Baseline and endline surveys for the evaluation of seasonal malaria chemoprevention in Katsina state, Nigeria

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Acronyms and abbreviations

IRS	indoor residual spraying
ITN	insecticide treated net
LGA	local government area
LLIN	long lasting insecticidal net
M&E	monitoring and evaluation
mRDT	malaria rapid diagnostic test
SMC	seasonal malaria chemoprevention

Executive summary

Malaria Consortium in collaboration with the State Ministry of Health and the local government area authorities conducted two cross sectional surveys to assess the coverage and acceptability of seasonal malaria chemoprevention (SMC). The surveys were conducted at two time intervals, at baseline i.e. before SMC delivery and at the end of the second transmission season.

The specific objectives of the surveys were to assess 1) The coverage of SMC at the end of the distribution round; 2) The acceptability of SMC by the community, with special emphasis on suitability of the distribution mechanisms.

At each survey round, the survey was designed using a two-stage cluster sampling for a sample size of 750 households from 30 clusters (30 clusters X 25 households) selected with probability proportionate to size.

The findings from the survey are summarised in the table below, in comparison with results from the baseline survey.

Table 1: Summary of key indicators

Indicator	Baseline 2013	Endline 2014
Household characteristics		
Household ownership of a mobile phone	55.3	53.3
Proportion of household heads with no education	68.4	69.8
Proportion of households with at least one insecticide treated net (ITN)	83.7	74.6
Proportion of households with at least two ITN	76.2	66
Proportion of children who slept under a net the previous night	90.8	93.8
Caregiver experiences with seasonal malaria chemoprevention		
Caregiver's knowledge of	n/a	91
Caregiver took child for SMC	n/a	87.7
Caregiver took child for SMC at fixed point	n/a	8.7
Caregiver's children received SMC from home	n/a	82.2
SMC coverage		
Child received at least one dose of SMC	n/a	83.9
Child received at least 3 doses of SMC	n/a	61.8
Morbidity in children		
Proportion of children with measured fever at time of visit	21.9	6.8
Percentage of children who tested positive with mRDT	76.9	47.8
Proportion of children with severe anaemia (<8.0 g/dl)	35.2	24.7

1 Introduction

1.1 Background

Malaria remains a major public health problem, with an estimated burden of 216 million clinical episodes and 655,000 deaths worldwide attributable to malaria in 2010. A significant proportion (91 percent) of reported deaths from malaria occur in sub-Saharan Africa, where children under five years of age bear most of the burden. In 2010, it was estimated that 86 percent of all malaria deaths occurred in this age group[1].

Global approaches to malaria control are beginning to shift from a 'one size fits all' approach to the targeting of malaria control strategies to specific populations and/or locations for maximum effectiveness.

In keeping with this approach, the World Health Organization recommended a new intervention against *Plasmodium falciparum* malaria: seasonal malaria chemoprevention (SMC). This intervention has been shown to be effective, cost-effective, safe, and feasible for the prevention of malaria among children less than five years of age in areas with highly seasonal malaria transmission [2].

SMC, previously referred to as intermittent preventive treatment in children, is defined as the intermittent administration of full treatment courses of an antimalarial medicine during the malaria season to prevent malarial illness with the objective of maintaining therapeutic antimalarial drug concentrations in the blood throughout the period of greatest malarial risk[3].

1.2 SMC in Nigeria

Nigeria is made up of six geopolitical zones and 37 states including the Federal Capital Territory. Nigeria has a tropical climate with wet and dry seasons. The dry season occurs from October to March and the wet season between April and September.

The geographic location of Nigeria makes the climate suitable for malaria transmission throughout the country. It is estimated that up to 97 percent of the country's more than 150 million people risk getting the disease. The remaining 3 percent of the population who live in the mountains in southern Jos (the Plateau State), at an altitude ranging from 1,200 to 1,400 metres, are at relatively low risk for malaria (Figure 1)
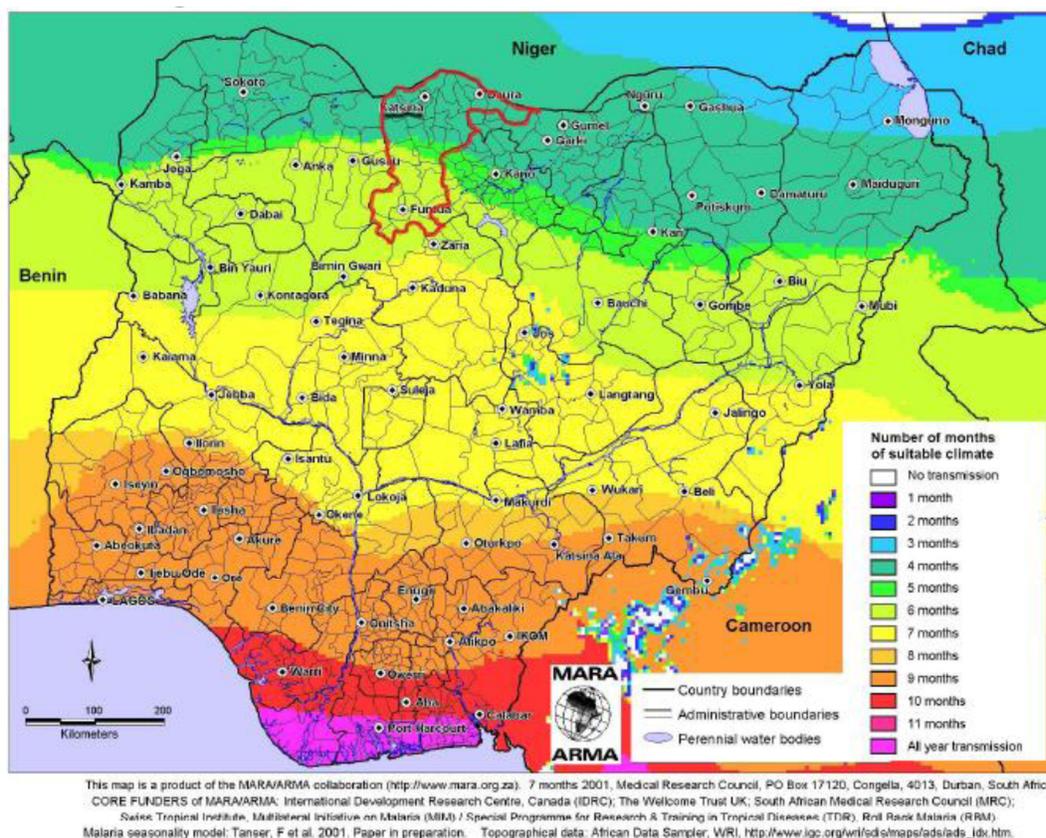
Figure 1: The duration of the malaria transmission season in Nigeria

The areas of northern Nigeria where malaria transmission lasts less than four months present an opportunity for those at risk to benefit from the implementation of SMC. Whereas the feasibility and effectiveness of SMC has been demonstrated elsewhere, the approaches to implementation, which require high coverage levels, have to be contextualised to fit the local setting.

Thus there was a need to explore possible approaches in the Nigerian context that will provide effective delivery systems for the eventual scaling up of the intervention to cover areas in northern Nigeria with highly seasonal malaria transmission.

Katsina state was selected because it is within the appropriate malaria transmission zone suitable for conducting an assessment of SMC, it has existing community-based delivery systems on which to develop a SMC delivery system. The state is located in the north-west zone of Nigeria, and constitutes 34 local government areas (LGAs) with a total estimated population of 6,916,641 in 2012 (1,383,328 under five years).

