the net was obtained. On the other hand, in other studies a reduction in net usage is associated with an older net, obtained more than one year ago (12).

#### **Mosquito net usage associated to education**

A larger proportion of the children with a mother whose highest level of education was at least secondary school had slept under a mosquito net every night ( $p < 0,000$ ) compared to the children with mothers whose level of highest education was primary school or that never had been to school. Almost twice as many children with mothers that had been to primary school slept under a mosquito net every night in the last seven nights, compared to children with a mother that never had been to school. All of the children with a mother that had been to university had slept under a mosquito net. It is important to keep in mind that no mother who had been to university had more than 3 children and the mosquito net ownership/usage tends to increase with smaller households, as shown above. In this study there was no significant relation between the father's highest level of education and the the usage of mosquito nets

among the children. The information about the fathers highest level of education is on the other hand hard to find. The family relationships in the community where the study was carried out are very complicated with some polygamous families, and in our study, we did not ask about whether the father lives with the child or not.

However, there has been shown in an earlier study that if the head of the household had been to at least tertiary school, it was associated with an increased bed net usage among children 5-19 years (15). A higher education of the father has been associated with a higher net usage according to a study that was carried out in Nigeria (17) On the other hand, a study in Kenya has shown that the education of the father was not associated with a higher net usage, but so was the education of the mother (18).

### **Mosquito net usage associated to income**

No significant relation was shown in this study between either the mosquito net ownership/usage among the parents nor the children and the monthly income in the household. It must be noted that many of the families in the study do not make a regular amount of money every month. It is therefore hard to evaluate the wealth of a household by solely looking at the income, rather we should also look at other factors contributing to wealth, such as ownership of other agricultural areas or other kinds of property. This has not been done in this study. In other studies there has been shown a significant correlation between bed net ownership and the wealth of the household, in that study measured as having enough food in the previous week (17).

### **Mosquito net usage associated to ways of sleeping**

In our study, children who slept on the floor were less likely to have slept under a mosquito net than children sleeping in a bed. This has also been shown in earlier studies and so even after a mass campaign (18). In a study in Burkina children were reported to sleep in groups

and it is not unthinkable to presume that the nets obtained from mass campaigns not always have the right size for the prevailed sleeping pattern (7).

### **Mosquito net usage associated to malaria knowledge**

Receiving malaria education has been shown to be significant related to use of an ITN to a higher extent (15).

Out of the respondents, 76.9 % mentioned mosquitoes as a cause of malaria but neither the parents nor the childrens' usage of mosquito net was significant related to whether they mentioned mosquitoes as a cause of malaria or not. Many of them that did not mention mosquitoes mentioned other causes, related to mosquitoes such as stagnant water and living near bushes. Whether study participants truly know that living near bushes and stagnant water can lead to malaria due to the harbouring of mosquitoes is not completely clear. However, it is fair to assume that more than 76.9 % know that mosquitoes causes malaria since 30 % of the parents that did not mention mosquitoes mentioned "people who do not sleep under mosquito nets as a high risk group of having malaria. Out of the total number of parents in the study, 90 % had stated that a treated bed net is more protective than an untreated since "the treatment kills the mosquitoes/prevents them from biting/entering. Therefore it is reasonable to presume the knowledge about the causes of malaria among the study participants as very good. In an Ethiopian study, it is showed that having the knowledge that mosquitoes causes malaria and that sleeping under mosquito nets can prevent malaria, is associated with an increased net ownership (16) and net usage both in the women themselves and in children < 5 years. It hasalso been showed that increased malaria knowledge of the mother is associated with an increased net usage (12)

### **Usage of mosquito nets among the parents**

Parents in larger households (households with more than 6 members) had more often slept under a mosquito net last night than parents in smaller households ( $p = 0.042$ ). In other

studies it has been shown that the number of ITN:s in the household is associated with the mothers usage of ITNs (16).

Having a child < 5 years was not significant related to the parents usage of a mosquito net last net. In other studies it has showed to be significant, where mothers with a child < 5 years had a higher usage of mosquito nets (16). This could be explained by the fact that many mothers sleep under the same mosquito net as their child, when the child is < 5 years and in another study in Uganda, sharing a bed with a parent was associated with bed net usage (25).

