

Kovana Marcel Loua and Paul Milligan (2018) Seasonal Malaria  
Chemoprevention coverage survey, Guinea, 2017. Report Feb 21 2018,  
University Gamal Abdel Nasser, Conakry, Republic of Guinea London School of  
Hygiene & Tropical Medicine, UK.



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## **Seasonal Malaria Chemoprevention Coverage Survey Guinea, 2017**

**University Gamal Abdel Nasser, Conakry, Republic of Guinea**

**London School of Hygiene & Tropical Medicine, UK**

Report February 21, 2018.

The 2017 SMC coverage survey in Guinea was conducted by the University Gamal Abdel Nasser, Conakry and the London School of Hygiene & Tropical Medicine, in collaboration with the National Malaria Control Programme and Catholic Relief Services, Guinea.

UGANC/LSHTM (2018) Seasonal Malaria Chemoprevention Coverage Survey 2017. Feb 21, 2018.

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Indicator	Definition	Population	Value (95%CI)	N
Average coverage per cycle	Mean of coverage in cycles 1,2,3 and 4	Children aged 3-59 months at cycle 1.	<b>73.4%</b> (61.0,85.8)	1180
Mean number of treatments per child	Mean number of SMC treatments received	Children aged 3-59 months at cycle 1.	<b>2.93</b> (2.44,3.43)	1180
Coverage of 4 cycles	% received 4 treatments	Children aged 3-59 months at cycle 1.	<b>62.6%</b> (49.2,74.3)	1180
Adherence	% received 3 doses at last cycle	Children aged 3-59 months at cycle 4	<b>73.4%</b> (58.3,84.5)	1226
Reach of SMC programme	% who received at least one treatment	Children aged 3-59 months at cycle 1.	<b>79.0%</b> (62.9,89.2)	1180
Coverage of cycle 1	% treated at cycle 1	Children aged 3-59 months at cycle 1.	<b>73.4%</b> (59.2,83.9)	1180
Coverage of cycle 2	% treated at cycle 2	Children aged 3-59 months at cycle 1.	<b>76.4%</b> (61.5,86.8)	1180
Coverage of cycle 3	% treated at cycle 3	Children aged 3-59 months at cycle 1.	<b>73.5%</b> (59.2,84.2)	1180
Coverage of cycle 4	% treated at cycle 4	Children aged 3-59 months at cycle 1.	<b>70.1%</b> (55.9,81.3)	1180
Treatment of older children	Mean number of SMC treatments received	Children aged 6-7yrs at the survey	<b>1.68</b> (0.92,2.45)	189
Awareness of SMC dates	% households heard date before last cycle	All households	<b>88.6%</b> (78.7,94.3)	530
LLIN use in children	% slept under an LLIN last night	Children 3-59 months who slept in the household last night	<b>43.6%</b> (33.2,54.6)	1226
LLIN use (all ages)	% slept under an LLIN last night	All who slept in the household last night	<b>40.0%</b> (30.7,49.9)	3008
Access to an LLIN (% of population)	% that could sleep under LLIN (if 2/net)	All who slept in the household last night	<b>35.5%</b> (27.8,44.0)	3008
% households with an LLIN	% households with an LLIN	All households	<b>57.2%</b> (46.0,67.7)	534
Access to LLIN (% of households)	% households with an LLIN for every 2 people	All households, all who slept there last night	<b>14.7%</b> (9.7,21.6)	534
Caregiver knowledge about SMC	Mean score out of 10	Carers of children 3-59 months	<b>8.0</b> (7.6,8.4)	530
Reported CHW adherence to guidelines	Mean score out of 8	Carers of a child who received SMC last cycle	<b>7.7</b> (7.6,7.9)	411
SMC directly observed	% of first doses administered by CHW	Children 3-59 months at cycle 1 who received SMC at last cycle	<b>98.6%</b> (95.1,99.6)	945
Interval between cycle 1 and cycle 2	Difference between median cycle dates	Dates recorded on SMC cards	<b>34 days</b>	347, 318
Interval between cycle 2 and cycle 3	Difference between median cycle dates	Dates recorded on SMC cards	<b>57 days</b>	318, 304
Interval between cycle 3 and cycle 4	Difference between median cycle dates	Dates recorded on SMC cards	<b>32 days</b>	304, 265
SMC card at survey	% of children with SMC card	Children eligible for SMC	<b>33.8%</b> (24.7,44.3)	1180

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## EXECUTIVE SUMMARY

Seasonal Malaria Chemoprevention (SMC) was introduced in Guinea in 2015 for children aged 3 months to 5 years, starting in 6 prefectures in 2015, expanding to 8 prefectures in 2016, and 10 in 2017. SMC gives children a high level of personal protection from malaria. SMC programmes have been associated with substantial reductions in malaria cases and malaria deaths. High coverage of four monthly cycles is needed to maximise the impact of this intervention. This survey was conducted to assess coverage of SMC in 2017 in the prefectures of Gaoual, Koundara, Mali, Lelouma, Labe, Koubia, Tougué, Dinguiraye, Siguiiri and Mandiana, where SMC was implemented in July, August, October and November of 2017. 1448 children, in 40 clusters, were surveyed. Caregivers were interviewed about SMC treatments and the dates of treatments were recorded from their SMC card. A listing of all household members was made and each asked about use of insecticide-treated bednets.