Malaria is endemic in Katsina state with all year round transmission at levels below national averages, with a seasonal peak between the months of August and November coinciding with the peak of the raining season. Of the 14 Four LGAs, four LGAs were selected as the site for the assessment of SMC delivery. These all exhibited a seasonal pattern of malaria burden as illustrated in Figure 2 below [5].
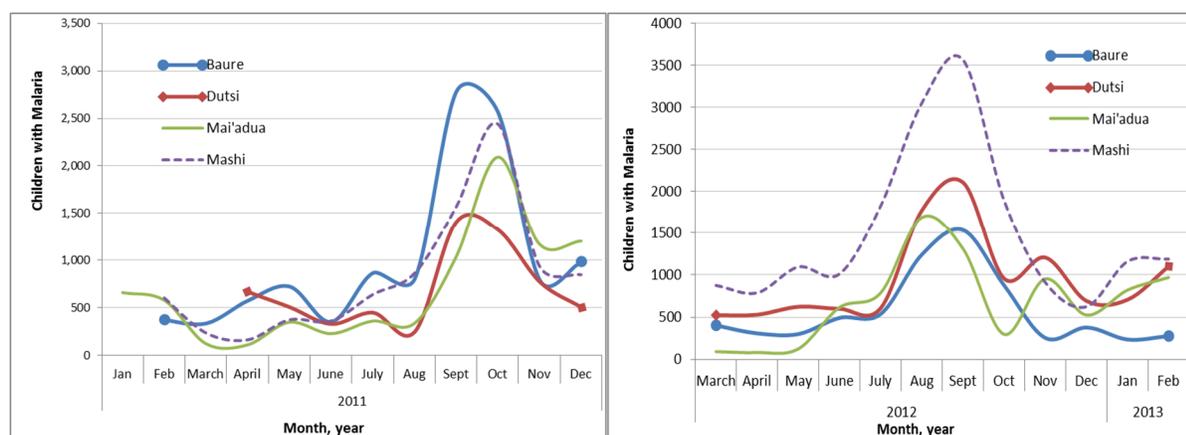
Figure 2: Malaria burden in four LGAs in Katsina state, 2011 and 2012

1.1 The SMC project

SMC delivery was conducted during two rainy seasons over two years. The intervention was delivered in two phases. In the first phase, the intervention was rolled out in two of the four selected LGAs in the 2013 transmission season, i.e. Baure and Mashi LGAs, and in all four in the 2014 transmission season. The intention is to allow some learning in the first round to feed into the second round, and also ensure that sufficient human resources are be available by the time of full scale implementation in the four LGAs.

The intervention was delivered by a combination of community based methods and fixed posts. In the community, community caregivers receive appropriated training before the intervention begun and were supervised by the appropriate staff within the health system. The drug was given to children in three single doses over three months during the course of the transmission season. The goal of the project is to improve child health outcomes in Katsina state, northern Nigeria, through increased access to SMC, exploring the feasibility, acceptability, and costs of community-based SMC delivery systems; and informing the development of guidelines and ongoing implementation, and potentially scale up, plans for SMC within the health system.

2.1 Baseline and endline surveys

Two cross sectional surveys were planned to be conducted to assess coverage and acceptability of SMC. The surveys were conducted at two time intervals, at baseline i.e. before SMC delivery and at the end of the second transmission season. The specific objectives of the surveys were to:

1. To measure SMC coverage across the LGAs where SMC was implemented
2. To assess the knowledge, and acceptability of SMC in the implementation area
3. To measure the child morbidity due to malaria and health seeking behavior of their caregivers
4. To assess anaemia, malaria parasite, and malnutrition prevalence among children under five

2 Methods

2.1 Survey design

The baseline and endline surveys were cross-sectional representative household surveys with a malariometric and anthropometric component for children under five years.

A baseline survey was conducted to establish estimates before the intervention, on which performance targets and implementation scale can be based. The baseline survey was conducted in the two LGAs (Dutsi and Mai'Adua) at the peak of the transmission season before SMC was rolled out. The endline survey was timed at one month following the end of the rainy season to avoid the immediate prophylactic effect of the last round of drug ingestion, while remaining close to the usual period of highest prevalence. Figure 3 illustrates the timing of the surveys.
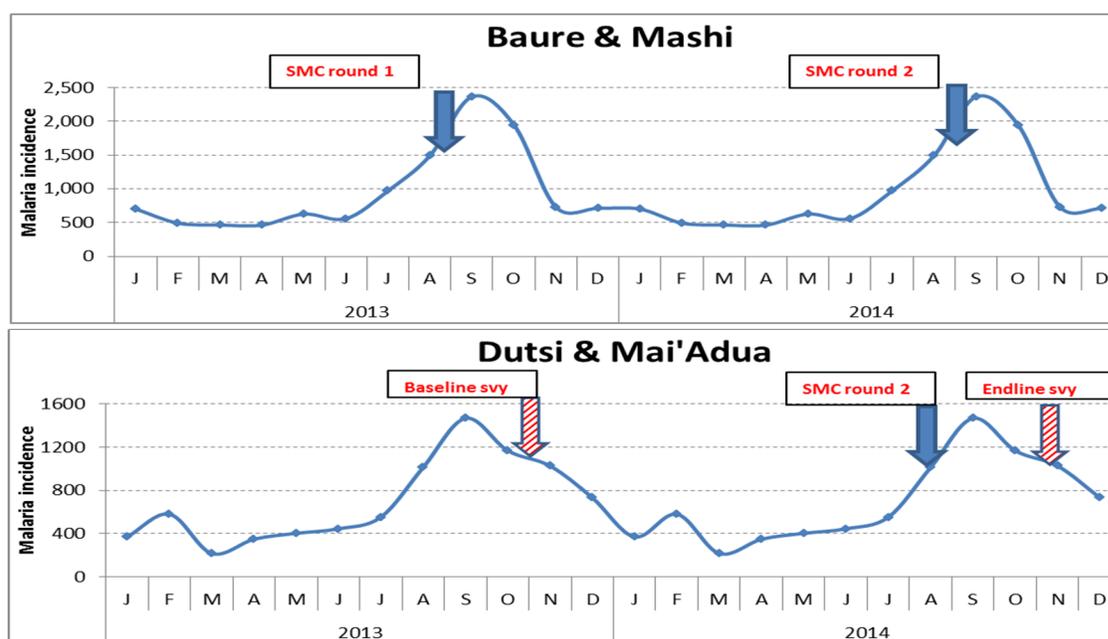
Figure 3: Timing of the surveys

Sampling and sample size

The survey employed a two stage cluster sample design. However, only sampling at the second stage was done. There was no re-sampling of clusters (first stage) as similar clusters sampled at baseline were used.

Stage one

Stage one involved sampling of the primary sampling units (clusters) which were the enumeration areas (EA), usually settlements. At each of the survey rounds, a total of 30 clusters were selected with probability proportionate to size from which both the household and child health components of the surveys evaluation were conducted.

Stage two

The second stage involved initially listing all households per cluster (settlement) for all the 30 clusters. From this, 25 households were selected per cluster using systematic sampling.

A household was defined as a group of people who usually take their meals together. For enumeration areas of more than 150 households, an equal size section approach was used, i.e. the cluster was divided into two to four sections of approximately equal number of households, and one section was selected using simple random sampling. All households in that section were then mapped and the sample drawn as described above.

The sample size of children under five that would give 95 percent power to detect a difference between 10 and 15 percent in malaria prevalence would be 690 in each survey. Respondents for the household survey were the heads of the household, from whom information relating to the household were obtained. Caregiver of children age under five years were the main respondents for information around knowledge of malaria prevention and health seeking behaviour for febrile children and SMC. Both household and caregiver questionnaires were based on the respective Malaria Indicator Survey (MIS) modules to ensure a standard approach[6].

All caregivers who were either permanent resident's of the households sampled or visitors in the households on the night before the survey were eligible to be interviewed in the survey. All children 3-59 months who were listed in the household were eligible for the malariometric and anthropometric component of the survey.

2.2 Data collection

Questionnaires

Three sets of questionnaires were used at each survey round, namely the household questionnaire, the caregiver questionnaire (which also had the child health assessment) and the malariometric questionnaire.

The **household questionnaire** was used to list all the usual members and visitors in the selected households. Some basic information was collected on the characteristics of each person listed, including age, sex, and relationship to the head of the household. The household questionnaire also collected information on characteristics of the household's dwelling unit, educational status of the head of household and availability and use of preventive measures for malaria control (mosquito nets, indoor residual spraying (IRS)).

The **caregiver's questionnaire** was used to collect information about the caregiver's knowledge of SMC, child's experience with SMC and a history of fever and its management. Each child from the households sampled was invited to participate in the malariometric and anthropometric survey. The malariometric questionnaire was used to collect anthropometric data e.g. height, weight and age, temperature, history

of fever and malaria rapid diagnostic test (mRDT) results for those that had high temperature or reported fever.

Teams and training

A team of experienced interviewers and supervisors were competitively selected from an existing database of previously contracted research assistants. Majority of those selected at baseline participated in the endline survey. Selection of the household survey team was based on experience in conducting surveys and cultural acceptability in. Interviewers underwent a three-day training which consisted of a review of how to administer the household and caregivers' questionnaires, mock interviews, and sessions covering tips on interviewing, how to locate selected households, and how to code interview results.

The malariometric team consisted of experienced phlebotomists, nurses and dispensers. Laboratory technicians were given a three-day refresher on the preparation of smears, as well as how to fix the thin slides in the field and store and transfer the slides from the field to the lab. Training was also done on anaemia testing using HemoCue equipment, and mRDTs were used for malaria testing. Other malariometric team members were taught how to administer informed consent and report the results to the parent/careCaregivertaker of the child.