### **Mosquito net usage associated to indoor residual spraying (IRS)**

No significant correlation could be seen in our study between the households use of indoor residual spraying (IRS) in the last twelve months. Though, IRS in the last twelve months has been significant related to use of ITNs in other studies (16).

### **Effects of mass campaigns**

Out of the total study participants, 56.3 % reported there had been a mosquito net mass distribution campaign in the area of their residence less than 6 months ago and 36 % there had been a mass campaign 6-12 months ago. Just over 50 % of the bed nets used by the children were from a mass campaign and almost 25 % of the nets were from an antenatal visit. Out of the parents 56.9 % slept under the same mosquito net as their child. Out of the parents that did not sleep under the same mosquito net as their child, 50.7 % had received their nets from a mass campaign and 41.4 % of those had received their nets less than six months ago. In an Ugandan study, it has been shown that children in households that had received a mosquito net from the last mass campaign were more likely to use a LLIN (5). This study is hard to compare to the study in Kasangati since there is a lack of information about whether the participants who did not get their and their child's net from a mass campaign, received any nets at all from the last campaign. It has been shown that some factors associated with an increased mosquito net usage before the campaign, like the education of the mother and the

wealth of the household disappeared after the campaign. Still, after a campaign there are some groups with people as males and people sleeping on the floor or in open rooms are less likely to sleep under an ITN (19). Results from studies show that high levels of ITN coverage can be achieved after a mass campaign for the distribution of free bed nets. Use of the nets can be amplified and maintained at least one year after the campaign (19). In other studies it is also shown that ITN coverage can be greatly increased after mass campaigns (5, 23, 24). Universal coverage means, as already mentioned in the background, an ownership of at least one mosquito net per every two members in the household (22). Thus, our study population at Kasangati Health Centre has due to this definition, achieved universal coverage. In fact, in a study in Burkina it is shown that the net usage is significantly higher among households that own at least 1 ITN/2 members of the household (14). Even the mosquito net usage both among the parents and the children in our study in Kasangati was very good (over 90 % of the parents and children had slept under a net every night). That the majority had received at least one net from a mass campaign is probably one important explanation to this. However, in a study in Burkina an initial peak in usage is reported after the mass campaign, but it tends to decline several months after the campaign (14). Hence, it would have been intriguing to see whether the usage still was this good within six months or one year after this study was finished.

Some kind of catch-up strategy by combining mass campaigns and distribution of nets during antenatal/immunization visits has shown to be an efficient strategy to achieve and maintain a high bed net coverage (24). One fourth out of the study population had received nets their child used from an antenatal visit and this could be even one more explanation to the high extent usage of mosquito nets.

### **Reasons for not using a mosquito net**

The most reported reason that the children did not sleep under a mosquito net in the last night/in the last seven nights were sleeping somewhere other than at home, that the net had been washed or that the child did not have any net. The most common reasons among the parents/caretakers for not using a net in the last night/the last seven nights were the heat or sleeping somewhere other than at home.

Reported reasons for not using an ITN in other studies has also been discomfort due to heat (19, 21), worn-out bed nets, absence of mosquitoes within the house. After a mass distribution the most mentioned reason to not use the net was inability to hang several nets in the house due to lack of space (19). Regular visits from community workers has been shown to be useful in maintaining mosquito net usage (26). Whether the participants in this study had been visited of someone after the campaign is unfortunately not captured in this study.

In Brkina there has been reported that people sleep under nets to relieve mosquito nuisance rather than to prevent malaria, and if people not where bothered of mosquitoes, they did not use the net even though it was a season of high transmission (7). This may not be applicable to the parents/caretakers in our study since 95.6 % of the participants reckoned it very important to sleep under a mosquito net to prevent malaria. A low mosquito density is one reported reason for not sleeping under a net from another study (21).

### **Treated bed nets**

Out of the parents that did not sleep under the same net as their child, 69 % answered their net was treated. Regarding the treatment of the children's mosquito nets, 82 % answered the net was treated and 10.6 that they did not know wether it was treated or not. All nets from the mass campaigns in Wakiso district are treated and all nets giving out from the atenatal clinic at Kasangati Health Centre are treated. Since the majority had received nets from a mass campaign or an atenatal visit it is fair to assume that majority of the used nets are treated.