73.4% of children received SMC at cycle 1, 76.4% at cycle 2, 73.5% at cycle 3 and 70.1% at cycle 4. The mean number of treatments per child was 2.93 (mean coverage 73.4% per cycle). Coverage in cycles 1 to 3 was high in all prefectures except Siguiiri where only just over half the children received SMC in each of the four cycles. As the population of Siguiiri is much larger than in the other prefectures, the low coverage in Siguiiri reduces the overall mean coverage proportionately. 21% of children did not receive any SMC treatments, most of those in three prefectures Siguiiri, Koundara and Mali. In Gaoual and Koundara where there was a sudden drop in coverage at cycle 4. Coverage could be substantially improved by addressing the problems in Siguiiri, and the problems at cycle 4 in Gaoual and Koundara.

It is essential to organise investigation of the reasons underlying these trends, in time to inform planning and training for the 2018 campaigns, so that the results of the survey are put to use for continuous improvement.

The consistently high coverage achieved in most areas, supports expansion of the SMC programme to other eligible prefectures. Steps should be taken to ensure adequate supplies of SMC drugs for all 4 cycles to avoid delays in cycle implementation. The mean coverage per cycle of 73.4% implies an increase of 36% in the number of treatments administered would be needed to achieve 100% coverage.

40% of all household members slept under a LLIN (long-lasting insecticide-treated net) the night before the survey, 57.2% of households owned at least one LLIN, but only 14.7% of households had one LLIN for every two persons in the household. Steps should be taken to improve LLIN coverage. SMC training should include messages about the importance of using an LLIN. These figures are slightly lower than reported by the 2016 MICS, but similar tools were used.

SMC coverage should continue to be monitored. Areas with low coverage, and any new areas of SMC implementation, should be surveyed at the end of the 2018 transmission season. In areas with high coverage, delivery can be monitored through administrative records (compiled from tally sheets and SMC drug utilisation), with a coverage survey every two years.

To ensure the continues success of the SMC programme in Guinea it will be important to put in place a system to monitor efficacy of SMC, using case control studies to measure clinical protection inn children, combined with monitoring of molecular markers of resistance to SMC

drugs in the parasite population. Monitoring of molecular markers can be done most efficiently and effectively through antenatal clinics. It will also be important to strengthen pharmacovigilance, building on progress made through the ACCESS-SMC project. As well as working to strengthen the PV system nationally, safety monitoring can be strengthened in selected areas where training and supervision can be provided to ensure that health staff recognise events and report suspected adverse drug reactions.

HMIS data on malaria should be regularly assessed to track the impact of the SMC programme on malaria cases, and malaria deaths in hospital. As part of the ACCESS-SMC project, data were collected on individual malaria cases at selected health facilities, these data are useful because they allow more detailed analysis of age distribution and seasonality that is possible with HMIS data since the HMIS records cases only on broad age groupings (under 5 and 5 and above), by calendar month. It is recommended to continue data collection from selected 'sentinel' sites in order to permit more detailed analysis of trends.

## INTRODUCTION

Malaria is endemic in Guinea, and the leading cause of under-5 deaths. WHO (2017) estimates there were 4.8million malaria cases and 9000 malaria deaths in Guinea in 2016 caused by *Plasmodium falciparum*, in a population of 12.4million people. The average prevalence of infection by Rapid Diagnostic Test was 53% in rural areas in 2012 (DHS, 2012). The main vectors are *Anopheles gambiae*, *An. funestus*, *An. melas* and *An. arabiensis*. Malaria occurs year-round with a highly seasonal pattern in the north. The under-5 mortality rate in Guinea was estimated in 2012 to be 101 per 1000 live births (DHS, 2012), with malaria the most common cause of death (estimated in 2013 to be responsible for 28% of deaths under 5 years of age (WHO, 2013). On December 29, 2015, WHO declared Ebola transmission had ended in Guinea, the epidemic caused an estimated 3800 cases and 2500 deaths since the outbreak started in March 2014.