2.3 Malariometric and anthropometric component

The surveys included a malariometric component in which all children age 3-59 months listed on the household listing form during the household interviews invited for the malariometric and anthropometric assessments. Caregivers were taken through the consenting procedures and a short interview concerning history of fever in the last three days. Each participant received a record form and unique ID number. All health workers recruited to conduct the survey received standardized training to perform finger pricks for anaemia and malaria parasitaemia. In addition, standard operating procedures (SOPs) were developed along the MIS guidelines for their guidance while in the field.

2.4 Data entry, analysis and reporting

Data entry was conducted in Abuja. A double data entry and validation system was designed in CSPro software with all the range, logical and consistency checks inbuilt. The data entry clerks had undergone a two-day refresher training on the data entry screens.

Before any entry, the data supervisor cross checked the total number of questionnaires in the batch and compared with the summary batch sheet for discrepancies before distributing the questionnaires for entry. Data cleaning was conducted at three levels: during the field, after completion of entry and during analysis.

Field cross checking was the first step in data cleaning in which field supervisors spent time cross checking the completed questionnaires for obvious errors e.g. missing fields and incomplete questionnaires.

Analysis was conducted using STATA 12 statistical software following a prior agreed upon analysis plan which was based on the indicators. Disaggregation of the indicators was mainly by background by LGA, household head education status and socioeconomic status (wealth quintiles) and in some cases age category and mother's education especially the child health component

The wealth index was computed at the household level using principal component analysis (PCA)[7]. The variables for household amenities, assets, livestock, and other characteristics that are related to a household's socioeconomic status were used for the computation. All variables were dichotomized except those of animal ownership where the total number owned was used.

2.5 Response rates

Table 2.1 below shows the response rates for both surveys. Both surveys had very good response rates with baseline response rate of 94 percent and 98 percent at endline. Interviews were conducted at the first visit to the household in more than 90 percent of the households at all survey rounds. Analysis was not weighted due to the invariability of information on cluster sizes.

Table 2.5: Survey response rates

Household interviews	Baseline	Endline
Households selected	740	740
Households with interview completed at 1st visit	680	692
Total household interviews conducted	693	724
Household interview response rate	(94 percent)	98 percent

3 Characteristics of the household survey

This chapter presents information on some of the characteristics of the households in which interviews were conducted. These were obtained from the household questionnaire (Appendix A) which included a description of all the household occupants (age, sex, relation to household head, and status in the household), condition of the structure of the house and household possessions (animals, durable goods, amenities).

3.1 Geographic distribution of the sample

Table 3.1 below shows the geographic distribution of the households visited. A similar sample size was planned at both baseline and endline in the two LGAs. Results show that this was achieved with an equal sharing between Dutsi and Maiadua at the two survey rounds. Using Principle component analysis, households were classified into five relatively equal wealth categories based on their household possessions. Effort was made to use the same household characteristics at both survey rounds to enable comparability between the survey rounds.

Table 3.1: Geographic distribution of the sampled households

Characteristic	Baseline	Endline
LGA distribution		
Dutsi	347 (50.1)	349 (48.2)
Maiadua	346 (49.9)	375 (51.8)
Wealth index		
Lowest	138 (19.9)	144 (19.9)
Second	139 (20.1)	145 (20)
Third	138 (19.9)	145 (20)
Fourth	139 (20.1)	145 (20)
Highest	139 (20.1)	145 (20)
Total	693	724

3.2 Household characteristics

Information was collected on the household hold head including his main occupation and education level. The majority of household heads (over 73 percent) are farmers/peasants. A significant proportion (over 10 percent) of household heads are involved in business activities. Occupation did not change from baseline to endline (p=0.051). Over 65 percent (68.5 percent at baseline and 69.8 percent at endline) of household heads have not had any education. From the sample at endline, a higher percentage (9.5 percent) of household heads had had university/tertiary education compared to the baseline 1.8 percent (p<0.001).

Table 3.2: Occupation and education level of the household head

Percent distribution of the occupation and education level of the head of the household

	Baseline	Endline	p-value
Occupation			
Farmer/peasant	517 (75)	532 (73.5)	
Civil Servant	74 (10.7)	68 (9.4)	
business man/woman	79 (11.5)	99 (13.7)	
Politician	2 (0.3)	0 (0)	0.051
Casual workers	14 (2)	10 (1.4)	
Unemployed	1 (0.1)	6 (0.8)	
Other	2 (0.3)	9 (1.2)	
Education level			
No education	467 (68.4)	505 (69.8)	
Primary	92 (13.5)	56 (7.7)	
Secondary	112 (16.4)	94 (13)	<0.001
University/Tertiary	12 (1.8)	69 (9.5)	
Number of households sampled	**693**	**724**	

3.3 Household possessions

Information was sought from respondents regarding the characteristics of the dwelling in which they live. These related to the structure of the house (roof, walls), type of fuel used for cooking, main source of drinking water, ownership of transport aides and ownership of animals. These characteristics are known to reflect a household's socioeconomic status and thus were used to compute the household's wealth index using the principle component analysis. Selected household characteristics are presented in Table 3.3 below.

Table 3.3: House characteristics and selected assets

Percent distribution of selected house assets according to LGA, household head's educational status and wealth quintile

Background characteristic	Natural /mud walls		Mobile phone		Any animal		Any transport		Households	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
LGA										
Dutsi	242 (69.7)	320 (91.7)	152 (45.9)	168 (48.1)	300(86.5)	294(84.2)	173(49.9)	195(55.9)	347	349
Mai'adua	158 (45.7)	181 (48.3)	221 (64.2)	218 (58.1)	274(79.2)	294(78.4)	203(58.7)	275(73.3)	346	375
Household head's education status										
No education	316 (66.4)	399 (79)	220 (47.7)	220 (43.6)	413(86.8)	430(85.1)	233(48.9)	304(60.2)	476	505
Up to primary	44 (47.3)	39 (69.6)	64 (71.1)	28 (50)	79(84.9)	49(87.5)	59(63.4)	32(57.1)	93	56
Above primary	40 (32.3)	63 (38.7)	89 (71.8)	138 (84.7)	82(66.1)	109(66.9)	84(67.7)	134(82.2)	124	163
Wealth index										
Lowest	113 (81.9)	141 (97.9)	23 (17)	21 (14.6)	138(100)	144(100)	21(15.2)	68(47.2)	138	144
Second	100 (71.9)	135 (93.1)	59 (44.7)	57 (39.3)	124(89.2)	140(96.6)	61(43.9)	77(53.1)	139	145
Third	85 (61.6)	126 (86.9)	77 (57.5)	69 (47.6)	111(80.4)	116(80)	80(58)	95(65.5)	138	145
Fourth	57 (41)	70 (48.3)	104 (77)	109 (75.2)	105(75.5)	109(75.2)	102(73.4)	102(70.3)	139	145
Highest	45 (32.4)	29 (20)	110 (79.1)	130 (89.7)	96(69.1)	79(54.5)	112(80.6)	128(88.3)	139	145
Overall	**400 (57.7)**	**501 (69.2)**	**373(55.3)**	**386(53.3)**	**574(82.8)**	**588(81.2)**	**376(54.3)**	**470(64.9)**	**693**	**724**
Overall p value (baseline to endline)	P<0.001		P=0.466		P=0.430		P<0.001			

Mobile phone ownership and ownership of any animals at household level did not significantly vary from baseline to endline (p=0.466 for mobile phone ownership and p=0.430 for animal ownership respectively).

However, the proportion of households with natural/mud and wattle houses increased from 57.7 percent at baseline to 69.2 percent at endline (p<0.001). Significant increases were more likely to be from households in Dutsi LGA, those whose household head had either no education or up to primary education and those from the lower social economic status.

Similarly, ownership of any transport means in the household increased from 54.3 percent at baseline to 64.9 percent at endline (p<0.001). Increases in ownership of any transport means was more likely to be in households from Maiadua LGA, those whose heads have attained education above primary level, and those in the lowest social economic status.

4 Knowledge of malaria and household protection against malaria

This section looks at the household practices of protection again malaria. Specific focus is put on the mosquito net availability and use by the vulnerable categories e.g. children. This is because insecticide-treated nets (ITNs) have been known to be one of the most effective prevention measures against malaria. The section also covers the knowledge of malaria related messages and seeks to establish perceptions around malaria prevention.

4.1 Ownership and use of mosquito nets

The study collected information on the level of protection against malaria in the household. This included ownership of long lasting insecticidal nets (LLINS), history of the household having been had IRS, use of other methods such as coils and spray.

Net ownership significantly declined from 83.7 percent at baseline to 74.6 percent at endline. Higher decline was associated with lower social economic status and lower levels of education.