In our study 96.9 % reckoned a treated net to be more protective against malaria than an untreated bed net, 90 % thought that the treatment of nets kills the mosquito/prevents it from biting/entering. It is remarkable that 5 % stated that when sleeping under a mosquito net you cannot have malaria. Since the interviews were carried out with interpreters and even sometimes several different interpreters, it is hard to make out whether the beliefs is that use of a treated bed net gives complete protection against malaria or if it gives a very good protection against malaria though not complete. If the former is correct, there exists a challenge around educate people about the remaining risks even though use of ITNs provide very good protection. This is because otherwise there is a risk of parents not seeking health care for those children when falling ill. Despite the great awareness about the importance of the treatment there were still a few (1.2 %) that considered the treatment to be harmful to human life and 0.8 % reported it to cause allergic reactions.

### **Strengths and limitations of this study**

The strength in this study is that the method used, semi-structured interviews, gave a good opportunity for ensuring that the respondents had understood the questions and to ask the respondent to advance or declare their statements in situations when the answer was not clear. This method also gave the opportunity to individuals to expand upon their thoughts in a more elaborate way.

The use of an interpreter has its advantages as it gave an opportunity for a more detailed insight of the views of the respondents that otherwise may have been not been possible due to differences between the cultures of the interviewer and the respondents. Another strength is the in the health centre where the study was accomplished, the care and treatment was supposed to be free for all the patients. This enabled us to study a large breadth of the community with respect to education, wealth etc. This study also covered the mosquito net

usage among people from many age groups since even the parents were asked about their own net usage, even though some age groups was more frequently encountered than others. However, the limitations of this study are many. Use of an interpreter also has its drawbacks. The respondent's answers were translated into English, a language both the interpreters and the interviewer mastered well, but still not is the native language to any of them. Since the interpreters aside from interpreting had their own assigned jobs, the use of several different interpreters was necessary which naturally can result in different translations or interpretations of the same word or meaning. Even though the free treatment and care of the clinic ascertained a big width of participants due to socioeconomic status, many of the participants came from the same area and stayed within 1-5 kilometres from the health centre. It is likely that this study did not capture the very poorest people that perhaps could not even afford the transport to the health centre where as a study primarily based on home visits may have done. Another limitation is that the information about the mosquito net ownership and usage was based on self-reported and it may not be possible to avoid bias with this kind of self-reporting.

## **Conclusions**

The mosquito net coverage had achieved universal coverage in our study population. Smaller households with less than 6 members had more often enough mosquito nets to cover all the children and also more often at least one mosquito net/2 persons. Over 90 % of the parents and the children in total had slept under a mosquito net every night in the last seven nights. However, the mosquito net use was significant higher in children < 5 years compared to children 5-12 years.

A higher educational attainment of the mother lead to a higher net usage both of the children and the parents themselves. Even the way of sleeping affected the usage of mosquito nets, where children sleeping on the floor were less likely to have slept under a net than children sleeping in a bed. Over 50 % of the nets the children used were from mass campaigns and the



majority of the respondents reported it to have been a mass campaign in their living area less than 6 months ago. Even antenatal clinics were a main source of the mosquito nets.

Consequently, the distribution of nets at antenatal clinics and mass campaigns around Kasangati seems to have accomplished its purpose to a high extent. However, the challenge for health workers and the community in this area is now to maintain the achieved high level of mosquito net usage.

# Populärvetenskaplig sammanfattning

## **Innehavande av myggnät i hushållen och faktorer associerade till myggnätsanvändning bland barn 0-12 år och deras föräldrar/vårdnadshavare på Kasangati Health Centre, Uganda.**