Malaria treatment guidelines require patients suspected to have malaria to be tested before being treated. Malaria diagnosis and artemisinin combination treatment (ACT) have been free in the public sector for all age groups since 2010 for ACT treatment and since 2012 for diagnosis. The first-line antimalarial is amodiaquine-artesunate, except in areas where Seasonal Malaria Chemoprevention (SMC) is used, where it has been replaced with artemether-lumefantrine.

Since 2009, long-lasting insecticide-treated bednets (LLINs) have been provided free of charge to all age groups. Intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine has been recommended since 2005. Indoor Residual Spraying and larviciding are not part of the national malaria control strategy. Since 2015, Seasonal Malaria Chemoprevention has been used to prevent malaria in children under 5 years of age in the northern part of the country, supported by the ACCESS-SMC project, financed by UNITAID, in 2015 and 2016, and by CRS and the Global Fund in 2017.

Further details about malaria control in Guinea are provided in the President's Malaria Initiative Malaria Operational Plan for Guinea for 2017 (PMI 2017).

## BACKGROUND AND OBJECTIVES

Seasonal Malaria Chemoprevention (SMC), involves the administration of a treatment course of sulfadoxine-pyrimethamine plus amodiaquine once a month to children aged 3–59 months in areas of highly seasonal malaria transmission, for up to four months, to prevent malaria (WHO 2013). SMC was introduced in Guinea in 2015 for children aged 3 months to 5 years, in 6 prefectures, in 8 prefectures in 2016, and 10 prefectures in 2017. This survey was planned to assess coverage of SMC in 2017 in the prefectures of Gaoual, Koundara, Mali, Lelouma, Labe, Koubia, Tougué, Dinguiraye, Siguiri and Mandiana, which had implemented SMC in July, August, October and November of 2017. The survey was conducted in December 2017, training December 8-9, piloting Dec 13-15, and survey work Dec 16-30, 2017. Data were uploaded to server at LSHTM and analysed in Jan 2018. Meetings were held in Conakry from Jan 31 to Feb 2 2018 to share preliminary results with the project team in UGANC, with the PNLP, with CRS and Global Fund, and with StopPalu and PMI. Additional analyses were prepared in response to queries raised, before preparing this draft report on 5 Feb 2018 for circulation among partners. This final report incorporating feedback was prepared 21 Feb 2018.

SMC involves administration of a course of treatment of sulfadoxine-pyrimethamine plus amodiaquine over three days, once per month for four months of the malaria transmission season, to prevent malaria illness. Children aged at least 3 months and less than 5 years of age are eligible to receive SMC, however children who were under 5 years of age at the first month continue to receive all four monthly treatments even if they reach the age of 5 during the 4-month period of SMC distribution. Each monthly treatment consists of a dose of sulfadoxine-pyrimethamine and a dose of amodiaquine, administered on the first day, and a dose of amodiaquine on each of the next two days. The drugs are distributed by community health workers (CHWs) who visit door to door to administer the first day's doses and leave the blister pack with the caregiver with instructions to administer the remaining amodiaquine doses on each of the next two days. CHWs check the age of the child and select the appropriate blister pack (lower dose for infants, higher dose for children 12-59 month), ask about allergies to SMC drugs, check whether the child has been given sulfadoxine-pyrimethamine or amodiaquine or any sulfa-containing antibiotic in the last 4 weeks, and check if the child has a fever. Children are eligible if they do not have known allergies to the drugs, have not been given amodiaquine or sulfa-containing medication in the last 4 weeks, and are not unwell. Children who are unwell should be referred to the nearest health centre where they can be appropriately treated, including treatment with an ACT if they have malaria. If they do not have malaria, they may receive SMC at the clinic. CHWs should also remind caregivers to bring the child to the health centre if the child becomes unwell at any time after taking SMC, and that the child can still develop malaria and so the guidance to seek treatment promptly in the case of fever should continue to be followed, and all household members should sleep under a treated bednet. Each course of SMC treatment provides about 90% protection from malaria for 28 days so that four treatments one month apart can provide a high degree of personal protection for 4 months. Introduction of SMC with high coverage has been found to reduce the incidence of malaria, severe malaria, and malaria deaths, substantially. To maximise the impact of the intervention, it is important that the first SMC cycle is timed to start at the beginning of the main transmission period; cycles should take place at monthly intervals; high coverage of 4 monthly treatments should be achieved; and caregivers should ensure children adhere to the daily regimen each month. Insecticide treated bednets should continue to be used, SMC should be an additional measure not a substitute for bednets. The survey therefore assessed bednet use by children and other members of the household.