Household ownership of at least two nets equally declined from 76.2 percent at baseline to 66 percent at endline. Similarly, higher declines were more likely to be observed in households of lower social economic status and those whose heads have lower education levels.

The use of other methods, in particular IRS is reported to have increased from 7.1 percent at baseline to 16.6 percent and endline.

Table 4.1: Household protection from malaria

Percent distribution of households that have mosquito nets, have received indoor residual spraying and other forms of malaria protection by LGA, household head's educational status & wealth quintile [7]

Background characteristic	Any mosquito net		≥2 mosquito nets		Other methods: IRS		Number of households	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
LGA								
Dutsi	288(83)	252(72.2)	265 (76.4)	227(65)	12(3.6)	60(17.2)	347	349
Mai'adua	292(84.4)	288(76.8)	263 (76)	251(66.9)	36(10.5)	60(16)	346	375
Household head's education status								
No education	391(82.1)	346(68.5)	346 (72.7)	304(60.2)	23(5)	80(15.9)	476	505
Up to primary	78(83.9)	48(85.7)	74 (79.6)	45(80.4)	9(10)	10(17.9)	93	56
Above primary	111(89.5)	146(89.6)	108 (87.1)	129(79.1)	16(13.1)	30(18.4)	124	163
Wealth Index								
Lowest	115(83.3)	87(60.4)	96 (69.6)	74(51.4)	8(5.9)	14(9.7)	138	144
Second	114(82)	104(71.7)	109 (78.4)	95(65.5)	7(5.3)	27(18.6)	139	145
Third	116(84.1)	100(69)	107 (77.5)	90(62.1)	6(4.5)	23(16)	138	145
Fourth	116(83.5)	117(80.7)	104 (74.8)	99(68.3)	8(6)	32(22.1)	139	145
Highest	119(85.6)	132(91)	112 (80.6)	120(82.8)	19(13.9)	24(16.6)	139	145
Overall	580(83.7)	540(74.6)	528(76.2)	478(66)	48(7.1)	120(16.6)	693	724
Overall p value (baseline to endline)	P<0.001		P<0.001		P<0.001			

4.2 Mosquito net use by children

Table 4.2 shows the percentage distribution of children who slept under a net among net owning households. From all households in the sample, a total of 706 children at baseline and 1,554 at endline were identified.

In all households, 80.7 percent of all children at baseline and 73.1 percent at endline slept under a net the previous night. However, in only net owning households, 90.8 percent of children slept under a net. This proportion significantly increased to 93.8 percent at endline. Usually, about 90 percent of children sleep under a net in these communities.

Table 4.2: Child mosquito net use

Percentage distribution of availability of mosquito nets, and use by children

Background characteristic	Household has a mosquito net		Net owning households				Total children	
			Child slept in a net during previous night		Child usually sleeps under a net			
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
LGA								
Dutsi	257(86.8)	516 (74.2)	232(90.3)	469 (90.4)	237(92.2)	456 (87.9)	296	695
Mai'adua	371(90.5)	692 (80.6)	338(91.1)	667 (96.4)	327(88.1)	640 (92.5)	410	859
Household's education status								
No education	447(88.7)	700 (70.6)	402(89.9)	642 (91.5)	397(88.8)	614 (87.5)	504	991
Up to primary	124(91.9)	115 (84.6)	114(91.9)	112 (96.6)	112(90.3)	105 (90.5)	135	136
Above primary	57(85.1)	393 (92)	54(94.7)	382 (97.2)	55(96.5)	377 (95.9)	67	427
Wealth index								
Lowest	93(83)	189 (63)	75(80.6)	168 (88.4)	78(83.9)	166 (87.4)	112	300
Second	120(88.9)	190 (71.4)	111(92.5)	173 (90.6)	111(92.5)	165 (86.4)	135	266
Third	123(88.5)	214 (74.6)	111(90.2)	198 (92.5)	108(87.8)	180 (84.1)	139	287
Fourth	139(90.3)	307 (85.5)	126(90.6)	297 (96.7)	125(89.9)	286 (93.2)	154	359
Highest	153(92.2)	308 (90.1)	147(96.1)	300 (97.1)	142(92.8)	299 (96.8)	166	342
Child age category								
≤2 years	142(87.7)	465 (77.8)	130(91.5)	440 (94)	128(90.1)	422 (90.2)	162	598
>2 years	486(89.3)	743 (77.7)	440(90.5)	696 (93.7)	436(89.7)	674 (90.7)	544	956
Overall	628(89.0)	1208 (77.7)	570 (90.8)	1136 (93.8)	564 (89.3)	1096 (90.5)	706	1554
P value for difference btn baseline& endline	P<0.001		P=0.006		P<0.001			

4.3 Knowledge, attitudes and perceptions around malaria prevention

Respondents were asked about their knowledge of malaria prevention methods, which information they had had and the source of this information. Specifically, the studies sought to know if respondents had heard any information on malaria testing through the use of mRDTs, malaria treatment and messages around how to prevent malaria. Knowledge of correct information on malaria prevention was known to be associated with proper use of these prevention methods. Results are presented in Table 4.3.1.

The households that had heard messages on malaria prevention significantly declined from 69.6 percent at baseline to 49.4 percent at endline. Bigger declines were more likely to be from Maiadua LGA and households from the lowest social economic status.

On the other hand, knowledge about malaria treatment increased from 58.2 percent at baseline to 75.6 percent at endline, with significant increases mainly associated with Dutsi LGA and lower social economic categories.

There were no significant changes in the proportion of households that had heard messages about malaria testing using mRDTs. At baseline, about one in four households (27.1 percent), had heard about malaria testing, a proportion that remained just about the same (28.3 percent) at endline.

Table 4.3.1: Heard any messages on malaria prevention, treatment and mRDTs

Percentage of household respondents who have heard any messages on malaria treatment, mRDTs and malaria prevention

Background characteristic	Malaria treatment		mRDTs		Malaria prevention	
	Baseline	**Endline**	**Baseline**	**Endline**	**Baseline**	**Endline**
LGA						
Dutsi	153(44.1)	281(80.5)	72(20.7)	105(30.1)	254(73.2)	224(64.2)
Maiadua	250(72.3)	266(70.9)	116(33.5)	100(26.7)	228(65.9)	134(35.7)
Household head's education status						
No education	249(52.3)	383(75.8)	116(24.4)	119(23.6)	328(68.9)	248(49.1)
Up to primary	60(64.5)	32(57.1)	32(34.4)	15(26.8)	64(68.8)	23(41.1)
Above primary	94(75.8)	132(81)	40(32.3)	71(43.6)	90(72.6)	87(53.4)
Wealth index						
Lowest	60(43.5)	105(72.9)	35(25.4)	24(16.7)	97(70.3)	67(46.5)
Second	64(46)	101(69.7)	24(17.3)	29(20)	95(68.3)	70(48.3)
Third	80(58)	110(75.9)	33(23.9)	43(29.7)	94(68.1)	76(52.4)
Fourth	94(67.6)	114(78.6)	40(28.8)	55(37.9)	98(70.5)	73(50.3)
Highest	105(75.5)	117(80.7)	56(40.3)	54(37.2)	98(70.5)	72(49.7)
Overall	403(58.2)	547(75.6)	188(27.1)	205(28.3)	482(69.6)	358(49.4)

P<0.001	P=0.618	P<0.001

Information was collected from respondents on what they thought were ways to prevent malaria. Responses of the mentioned methods are given in Table 4.3.2. Respondents who gave more than one response were not asked to rank the responses given, thus no response was ranked as the primary reason from each respondent. The percentages given below are not percentages of respondents who gave the specific response, but percentages of all responses given that were that particular response.

Results show that over 85 percent of the respondents mentioned sleeping under a bed net at both survey rounds, while use of coils or mosquito sprays was mentioned by over 53 percent of the respondents at both baseline and endline. Incorrect responses such as drinking boiled water were mentioned by 9 percent at baseline and 5 percent and endline. There were no significant differences between baseline and endline for each of the mentioned prevention method.