Malaria är en av de ledande dödsorsakerna i Uganda. De som drabbas hårdast är barn under 5 år. En av de mest effektiva preventionsmetoderna mot malaria är att varje natt sova under ett impregnerat myggnät. Under de senaste åren har innehavandet av myggnät i hushållen ökat markant som ett resultat av de stora masskampanjerna där man delar ut impregnerade myggnät utan kostnad. Under senare år har man riktat masskampanjerna mot hela befolkningen då studier har visat att en användning myggnät bland hela populationen är nödvändig för att minska malariatransmissionen. Majoriteten av deltagarna i den här studien rapporterar att en masskampanj har ägt rum, mindre än sex månader i området där de bor. Detta har visat sig ge resultat då alla studiedeltagarna ägde minst ett myggnät i sitt hushåll. Ett mindre hushåll, som i denna studie definierades som ett hushåll med mindre än 7 medlemmar innehade oftare minst 2 myggnät/person i hushållet jämfört med större hushåll. Över 90 % av både föräldrarna och barnen hade när de tillfrågades under senaste veckan sovit under ett myggnät varje natt. Dock var myggnätsanvändningen signifikant högre hos barn < 5 år, jämfört med barn 5-12 år. I denna studie sågs en signifikant mindre användning av myggnät hos barn i åldrarna 7, 8 och 10 år. Ju högre utbildning mamman hade, desto större var myggnätsanvändningen hos både henne själv och barnet. Utav barnen vars mammas högsta utbildning var tertiary school/universitet hade 100 % sovit under myggnät varje natt. Nästan två gånger så många barn med en mamma vars högsta utbildning var primary school hade sovit under ett myggnät varje natt senaste veckan, jämfört med de barnen vars mamma aldrig hade gått i skolan. Även sättet att sova på påverkade myggnätsanvändningen där barn som sov på golvet sov under myggnät i mindre utsträckning än barn som sov i en säng.

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# Appendix 1

## Parent questionnaire

Medical student: Josefin Henrysson, Sahlgrenska Academy, University of Gothenburg, Sweden.

Supervisors: Dr Ivan Nyenje, Kasangati Government Health centre, Uganda and Prof. Rune Andersson, Sahlgrenska Academy, University of Gothenburg, Sweden.

Signed consent \_\_\_\_\_

Patient/ID nr: \_\_\_\_\_

Speaks English

- Yes  
 No

## Part 1 Demographic characteristics of the respondents, living conditions and economic and socio-cultural factors

1. Age of respondent \_\_\_\_\_

### 2. Sex of respondent

- Female  
 Male

### 3. Are you pregnant?

- Yes  
 No  
 Do not know

4. Relation to the child \_\_\_\_\_

5. Number of children below five years in your household \_\_\_\_\_

6. Number of persons in your household in total? \_\_\_\_\_

### 7. Level of highest education of the mother

- Never been to school  
 primary school  
 Secondary school  
 University/Tertiary school  
 There is no mother

### 8. Level of highest education of the father

- Never been to school  
 Primary school  
 Secondary school  
 University/Tertiary school  
 There is no father

## 9. Total income in your household per month (Ugandan shillings/USH), approximately

- < 50,000  
 50,001-100,000  
 100,001-200,000  
 200,001-500,000  
 500,001-1,000,000  
 > 1,000,000  
 Do not know

## 10. Residence

- Rural  
 Periurban  
 Urban

## 11. How far from the health centre you visit when you or your child get sick do you live?

- Less than 1 km (<0,6 miles)  
 1-5 km (0,6-3,1 miles)  
 6-10 km (3,7-6,2 miles)  
 11-15 km (6,8-9,3 miles)  
 more than 15 km (>9,3 miles)

## 12. Living conditions

- Hut  
 Brick house  
 Apartment  
 Living with relatives/friends  
 Other, please specify \_\_\_\_\_

13. How many mosquito nets does your household have? \_\_\_\_\_

## Part 2. General questions about malaria

### 14. What signs or symptoms of malaria do you know?

- Nausea  Vomiting  
 Headache  General body pain  
 Fever  
 Inability to feed and drink  
 Others, please specify \_\_\_\_\_

**15. What signs or symptoms of severe malaria do you know?**

- Impaired consciousness
- Prostrated     Rapid breathing
- Convulsions     Severe anaemia
- Persistent vomiting     Do not know
- Others, please specify \_\_\_\_\_

**16. What people do you think are at highest risk of having malaria?**

- Pregnant women
- People that do not sleep under mosquito nets
- Children 0-5 years
- Children 5-15 years
- Older people above 65 years
- People with HIV or a weak immune status
- There are no risk groups
- Others, please specify \_\_\_\_\_