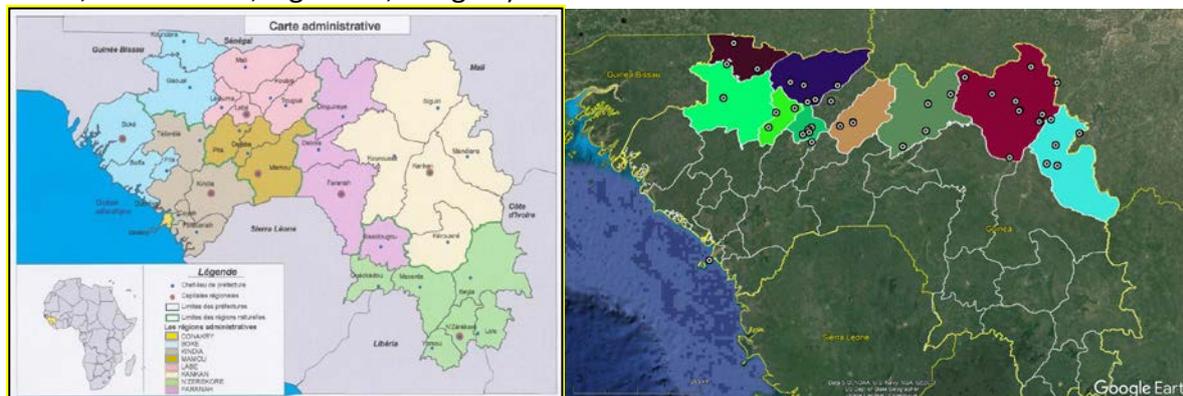
## METHODS

### Sampling:

Forty settlements were selected from 10 prefectures where SMC was implemented in 2017 in the country (Figure 1), with probability proportional to population size based on the 2014 General Population and Housing Census (RGPH), and in each selected settlement, in order to minimise selection bias, area sampling was used, whereby the settlement was divided into segments, one segment chosen at random, and all households in the selected segment included in the survey. Data were collected on tablet PCs which automatically selected the segment and recorded the GPS location of each dwelling visited. In each household, caregivers of children were asked about SMC treatments their child had received, and SMC record cards were inspected and photographed. All children aged 3 months to 7 years were included in order to determine coverage in the target age group (3 to 59 months) and to determine the proportion of children just above the recommended age limit who received treatment.

In addition, all persons who slept in the household the night before the survey were listed, all bednets owned by the household were also listed and inspected, and for each person, the net they slept under, if any, was noted.

Figure 1: Prefectures of Guinea (left) and the location of SMC Coverage survey clusters (right). (Note there are 40 clusters: Dinguiraye 4, Gaoual 3, Koubia 1, Koundara 2, Labe 5, Lelouma 2, Mali 5, Mandiana 5, Siguiri 11, Touge 2).



#### Training, piloting and data collection:

A total of 18 interviewers were trained from 8-9 December 2017, the training included survey context and objectives, methods for household selection, seeking consent, and completion of the questionnaires, which included a household roster and bednet use by each member of the household, questions about the household, about each caregiver, and about each child aged 3 months to 7 years, and photographing the SMC record card. A pilot survey was conducted over two days (14 and 15 December 2017) to test the survey tools and practice using them before the main data collection. Data were collected on tablet PCs (Google Nexus) using the Dharma platform, with three separate forms (Household roster; bednet survey; and SMC coverage). A roster of all persons who slept in the household the night before the survey was made, a list of all bednets made, and each person asked if they slept under a net and if so which net. Household level questions included socioeconomic status and awareness about the SMC programme; one caregiver in each household was asked about their knowledge about SMC and about the process that the CHW went through during SMC administration and about the time and any costs that were involved in receiving SMC. Each caregiver was asked about their age, marital status and level of education and for each child aged from 3 months to 7 years, questions about SMC were asked and details of SMC treatments captured from the SMC card, which was also photographed. Data collection was carried out by 12 fieldworkers, organised in 5 teams each assisted by a local guide, overseen by two supervisors. Data collection took place from 16-30 December 2017. Two supervisors provided close supervision to the 05 teams place from 13 December to 30 December 2017. The software Dharma Platform Version 1.001 (November 2017) was used, with forms for SMC coverage surveys developed by LSHTM. Data were uploaded to a server, incorporated into an Access database, and analysed using Stata version 14 (Stata corp, Texas, USA).

## RESULTS

### Response rates

A total of 534 households participated in the survey (Table 1), 95% of all households visited. The location of the clusters is shown in Figure 1. A total of 1448 children were included, of these 1226 were aged 3-59 months at the time of cycle 4 and hence eligible to be treated at cycle 4, and 1180 were aged at least 3 months at the time of cycle 1 and were under 5 years at the survey and so were eligible to have receive 4 SMC treatments. 189 children were aged 6-7 years when the survey was done and so were above 5 years of age at the time of SMC cycle 1.