Table 4.3.2: Knowledge of malaria prevention methods

Percentage of household's knowledge of malaria prevention methods

Background characteristic	Use a mosquito net		Use coils/spray		Keep surroundings clean		Drink boiled water	
LGA	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
Dutsi	284(81.8)	293(84.4)	181(52.2)	156(45)	77(22.2)	84(24.2)	7(2)	12(3.5)
Maiadua	318(91.9)	348(93)	191(55.2)	230(61.5)	192(55.5)	178(47.6)	59(17.1)	29(7.8)
Household head's education status								
No education	407(85.5)	442(88)	241(50.6)	243(48.4)	170(35.7)	178(35.5)	29(6.1)	18(3.6)
Up to primary	81(87.1)	48(85.7)	58(62.4)	35(62.5)	48(51.6)	18(32.1)	15(16.1)	4(7.1)
Above primary	114(91.9)	151(92.6)	73(58.9)	108(66.3)	51(41.1)	66(40.5)	22(17.7)	19(11.7)
Wealth index								
Lowest	121(87.7)	130(90.3)	60(43.5)	72(50)	41(29.7)	47(32.6)	5(3.6)	3(2.1)
Second	114(82)	122(84.1)	79(56.8)	60(41.4)	42(30.2)	51(35.2)	9(6.5)	7(4.8)
Third	119(86.2)	127(88.8)	66(47.8)	72(50.3)	44(31.9)	44(30.8)	6(4.3)	6(4.2)
Fourth	122(87.8)	125(86.2)	79(56.8)	85(58.6)	64(46)	53(36.6)	17(12.2)	13(9)
Highest	126(90.6)	137(95.1)	88(63.3)	97(67.4)	78(56.1)	67(46.5)	29(20.9)	12(8.3)
Overall	**602(86.9)**	**641(88.9)**	**372(53.7)**	**386(53.3)**	**269(38.8)**	**262(36.2)**	**66(9.5)**	**41(5.7)**
Overall p-value (baseline to endline)	P=0.339		p-=0.891		P=0.307		P=0.006	

Table 4.3.3 shows the source of information for one of the selected messages described above. The source of information for these messages was varied. At baseline, majority of the respondents reported having heard these messages from radio (51.2) and community health workers (21.6 percent). Radio as a primary source of messages significantly reduced at endline, dropping to 23.9 percent. The use of street campaigns registered the biggest increase from 1.4 percent at baseline to 20.2 percent at endline. Community health workers registered an increase as a source (from 21.6 percent to 31.1 percent). Report of health facilities as source of malaria related messages remained low through out (8.1 percent at baseline to 3.9 percent at endline).

Table 4.3.3: Source of information on malaria treatment

Percentage of households' selected source of information on most heard malaria message by background characteristics

Background characteristic	Friend/ neighbor		Community health worker		Health centre		Radio		Street campaign	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
LGA										
Dutsi	34(11.1)	30(8.6)	42(13.7)	166(47.8)	11(3.6)	13(3.7)	197(64.2)	60(17.3)	3(1)	70(20.2)
Maiadua	23(6.7)	66(17.6)	99(28.7)	58(15.5)	42(12.2)	15(4)	137(39.7)	112(29.9)	6(1.7)	76(20.3)
Household head's education status										
No education	50(11.3)	56(11.2)	85(19.2)	168(33.5)	31(7)	15(3)	232(52.4)	103(20.5)	7(1.6)	119(23.7)
Up to primary	4(4.5)	12(21.4)	21(23.9)	13(23.2)	10(11.4)	2(3.6)	42(47.7)	20(35.7)	2(2.3)	7(12.5)
Above primary	3(2.5)	28(17.2)	35(28.9)	43(26.4)	12(9.9)	11(6.7)	60(49.6)	49(30.1)	0(0)	20(12.3)
Wealth index										
Lowest	25(19.8)	15(10.4)	27(21.4)	67(46.5)	6(4.8)	6(4.2)	62(49.2)	13(9)	1(0.8)	32(22.2)
Second	18(14.6)	16(11)	18(14.6)	51(35.2)	5(4.1)	7(4.8)	69(56.1)	28(19.3)	2(1.6)	29(20)
Third	10(7.7)	23(16.1)	26(20)	42(29.4)	15(11.5)	0(0)	66(50.8)	31(21.7)	1(0.8)	36(25.2)
Fourth	3(2.2)	18(12.4)	25(18.5)	36(24.8)	13(9.6)	1(0.7)	75(55.6)	54(37.2)	2(1.5)	29(20)
Highest	1(0.7)	24(16.7)	45(32.6)	28(19.4)	14(10.1)	14(9.7)	62(44.9)	46(31.9)	3(2.2)	20(13.9)
Overall	**57(8.7)**	**96(13.3)**	**141(21.6)**	**224(31.1)**	**53(8.1)**	**28(3.9)**	**334(51.2)**	**172 (23.9)**	**9(1.4)**	**146(20.2)**

5 Seasonal malaria chemoprevention

This section provides a description of the knowledge, perceptions and coverage of SMC. Since the baseline survey was conducted before the rollout of SMC, most of the questions were only applicable at the endline survey, after SMC activities had been implemented.

5.1 Knowledge around SMC

The project implemented a serious of intervention awareness campaigns. Several avenues e.g. use of community agents, radio spots, street announcements were used. Information on knowledge of SMC and the source of this knowledge was collected at endline to establish the success of the campaigns. Results are presented in Table 5.1.

Of the respondents, 87.4 percent had heard about seasonal malaria chemoprevention. There were no differences in likelihood of having heard these messages by household wealth status or education level of the head of the household. However, respondents from Dutsi were more likely to have heard messages around SMC.

The major source of information around SMC was through community agents, who were mentioned by about half of the respondents (44.6 percent). Other significant avenues were through street announcements (36.9 percent) and through friends/neighbours (28.2 percent). These methods were similar across all categories though higher in Dutsi compared to Maiadua.

Table 5.1: Knowledge of SMC at endline

Percentage of households' knowledge of SMC and their source of this information

Background characteristic	Know about SMC	Source of information about SMC						
		Friend/ neighbour	Community agent	Health facility	radio	Street Announce ment	Meeting	Other
LGA								
Dutsi	318(91.6)	73(21)	196(56.5)	71(20.5)	59(17)	146(42.1)	9(2.6)	36(5.2)
Maiadua	312(83.4)	130(34.9)	125(33.5)	41(11)	139(37.3)	120(32.2)	39(10.5)	74(10.3)
Household head's education status								
No education	437(87.1)	130(25.9)	225(44.8)	72(14.3)	116(23.1)	198(39.4)	22(4.4)	81(8.3)
Up to primary	52(92.9)	21(38.2)	23(41.8)	9(16.4)	21(38.2)	22(40)	5(9.1)	4(2.7)
Above primary	141(86.5)	52(31.9)	73(44.8)	31(19)	61(37.4)	46(28.2)	21(12.9)	25(8.7)
Wealth index								
Lowest	128(88.9)	36(25)	86(59.7)	29(20.1)	25(17.4)	56(38.9)	3(2.1)	13(4.6)
Second	119(82.1)	32(22.1)	71(49)	19(13.1)	27(18.6)	54(37.2)	7(4.8)	28(9.9)
Third	128(89.5)	49(34.3)	64(44.8)	23(16.1)	33(23.1)	60(42)	9(6.3)	26(9.2)
Fourth	129(89)	41(28.3)	53(36.6)	19(13.1)	54(37.2)	59(40.7)	15(10.3)	16(5.6)
Highest	126(87.5)	45(31.5)	47(32.9)	22(15.4)	59(41.3)	37(25.9)	14(9.8)	27(9.5)
Overall	630(87.4)	203(28.2)	321(44.6)	112(15.6)	198(27.5)	266(36.9)	48(6.7)	110(7.8)

As part of the interview with the head of the household, all household members were identified. Separate interviews were conducted with mothers/caregivers of children below five years. The interview focused on knowledge about SMC, the caregiver's experiences from having taken a child for SMC and information on the child's SMC drug taking. This information was only collected at endline since no SMC was given prior to the baseline survey.

A total of 628 (91 percent) of the caregivers had heard information about SMC. With the exception of Dutsi LGA, knowledge of SMC was similar across the other categories.

This information is similar to results obtained from interviews with the primary respondents in the households. The major source of this information was community agents (50.3 percent) and street announcements (40.9 percent).

5.2 Location of receipt of SMC

Results from Table 5.2.1 below shows that 87.4 percent of the caregivers interviewed had taken their children for SMC during the 2014 round. Dutsi LGA had the highest percentage with 96.2 percent having taken their children for SMC. SMC was delivered through two avenues, a house to house approach and a fixed point delivery method e.g. at health centres or markets.

Four in every five (82.2 percent) of all respondents reported their children to have received SMC from their homes. Only 5.7 percent reported receipt through a fixed point while the rest received at SMC through both delivery mechanisms.