**17. What do you think causes malaria?**

- Biting by mosquitoes
  - Transfusion of infected blood
  - Others, please specify \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**18. Are you worried about malaria?**

- Very worried
- Not very worried
- Not worried at all
- Do not know

Why? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**19. From where did you have most of your knowledge about malaria?**

- School
- Relatives
- Health centre/hospital
- Through mass campaigns
- media (radio, television, newspapers)
- Others please specify \_\_\_\_\_

**20. Do you think that a person could become completely immune against malaria ?**

- Yes
- No
- Do not know

If yes, when? \_\_\_\_\_

**Part 3 Specific questions about your child's usage of mosquito nets**

**21. Age of your child \_\_\_\_\_**

**22. Sex of your child**

- Boy
- Girl

**23. Has your child had malaria in the last year?**

- Yes, 1-2 times
- Yes, three or more times
- No
- Do not know

**24. Was your child diagnosed with malaria by using a blood test when having malaria in the last year?**

- Yes
- No
- Do not know
- Did not have malaria in the last year

**25. How does your child sleep?**

- On the floor
- In a bed
- Others, please specify \_\_\_\_\_

**26. Did your child sleep under a mosquito net last night?**

- Yes
- No
- Do not know

**27. How often did your child sleep under a mosquito net in the last seven nights?**

- Every night
- More than four nights
- Less than four nights
- Not at all
- Do not know

**28. What are the reason/reasons that your child did not sleep under a mosquito net last night/all of the nights in the last seven nights?**

- My child did sleep under a mosquito net last night
- Other family members must be prioritised
- I can see no reason for my child sleeping under a mosquito net
- It is too hot
- There are some technical problems hanging up the mosquito net
- Do not have a net
- Other reasons, please

specify \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**29. Is the mosquito net that your child slept under treated with a treatment that kills or repels mosquitoes?**

- Yes
- No
- Do not know
- Did not use any net

**If not treated, why?**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**30. How long time ago was the mosquito net that your child slept under last treated?**

- Less than 6 months ago
- 6-12 months ago
- 1-2 years ago
- More than 3 years ago
- Never treated
- Do not know
- Did not use any net

**31. Who did treat the net your child slept under, last time it was treated?**

- Government facility
- Private facility
- Someone in our household
- Others, please

specify \_\_\_\_\_

**32. Have you heard of long-lasting treated bed nets?**

- Yes
- No
- Do not know

**33. Is the mosquito net your child slept under treated with a long-lasting treatment?**

- Yes
- No
- Never heard of that
- Do not know

**34. How long time ago did you get the mosquito net that your child slept under?**

- Less than 6 months ago
- 6-12 months ago
- 1-2 years ago
- More than 3 years ago
- Do not know
- Did not use any net

**35. From where did you get the mosquito net that your child slept under?**

- From a mass distribution campaign
- From an antenatal or immunization visit
- from the government health facility
- Had them freely from a private health facility
- Bought it
- Do not know
- Did not use any net

**36. During what season does your child sleep under a mosquito net more often?**

- Rainy season
- Dry season
- Use it during the whole year
- Never use it
- Do not know

**37. Does your child use any spray or cream on the skin that repels mosquitoes?**

- Yes
- No
- Do not know

**38. How often does your child use sprays and creams on the skin that repels mosquitoes?**

- Every evening
- More than four evenings in a week
- Less than four nights in a week
- Never

#### **Part 4 Specific questions about your usage of mosquito nets**

**39. Did you sleep under a mosquito net last night?**

- Yes
- No
- Do not know

**40. How often did you sleep under a mosquito net in the last seven nights?**

- Every night
- More than four nights
- Less than four nights
- Not at all
- Do not know

**41. Did you sleep under the same mosquito net as your child?**

- Yes
- No
- Did not sleep under a net

**42. What are the reason/reasons that you did not under a mosquito net in the last night/all of the nights in the last seven nights?**

- I did sleep under a mosquito net last night
  - Other family members must be prioritised
  - I can see no reason for me sleeping under a mosquito net
  - It is too hot
  - There are some technical problems hanging up the mosquito net
  - Do not have a net
  - Other reasons, please specify
- 
- 
- 