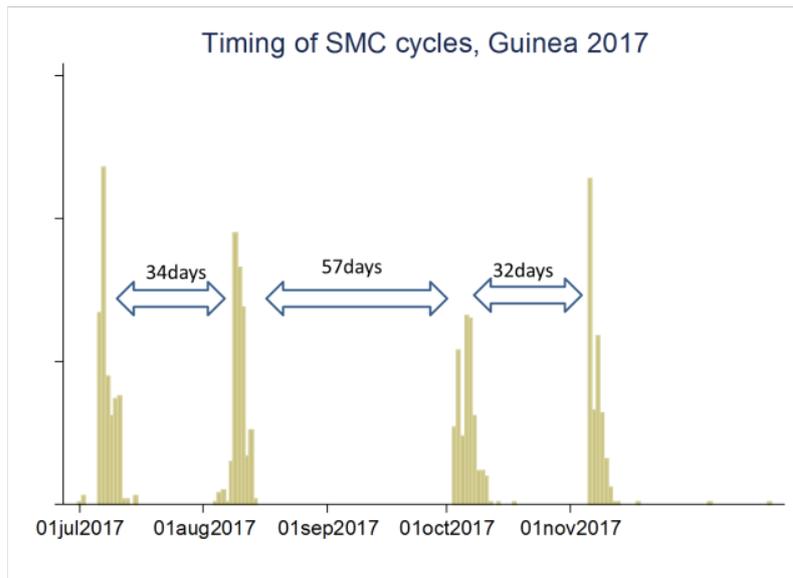
**Table 1:** Response rates and the number of households, children and other household members surveyed:

<b>Households surveyed:</b>	No. of households	%
Agreed to participate	534	94.68%
No children of eligible age	13	2.30%
Refused to participate	1	0.18%
Unable to find someone to speak with	16	2.84%
TOTAL	564	
<b>Children surveyed:</b>	No. of children	
Aged 3-59 months at cycle 4 (eligible for SMC at cycle 4)	1226	
Aged 3-59 months at cycle 1 (eligible for 4 SMC treatments)	1180	
Aged 5-6 years at survey	30	
Aged 6-7 years at survey (more than 5 years of age at cycle 1)	189	
TOTAL (3 months to 7 years at survey)	1448	
<b>Caregivers surveyed:</b>	616	
<b>Total population surveyed:</b>	No. of household members	
Slept in the household the night before the survey	3010	
TOTAL	3041	

### Timing of SMC cycles

SMC treatments provide a high degree of protection for 28 days, after this time protection decreases rapidly. SMC cycles should therefore take place at intervals of about 28 days to ensure children remain protected. Cycle 1 took place in July, cycle 2 in August, the third cycle, which was delayed due to a shortage of SMC drugs, took place in October, and the last cycle in November (Figure 2). The intervals between the median dates of the cycles as recorded on SMC cards, was 34 days between cycle 1 and cycle 2, 57 days between cycle 2 and cycle 3, and 32 days between cycle 3 and cycle 4.

Figure 4: Timing of SMC cycles



### Awareness about the SMC campaign

Caregivers need to be aware of the purpose of the SMC programme and need to know the day when SMC will be distributed in their area in order to ensure they are available on that day. 91.3% of households knew about SMC; before the last cycle, 88.6% of them had heard the date when CHWs would come. In two prefectures, Gaoual and Koundara, it appears communication about SMC cycle 4 was less effective, in Gaoual only 49.1% of households knew the date of cycle 4 and in Koundara, 16.9%. The common sources of information about SMC varied: criers in Koubia, Siguiiri and Touge; the mosque or church in Dinguiraye, Mandiana and Siguiiri; and from health workers in all prefectures. The local radio stations were not fully operational during the SMC period which may explain why the radio was less often given as a source of information (41.1% heard through the radio). In Gaoual and Koundara, people heard about the campaign from the SMC supervisor, but there was less use of criers.