Table 5.2.1: Caregivers' knowledge of SMC at endline

Percentage of caregivers that have heard about SMC and the source of this information

Characteristic	Know about SMC	Source of information about SMC						
		Friend/ neighbor	Community agent	Health facility	radio	Street announce ment	Church/TV/ newspaper	other
LGA								
Dutsi	378 (96.7)	86 (22.8)	208 (55)	91 (24.1)	48 (12.7)	150 (39.7)	13 (3.4)	9 (2.4)
Maiadua	250 (83.6)	79 (31.6)	108 (43.2)	25 (10)	89 (35.6)	107 (42.8)	30 (12)	7 (2.8)
Household head's education status								
No education	418 (90.9)	117 (28)	208 (49.8)	62 (14.8)	78 (18.7)	176 (42.1)	22 (5.3)	4 (1)
Up to primary	47 (87)	8 (17)	24 (51.1)	8 (17)	14 (29.8)	22 (46.8)	1 (2.1)	0 (0)
Above primary	163 (92.6)	40 (24.5)	84 (51.5)	46 (28.2)	45 (27.6)	59 (36.2)	20 (12.3)	12 (7.4)
Wealth index								
Lowest	116 (87.9)	31 (26.7)	62 (53.4)	15 (12.9)	10 (8.6)	52 (44.8)	4 (3.4)	1 (0.9)
Second	126 (92.6)	35 (27.8)	76 (60.3)	28 (22.2)	17 (13.5)	46 (36.5)	4 (3.2)	1 (0.8)
Third	119 (87.5)	27 (22.7)	61 (51.3)	19 (16)	22 (18.5)	55 (46.2)	6 (5)	1 (0.8)
Fourth	136 (95.1)	34 (25)	56 (41.2)	16 (11.8)	39 (28.7)	57 (41.9)	14 (10.3)	3 (2.2)
Highest	131 (91.6)	38 (29)	61 (46.6)	38 (29)	49 (37.4)	47 (35.9)	15 (11.5)	10 (7.6)
Overall	**628 (91)**	**165 (26.3)**	**316 (50.3)**	**116 (18.5)**	**137 (21.8)**	**257 (40.9)**	**43 (6.9)**	**16 (2.6)**

Information was collected from caregivers whose children had received SMC. This related to their experience with the entire process of receiving SMC, ranging from which delivery mechanism they received SMC, the duration and level of satisfaction with the process. A summary of this is presented in Table 5.2.3.

The duration spent in receipt of drugs in the home was 22 minutes, half the time spent in receipt of drugs from a fixed point which was 47 minutes. For home-based SMC receipt, the duration was slightly shorter in Dutsi LGA (19 minutes) compared to Maiadua (26 minutes).

Shortage of drugs was reported by 9.5 percent among those who received their drugs from home and 37.7 percent among those with who received their drugs from the fixed point. Dutsi LGA in particular registered massive shortages with fixed point delivery method, with more than half of the respondents from the LGA who received the drugs through the fixed point reporting there having been a stockout of drugs

Respondent satisfaction was very high (72 percent) among those who received drugs from their homes compared to those who received drugs from a fixed post (37.7 percent).

Table 5.2.3: Caregivers' experience while taking their children for SMC at endline

Percentage of caregivers that took their children for SMC and their experience around the exercise

Characteristic	Took child for SMC	Among those who took their child for SMC							
		House to house delivery				Fixed point delivery			
		Received from home	Service duration (mins)	Shortage of drugs (yes)	Satisfied with experience	Received from fixed point	Service duration (mins)	Shortage of drugs (yes)	Satisfied with experience
LGA									
Dutsi	376 (96.2)	308 (81.9)	19.1	35(11.4)	238 (77.3)	27 (7.2)	50.6	15(55.6)	9(33.3)
Maiadua	229 (76.6)	189 (82.5)	26.9	12(6.3)	124 (65.6)	26 (11.4)	43.5	5(19.2)	15(57.7)
Household head's education status									
No education	405 (88)	340 (84)	18.8	32(9.4)	247 (72.6)	33 (8.1)	48.6	14(42.4)	15(45.5)
Up to primary	45 (83.3)	36 (80)	23.2	2(5.6)	28 (77.8)	5 (11.1)	75.0	2(40)	2(40)
Above primary	155 (88.1)	121 (78.1)	29.8	13(10.7)	87 (71.9)	15 (9.7)	33.7	4(26.7)	7(46.7)
Wealth index									
Lowest	114 (86.4)	96 (84.2)	14.5	9(9.4)	63 (65.6)	7 (6.1)	61.0	4(57.1)	3(42.9)
Second	123 (90.4)	102 (82.9)	16.7	9(8.8)	82 (80.4)	12 (9.8)	54.1	10(83.3)	4(33.3)
Third	117 (86)	102 (87.2)	19.8	13(12.7)	73 (71.6)	7 (6)	27.9	1(14.3)	3(42.9)
Fourth	132 (92.3)	108 (81.8)	28.0	12(11.1)	78 (72.2)	13 (9.8)	34.7	1(7.7)	6(46.2)
Highest	119 (83.2)	89 (74.8)	29.8	4(4.5)	66 (74.2)	14 (11.8)	57.5	4(28.6)	8(57.1)
Overall	**605 (87.7)**	**497 (82.2)**	**21.9**	**47 (9.5)**	**362 (72.8)**	**53 (8.7)**	**47.1**	**20 (37.7)**	**20 (37.7)**

Information was collected about the SMC drugs that were given. This ranged from whether caregivers were given any information specifically about SMC drugs, the different types of drugs given and how the children took the drugs.

Overall, 489/605 (81.2 percent) reported to have been given information about SMC drugs. SMC information was largely similar across the different LGAs and distribution mechanisms.

86 percent of the respondents reported having received two different types of drugs, expressing correct knowledge of the types of drugs that were given. 13 percent reported having received only one type of drug, implying either non clarity of the question or probably not having been given proper information.

As part of ensuring adherence, the first dose of SMC drugs is supposed to be given by the provider as directly observed treatment (DOT). Two of every three caregivers interviewed (67.2 percent) reported that the first dose was the providers who were mainly the community caregivers. Directly observed 1st dose of SMC treatment was higher among those who received SMC from home, and those from Maiadua LGA.

86 percent of the caregivers reported correct information of the duration of an SMC dose. They reported that with the exception of the 1st day, an SMC dose would take two days. Correct knowledge of SMC dose duration was higher in Dutsi LGA and lower among those who received drugs from the fixed point.

Table 5.2.4: Caregivers' knowledge of SMC drugs and dosage

Percentage of caregivers that heard information on SMC drugs and their dosing at endline

	LGA		Distribution point			overall
	Dutsi	Maiadua	Home	Fixed	both	
Given information about SMC drugs						
Yes	324(86.9)	162(73.6)	397(81.4)	41(78.8)	48(90.6)	486(81.2)
Number of drug types given						
1 type	66(17.6)	13(5.7)	72(14.5)	7(13.2)	0(0)	79(13.1)
2 types	307(81.6)	214(93.4)	422(84.9)	46(86.8)	53(96.4)	521(86.1)
Don't know	3(0.8)	2(0.9)	3(0.6)	0(0)	2(3.6)	5(0.8)
1st dose directly observed by community caregivers						
Yes	216(62.2)	149(76)	315(70.6)	26(56.5)	24(47.1)	365(67.2)
No	130(37.5)	33(16.8)	121(27.1)	17(37)	25(49)	163(30.0)
Don't remember	1(0.3)	14(7.1)	10(2.2)	3(6.5)	2(3.9)	15(2.8)
Dose duration after 1st day						
1 day	4(1.1)	12(5.4)	15(3)	0(0)	1(1.9)	16(2.7)
2 days	365(97.3)	149(66.5)	435(88.1)	36(69.2)	43(81.1)	514(85.8)
3 days	6(1.6)	50(22.3)	35(7.1)	13(25)	8(15.1)	56(9.4)
> 3 days	0(0)	6(2.7)	4(0.8)	2(3.8)	0(0)	6(1)
Don't know	0(0)	7(3.1)	5(1)	1(1.9)	1(1.9)	7(1.2)
Number of caregivers	**327**	**229**	**497**	**53**	**55**	**605**

Caregivers were also read out a list of questions to which they were expected to state on a likert scale their level of agreement or disagreement. These questions ranged from their knowledge of the effectiveness of SMC, its potential side effects, challenges in the delivery of SMC and experiences of their children's receipt of SMC.

Overall, caregivers had the right information about appropriate administration of SMC, e.g. 68 percent agreed that ill children should not be given SMC, 78 percent agreed that children should take SMC every month during the rainy season. Correct information on the effectiveness of SMC was however not well known as 80.1 percent said that it is not possible for a child to get malaria after receiving SMC.

Access to and administration of SMC drugs was reported to be very good with 82.9 percent of the caregivers reporting that it is easy to get SMC drugs while 77.9 percent reported that SMC drugs are easy to administer.