**43. How often did you sleep under a mosquito net before you were pregnant with this child? (solely parents/caretakers to children < 5 years)**

- Every night
- More than four nights
- Less than four nights
- Not at all
- Do not know

**44. How often did you sleep under a mosquito net before you had any of your children?**

- Every night
- More than four nights
- Less than four nights
- Not at all
- Do not know

**45. Is the mosquito net that you slept under treated with a treatment that kills or repels mosquitoes?**

- Yes
- No
- Do not know
- Did sleep under the same net as my child
- Did not use any net

**46. How long time ago was the mosquito net that you slept under last treated?**

- Less than 6 months ago
- 6-12 months ago
- 1-2 years ago
- More than 3 years ago
- Never treated
- Do not know
- Did sleep under the same net as my child
- Did not use any net

**47. How long time ago did you get the mosquito net that you slept under?**

- Less than 6 months ago
- 6-12 months ago
- 1-2 years ago
- More than 3 years ago
- Do not know
- Did sleep under the same net as my child
- Did not use any net

**48. From where did you get the mosquito net that you slept under?**

- From a mass distribution campaign
- From an antenatal or immunization visit
- from the government health facility
- Had them freely from a private health facility
- Bought it
- Do not know
- Did sleep under the same net as my child
- Did not use any net

**49. During what season do you sleep under a mosquito net more often?**

- Rainy season
- Dry season
- Use it during the whole year
- Never use it
- Do not know

**Part 5 General questions about the mosquito nets**

**50. If the number of mosquito nets is less than the number of family members.**

**Who would you prioritise? Mark with a number from 1-6 where 1 is the one you would prioritise first and 6 is the one you would least prioritise.**

- Infants and the youngest children \_\_\_\_\_
- The oldest person in the household \_\_\_\_\_
- Children going to school \_\_\_\_\_
- The person earning the money \_\_\_\_\_
- The mother if pregnant \_\_\_\_\_
- The mother if not pregnant \_\_\_\_\_

**51. How long time ago was the last mosquito net mass distribution campaign in the area where you live?**

- Less than 6 months ago
- 6-12 months ago
- More than one year ago
- Do not know
- There has not been any campaign in the area where I live

**52. How often did your child sleep under a mosquito net before the last mosquito net mass distribution campaign in the area where you live?**

- Every night
- More than four nights a week
- Less than four nights a week
- Not at all
- There has not been any campaign in the area where I live
- Do not know

**53. How often did you sleep under a mosquito net before the last mosquito net mass distribution campaign in the area where you live?**

- Every night
- More than four nights a week
- Less than four nights a week
- Not at all
- There has not been any campaign in the area where I live
- Do not know

**54. How important do you think it is sleeping under a mosquito net to protect against malaria?**

- Very important
- Important
- Not very important
- Not important at all

**55. What kind of nets do you think are most protective against malaria?**

- Impregnated or treated bed nets
- Nets that are not treated or impregnated
- There are no differences between the nets
- Do not know

Why? \_\_\_\_\_

\_\_\_\_\_

**56. What kind of nets do you think are most protective against malaria?**

- Nets that are bought at a shop/pharmacy
- Nets that are given freely
- There are no differences between the nets
- Do not know

Why?

\_\_\_\_\_

\_\_\_\_\_

**57. What does your household do to protect against malaria?**

- Remove cans and other water accumulating items
- Slash nearby bushes
- Spray the interior walls with a spray that kills or repels mosquitoes
- Close the windows and doors in the evening
- Others, please

specify \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**58. Has anyone come into your home to spray the interior walls against mosquitoes in the last twelve months?**

- Yes
- No
- Do not know

**59. Have you seen somebody use the mosquito nets for something else than sleeping under?**

- Yes
- No
- Do not know

If yes, for

what? \_\_\_\_\_

**60. When do consider a net as no longer useable?**

- When it is dirty
- When it is full of holes
- After more than 10 washes
- After more than 20 washes
- Others, please specify

\_\_\_\_\_

\_\_\_\_\_

Why? \_\_\_\_\_

\_\_\_\_\_

**Thank you for participation!**

Comments from the

interviewer \_\_\_\_\_

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