Figure 5: Public awareness about SMC, and about the dates of the most recent SMC campaign (cycle 4), and where caregivers heard about date of the campaign:

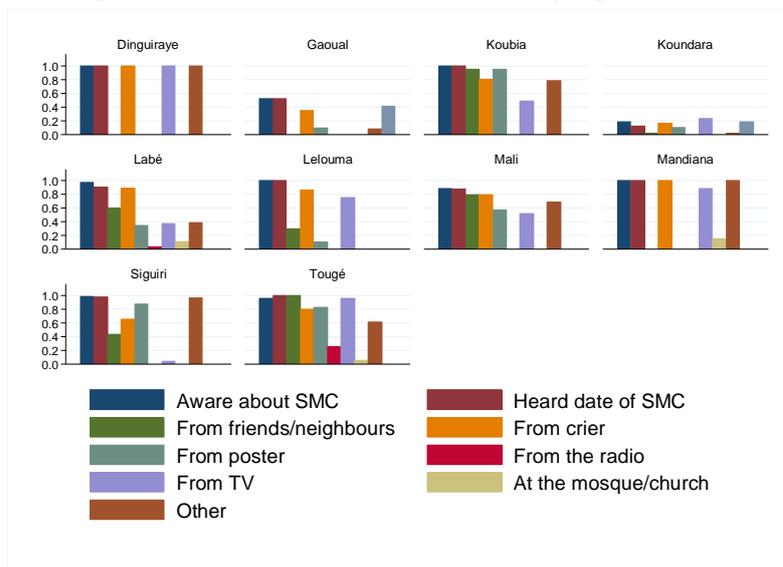


Table 2: Percentage of households that were aware of the SMC programme, had heard the date when cycle 4 would start in their village, and the source of the information

Prefecture	Household aware about SMC	Heard the date of cycle 4	From friends/ neighbour	From a health worker	From a crier	From posters	On the radio	On TV	At the Mosque /church	Other*
Dinguiraye	100.0	100.0	0.0	100.0	0.0	0.0	100.0	0.0	100.0	0.0
Gaoual	49.1	49.1	0.0	35.4	10.3	0.0	0.0	0.0	6.2	41.6
Koubia	100.0	100.0	95.1	80.5	95.1	0.0	50.0	0.0	71.4	0.0
Koundara	21.1	16.9	1.9	14.9	9.3	0.0	25.3	0.0	4.2	18.7
Labé	96.9	84.1	60.4	90.3	30.5	3.4	35.2	10.2	32.2	0.0
Lelouma	100.0	100.0	28.7	85.8	12.2	0.0	68.9	0.0	0.0	0.0
Mali	88.5	88.7	80.8	80.5	58.9	0.0	50.2	0.0	68.3	0.0
Mandiana	100.0	100.0	0.0	100.0	0.0	0.0	88.2	12.1	100.0	0.0
Siguiriri	98.0	97.3	49.3	67.8	86.4	0.0	5.2	0.0	96.0	0.0
Tougé	97.3	100.0	100.0	81.8	82.7	27.2	94.0	8.2	60.1	0.0
<b>TOTAL</b>	<b>91.3</b>	<b>88.6</b>	<b>39.8</b>	<b>77.7</b>	<b>48.3</b>	<b>2.0</b>	<b>41.1</b>	<b>3.8</b>	<b>66.0</b>	<b>3.3</b>

\*the most common other source of information given was the SMC supervisor

### Caregivers' knowledge about SMC

Caregivers were generally well informed about SMC with an average score of 80% on a 10-point knowledge questionnaire (Table 2, Table 3).

**Table 3:** Caregivers' knowledge about SMC:

	Question	Correct response
1	For how many months should the child take SMC	4
2	SMC is given to prevent malaria	Yes
3	SMC can prevent other diseases	No
4	How many tablets should the child take on the first day?	2
5	How many tablets should the child take on the second day?	1
6	How many tablets should the child take on the third day?	1
7	The child should swallow all the medication	Yes
8	I can give the tablets to someone else who is unwell	No
9	The child should complete the 3-day course of treatment	Yes
10	I should take the child to the health centre if unwell after SMC	Yes

**Maximum score: 10**

**Table 4:** Caregivers' knowledge scores on SMC:

Prefecture	Average caregiver knowledge score (out of 10)	Average reported CHW score for adherence to guidelines (out of 8)
Dinguiraye	8.0	8.0
Gaoual	8.1	8.0
Koubia	8.4	7.5
Koundara	6.8	6.1
Labé	8.7	7.9
Lelouma	8.8	8.0
Mali	7.2	7.0
Mandiana	7.4	8.0
Siguiriri	7.9	8.0
Tougé	9.3	6.8
<b>TOTAL</b>	<b>8.0</b>	<b>7.7</b>