Perceptions about the malaria burden in the community were that it has significantly decreased (agreed by 82.9 percent of caregivers) though only about half of the caregivers (49.9 percent) still consider it a serious disease.

Table 5.2.5: Caregivers' knowledge and perceptions around SMC

Level of caregivers agreement/disagreement with statements around SMC

	Percent of caregivers				Number of caregivers
	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	
It is not possible that a child gets malaria after being given SMC	59.4	20.5	10.4	9.7	616
It is enough to give SMC medicine only once during the rainy season	40.7	21.6	19.1	18.6	612
Malaria has decreased in this community since July 2013	62.6	20.3	12.1	4.9	610
Most of my neighbours take their child to the SMC distribution	56.1	17.5	15.3	11.2	610
The medicine is harmful to children	19.6	14.5	17.3	48.7	608
The SMC medicines are easy to administer to young children	43.3	34.6	12.6	9.5	610
Young children should take SMC every month during the rainy season	54.1	23.8	11.8	10.3	604
Most children don't like or refuse to take the SMC medicine	27.1	26.4	24.1	22.5	610
Children can fall ill as a result of taking the medicines e.g. vomit, get a high temperature (side effects)	28.5	19.4	19.7	32.4	614
These drugs should not be given if the child is ill	47.6	20.4	14.2	17.8	613
When I crush the tablet, most is spilled or spoiled and the child receives only a small quantity of the medicine	29.3	27.3	21.3	22.1	611
People in this community don't think malaria is a serious disease anymore	29.3	21.1	24.0	25.7	608
It is easy to get the SMC drug from the **community caregivers** or health facility	58.7	24.2	9.1	8.1	607

5.3 SMC coverage

The survey was conducted in the 2nd phase LGAs which had received one round of SMC in from July to October 2014. Information on SMC receipt at each cycle was predominantly obtained from SMC cards given to the caregivers and from verbal responses of sampled caregivers in cases where the card could not be obtained.

Overall reported coverage of SMC (receipt of at least one dose of SMC) was very high at 83.9 percent after one round of distribution. The coverage was deemed equitable by social economic status and gender as coverage was similar across each category. Dutsi LGA had a significantly higher coverage (94.8 percent) compared to Mai'adua.

Coverage per cycle slightly declined at subsequent cycles from 75 percent in cycle one through to 55 percent at cycle four. This is in cases where information could be obtained. SMC distribution at each cycle was equitable. 61.8 percent of all children for whom data was collected received at least 3 cycles of SMC.

Table 5.3: Coverage of SMC after one round of distribution

Unweighted percentage of children who ever received SMC by background characteristics in 2 LGAs in Katsina State, Northern Nigeria, 2014

Background characteristic	Child ever received SMC	percent of children who received SMC per cycle (coverage)				Received at least 3 cycles	Number of children
		Month 1	Month 2	Month 3	Month 4		
Locality (LGA)							
Dutsi	659(94.8)	630(90.6)	595(85.6)	519(74.7)	468(67.3)	513(73.8)	695
Maiadua	645(75.1)	535(62.3)	447(52)	462(53.8)	393(45.8)	448(52.2)	859
Caregiver's education status							
No education	1075(84.6)	950(74.8)	852(67.1)	797(62.8)	681(53.6)	777(61.2)	1,270
Any education	229(80.6)	215(75.7)	190(66.9)	184(64.8)	180(63.4)	184(64.8)	284
Wealth index							
Lowest	248(82.7)	211(70.3)	185(61.7)	170(56.7)	148(49.3)	161(53.7)	300
Second	239(89.8)	207(77.8)	180(67.7)	175(65.8)	159(59.8)	168(63.2)	266
Third	237(82.6)	230(80.1)	209(72.8)	201(70)	175(61)	200(69.7)	287
Fourth	308(85.8)	263(73.3)	237(66)	214(59.6)	193(53.8)	212(59.1)	359
Highest	272(79.5)	254(74.3)	231(67.5)	221(64.6)	186(54.4)	220(64.3)	342
Child sex							
Male	681(83.8)	610(75)	549(67.5)	513(63.1)	452(55.6)	503(61.9)	813
Female	623(84.1)	555(74.9)	493(66.5)	468(63.2)	409(55.2)	458(61.8)	741
Child age							
<12 mths	191(77)	161(64.9)	146(58.9)	140(56.5)	123(49.6)	137(55.2)	248
12-24 mths	302(86.3)	280(80)	244(69.7)	226(64.6)	192(54.9)	221(63.1)	350
25-36 mths	293(85.2)	261(75.9)	234(68)	220(64)	193(56.1)	215(62.5)	344
37-59 mths	518(84.6)	463(75.7)	418(68.3)	395(64.5)	353(57.7)	388(63.4)	612
Overall	**1304 (83.9)**	**1165 (75.0)**	**1042(67.1)**	**981 (63.1)**	**861(55.4)**	**961 (61.8)**	**1554**

6 Child health

This section presents findings from the surveys regarding the child health, from children under five years that live in the households in which interviews were conducted. Information was collected from the child health section of the caregiver's questionnaire and hence refers only to the children of the interviewed caregivers.

6.1 Fever history and health-seeking behaviour

Information was collected about the caregiver's knowledge of their child's health status in with regard to malaria in the previous two weeks. Caregivers were asked if their children had a fever in the previous two weeks and their health seeking behaviour. At baseline, 21 percent of children reported to have had fever in the previous 2 weeks. This proportion was much lower at endline with only 12.7 percent reporting a fever episode in the previous two weeks.

Treatment seeking did not vary between baseline and endline, with about 80 percent of those that had a fever episode seeking treatment (p=0.931). Majority of the febrile children who sought care sought it from the public sector (68.5 percent at baseline and 52 percent at endline). There was a significant increase in the proportion that sought care from the community, from 24.4 percent at baseline to 26.6 at endline.

Care seeking for a febrile illness was not significantly different across mother's education status, wealth status or child age.

Table 6.1: Two week history of fever among children

Percentage distribution of children under 5 years who had fever in the previous two weeks by background characteristics

	Had fever during the last two weeks		Sought any advise or treatment		First point in seeking treatment						Number of children	
					Public		Private		Community			
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
LGA												
Dutsi	61(20.6)	112(16.1)	56(91.8)	94(83.9)	43(76.8)	44(43.6)	5(8.9)	1(1)	8(14.3)	31(30.7)	296	695
Mai'adua	87(21.2)	86(10)	61(76.3)	71(82.6)	44(62)	48(63.2)	4(5.6)	5(6.6)	23(32.4)	16(21.1)	410	859
Mother's education status												
No education	83(16.5)	120(12.1)	59(73.8)	102(85)	40(61.5)	56(52.3)	5(7.7)	2(1.9)	20(30.8)	29(27.1)	401	991
Up to primary	47(34.8)	21(15.4)	41(95.3)	15(71.4)	37(82.2)	7(36.8)	3(6.7)	2(10.5)	5(11.1)	6(31.6)	135	136
Above primary	18(26.9)	57(13.3)	17(94.4)	48(84.2)	10(58.8)	29(56.9)	1(5.9)	2(3.9)	6(35.3)	12(23.5)	170	427
Wealth index												
Lowest	29(25.9)	28(9.3)	17(58.6)	23(82.1)	11(57.9)	6(24)	2(10.5)	0(0)	6(31.6)	13(52)	112	300
Second	28(20.7)	34(12.8)	24(92.3)	29(85.3)	18(69.2)	11(37.9)	0(0)	1(3.4)	8(30.8)	8(27.6)	135	266
Third	22(15.8)	39(13.6)	19(90.5)	36(92.3)	13(65)	22(59.5)	2(10)	0(0)	5(25)	13(35.1)	139	287
Fourth	28(18.2)	51(14.2)	22(81.5)	39(76.5)	19(79.2)	30(69.8)	3(12.5)	1(2.3)	2(8.3)	6(14)	154	359
Highest	41(24.7)	46(13.5)	35(92.1)	38(82.6)	26(68.4)	23(53.5)	2(5.3)	4(9.3)	10(26.3)	7(16.3)	166	342
Child age category												
≤2 years	32(19.8)	95(15.9)	28(90.3)	79(83.2)	22(75.9)	40(46)	2(6.9)	3(3.4)	5(17.2)	21(24.1)	162	598
>2 years	116(21.3)	103(10.8)	89(80.9)	86(83.5)	65(66.3)	52(57.8)	7(7.1)	3(3.3)	26(26.5)	26(28.9)	544	956
Overall	148 (21.0) P<0.001	198 (12.7)	117 (82.3) P=0.931	165(83)	87(68.5)	92(52)	9(7.1)	6(3.4)	31 (24.4)	47 (26.6)	706	1554

6.2 Prevalence of fever and malaria

A malariometric component was conducted as part of the survey at both baseline and endline. During this process, children were asked if they felt fever at the time of the visit. none the less, fever was measured for all children and a finger prick done to take a sample. Those found to be positive were treated for malaria using artemisinin based combination therapies.