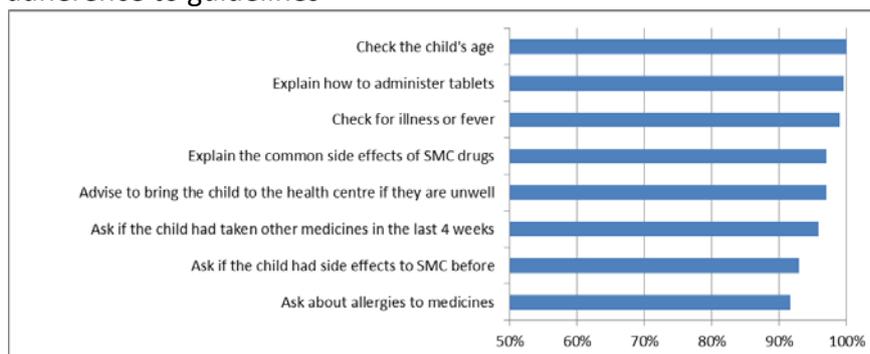
### Community Health Worker adherence to SMC guidelines, as reported by caregivers

CHW's should check the child's age, and before administering the treatment should ask about illness and refer the child if they are unwell, and should check the child has not had severe side effects to SMC before. They are also trained to explain to the caregiver how to administer the amodiaquine tablets on the next two days, and to advise caregivers about potential side effects and to bring the child to a health worker if they are become unwell after SMC. Caregivers of children who had received SMC, reported that the CHW generally followed these guidelines correctly (Table 4, Figure 4).

**Table 5:** CHW adherence to guidelines

Action	% of caregivers who reported that the CHW performed the action at the last visit:	
1	Check the child's age	100.0
2	Explain how to administer tablets	99.6
3	Check for illness or fever	98.9
4	Explain the common side effects of SMC drugs	97.0
5	Advise to bring the child to the health centre if they are unwell	97.0
6	Ask if the child had taken other medicines in the last 4 weeks	95.8
7	Ask if the child had side effects to SMC before	92.9
8	Ask about allergies to medicines	91.7

Figure 6: CHW adherence to guidelines



### SMC administration at the last cycle before the survey (cycle 4)

Caregiver's recall is likely to be most accurate about the last SMC treatment, so a number of questions asked specifically about SMC treatment at the fourth cycle. 75.6% of eligible children were treated (Table 5), and in 98.6% of treated children, the first dose was administered by the CHW (Table 6). In common with other surveys, the reported adherence to the unsupervised doses of amodiaquine was very high. A total of 73.4% of children received all three daily doses.

**Table 7:** Percentage of children who were definitely eligible at cycle 4 (aged 3-59 months), who received SMC, and the percentage who received all 3 daily doses:

Prefecture	Percentage treated	Percentage who received all 3 daily doses	Number of children aged 3-59 months
Dinguiraye	100.0	100.0	162
Gaoual	33.4	33.4	60
Koubia	91.4	91.4	35
Koundara	28.2	28.2	41
Labé	80.3	64.6	148
Lelouma	91.7	89.1	36
Mali	74.8	73.3	134
Mandiana	86.3	86.3	150
Siguiiri	67.0	67.0	399
Tougé	90.9	90.9	61
<b>Total</b>	<b>75.6</b>	<b>73.4</b>	<b>1,226</b>

**Table 8:** Out of those who received SMC at cycle 4, the percentage whose first dose was administered by the CHW, the percentage that received the second dose, and the percentage that received the third dose:

Prefecture	First dose administered by the CHW	Second dose given	Third dose given
Dinguiraye	100.0	100.0	100.0
Gaoual	100.0	100.0	100.0
Koubia	100.0	100.0	100.0
Koundara	100.0	100.0	100.0
Labé	91.1	91.9	85.1
Lelouma	97.2	97.2	100.0
Mali	100.0	100.0	98.0
Mandiana	100.0	100.0	100.0
Siguiri	100.0	100.0	100.0
Tougé	100.0	100.0	100.0
<b>TOTAL</b>	<b>98.6</b>	<b>98.8</b>	<b>97.9</b>

The most common reasons for not receiving SMC at cycle 4 were that the child was away, the drugs were unavailable, and that the CHW did not visit (Table 7). In the few cases where caregivers said they had not administered the second and third amodiaquine doses, the reasons given were that they were away, they did not understand that they had to administer the amodiaquine, they were too busy, and because the child had side effects (Table 8).

**Table 9:** Reasons for not receiving SMC at cycle 4

Reason	%
Child was away at the time	33.2
Stock-out of SMC drugs	25.5
CHW did not come	18.3
No reason given	14.2
Caregiver not available	2.8
Child too old	2.6
Child was living away from home	1.5
Child was unwell	0.8
CHW did not check child age	0.5
Child too young	0.3
Family refused	0.3

**Table 10:** Reasons for not administering doses 2 and 3 at cycle 4

Reasons for not giving the dose:	Dose 2	Dose 3
	Carer away	Carer away
	Carer did not understand	Carer too busy
		Child had side effects

SMC delivered door-to-door involves few costs to the household but someone responsible has to be available when the CHW visits and this may interfere with other activities. 94% of households reported that the mother was with the child during the CHW visit. About 20% of households reported that they waited more than one hour for the CHW to visit, 31% less than an hour, but about half could not say how long they waited. The process of SMC administration in the household, once the CHW arrived, was reported by 58% of household to take less than 15 minutes. 33% could not say how long the process took, but all respondents were able to give an approximate rating to the amount of time they had to give up for SMC (very short or short, long or very long, etc), only 7.7% rated the time as long, very long, or all day.