At baseline, 9.7 percent of the children reported to be having fever at the time of the visit, this significantly reduced to 3.8 percent at endline. The same trend is observed for the measured fever i.e. having a temperature above 37.5^0c. 21.9 percent of children with temperature taken at baseline were found to have fever, a proportion that was only 6.8 percent at endline.

Results from the mRDT tests conducted showed an mRDT positivity rate of 76.9 percent at baseline, declining to 47.8 percent at endline. mRDT positivity was higher in Dutsi LGA, and reduced among children from a higher social economic status.

Table 6.2: Prevalence of fever and malaria among children

Percent distribution of prevalence of fever among children under 5 years by background characteristics

Background characteristic	Reported fever at time of visit		Measured fever (High temp, >=37.50C)		RmDT test (mRDT positive)		Percent high temp with positive mRDT		Number mRDT done		Number Temperature taken	
	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
LGA												
Dutsi	19(10.7)	20(8.2)	42(23.6)	19(7.8)	146(82)	128(52.9)	28(15.7)	12(4.9)	178	242	178	245
Mai'adua	40(9.3)	3(0.8)	91(21.2)	22(6.2)	320(74.8)	135(43.8)	86(20)	13(3.7)	428	308	429	356
Wealth index												
Lowest	11(23.4)	6(5.6)	19(40.4)	11(10.2)	41(87.2)	66(61.7)	15(31.9)	8(7.4)	47	107	47	108
Second	9(8.4)	4(3.4)	12(11.2)	9(7.6)	86(80.4)	56(47.9)	10(9.3)	4(3.4)	107	117	107	119
Third	10(9.5)	5(4.9)	28(26.7)	5(4.9)	80(76.2)	45(45.5)	20(19)	3(2.9)	105	99	105	102
Fourth	20(12.3)	8(5.3)	30(18.4)	11(7.3)	119(73.5)	64(46.7)	27(16.6)	7(4.7)	162	137	163	150
Highest	9(4.9)	0(0)	44(23.8)	5(4.1)	140(75.7)	32(35.6)	42(22.7)	3(2.5)	185	90	185	122
Child age category												
≤2 years	15(8.2)	8(3.5)	38(20.7)	13(5.7)	140(76.1)	100(47.6)	37(20.1)	6(2.6)	184	210	184	230
>2 years	44(10.4)	15(4)	95(22.5)	28(7.5)	326(77.3)	163(47.9)	77(18.2)	19(5.1)	422	340	423	371
Overall	**59(9.7)**	**23 (3.8)**	**133 (21.9)**	**41 (6.8)**	**466(76.9)**	**263(47.8)**	**114(18.8)**	**25 (4.2)**	**607**	**550**	**607**	**601**
P value (from baseline to endline)	p<0.001		p<0.001		p<0.001		p<0.001					

Malaria parasite prevalence

From the same sample obtained off the finger prick, thick and thin smears were created, dried in a dust free environment and transported to a central laboratory were confirmatory microscopy testing was conducted. Results are as shown in Figure 4.

The malaria parasite prevalence from the survey was estimated at 29.2 percent in all children under five years and 31.7 percent in children 6-59 months. Prevalence was significantly higher in the rural areas than in urban areas (p<0.001) and also in the older children (6-59 months) than in the younger age group (p<0.001). There was a trend in malaria parasite prevalence with wealth categories, with increasing prevalence for lower wealth categories.

Results also show that 97.7 percent of the infected children had *Plasmodium falciparum* whereas 19.6 percent had *Plasmodium malariae*. The prevalence of these malaria specifications are similar to observations in other studies in the same region e.g. the baseline study and the Malaria Indicator Survey 2009. 18 percent of the infected children had mixed infections.
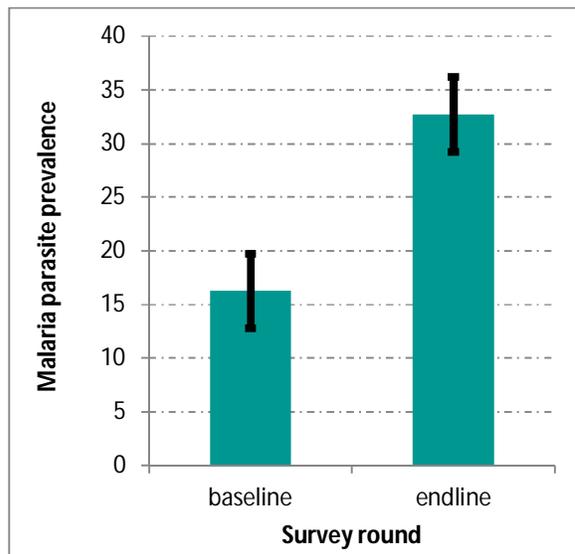

Figure 4: Malaria parasite prevalence

6.3 Prevalence of anaemia

All children who presented for the malariometric assessment were also assessed for anaemia. From the same sample collected for other tests, a test for haemoglobin concentration was done using a HemoCue system right in the field. After data cleaning, data was available for 607 & 601 children at baseline and endline respectively. Results in Table 6.3 show that 71.3 percent & 74.7 percent of children in Katsina were anaemic at baseline and endline respectively (Hb concentration levels below 11 g/dl). 30.7 percent and 32.1 percent had mild anaemia (Hb concentration levels of 10-10.9 g/dl) at baseline and endline respectively. 35.2 percent and 24.7 percent severe anaemia (Hb concentration levels less than 7.0 g/dl) at baseline and endline respectively. There were no significant differences in anaemia prevalence by either the age category, LGA or wealth category.

7   Conclusion and discussion

7.1 Conclusions and discussion

The baseline and endline surveys were conducted before SMC implementation in December 2013 and after one round of implementation in December 2014 with the objective of establishing the coverage and acceptability of SMC. In addition, the surveys were also to measure indicators relating to malaria prevention and child health. It covered indicators relating to extent of ownership and use of mosquito nets in households, child morbidity and health seeking behaviour of their caregivers.

7.2 Household malaria prevention

Overall mosquito net ownership declined from 83.7 percent at baseline to 74.6 percent at endline. Household ownership of at least two nets declined by the same proportions. The decline is in line with the anticipated decline rate, in the absence of either a mass campaign or continuous distribution mechanisms, which neither of the two LGAs was reported to have had. A reported doubling in households reporting IRS is not backed by evidence from reports, it is possible that this could be background noise.

Knowledge about malaria prevention and treatment

There was a decline from baseline to endline in the proportion of households who had heard about malaria prevention messages and vice versa in the proportion of households who had heard about malaria treatment messages. It is unclear how malaria prevention messages registered a decline whereas malaria treatment saw an upward increase. One potential explanation could be that messages around SMC were viewed more as malaria treatment messages as opposed to malaria prevention messages.

With no messages about malaria testing run by the project, knowledge of malaria testing messages remaining similar over time could imply that no other behaviour change communication interventions around malaria testing were implemented in the two LGAs.

The data shows that at baseline, malaria messages were delivered through radios and community health workers. However, after the introduction of SMC, community health workers and street campaigns became the major sources of malaria related messages.

Communication for SMC

Knowledge of SMC as obtained from the primary respondents in the household was 87.4 percent and 91 percent when restricted to caregivers. Results show that most of the most of the messages around SMC were delivered by the community caregivers. This highlights the ability to leverage resources by using community caregivers to disseminate information about an activity in addition to other sources.

SMC delivery

House to house delivery method was the most used approach, as reported by 88.2 percent of the respondents. This was similar across the LGAs though Maiadua had slightly higher numbers receiving through the fixed point delivery approach. The duration spent in receipt of drugs in the home was 20 minutes, half the time spent in receipt of drugs from a fixed point which was 47 minutes. Knowledge of the different types of SMC drugs and dose duration was high at over 80 percent. This highlights house to house delivery of SMC as a quicker and most preferred delivery mechanism by the caregivers. There is need for costing the two delivery mechanisms to assess if home based delivery still remains a cost effective delivery channel.

SMC coverage

Computations for SMC coverage were based on information extracted from the SMC cards that had been given to children during the SMC distribution. This information could, therefore, not be established for children for whom cards were not available. 83.9 percent of children received at least one dose of SMC. This declines at subsequent doses and a much smaller percentage (61 percent) had received at least three doses.

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Appendices

Survey questionnaires