**Table 11:** Percent of Households who waited with the child

<b>Who waited with the child</b>	<b>% of households</b>
<b>Mother</b>	94.0
<b>Father</b>	2.32
<b>Grandmother</b>	2.13
<b>Grandfather</b>	0.58
<b>Other</b>	0.46
<b>Sister</b>	0.26
<b>Neighbour</b>	0.23
<b>Aunt</b>	0.03

**Table 12:** time spent waiting

<b>How do you rate the time spent waiting in total:</b>	<b>% of households</b>
<b>Very short</b>	40.7
<b>Short</b>	32.6
<b>Neither short nor long</b>	19.0
<b>Long</b>	3.6
<b>Very long</b>	3.5
<b>All day</b>	0.6

<b>Time spent waiting for the CHW</b>	<b>% of households</b>
<b>Less than 1 hour</b>	30.8
<b>1-2 hours</b>	11.2
<b>Up to half a day</b>	5.5
<b>A full day</b>	2.9
<b>Don't know</b>	49.7

Time taken to administer SMC in the household:

<b>Time taken while CHW was at the compound</b>	<b>% of households</b>
<b>Less than 15 minutes</b>	58.0
<b>15-30 minutes</b>	4.4
<b>30 minutes - 1 hour</b>	0.4
<b>1-2 hours</b>	1.6
<b>Long wait of more than 2hrs</b>	2.2
<b>Don't know</b>	33.4

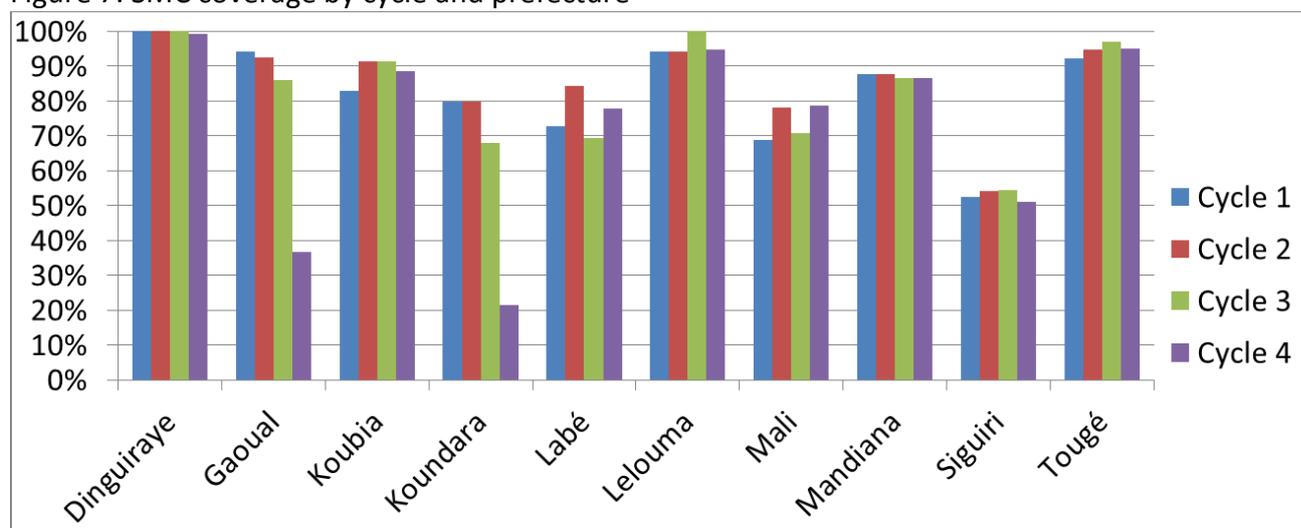
### Total number of SMC treatments received by each child

Children aged 3 to 59 months at the time of cycle 1 are eligible to receive SMC four times, and should receive all of these treatments to maximise their protection. The mean number of treatments per child was 2.93. 73.4% of children received SMC at cycle 1, 76.4% at cycle 2, 73.5% at cycle 3 and 70.1% at cycle 4. 21% of children did not receive any SMC treatments, most of those in three prefectures Siguiiri, Koundara and Mali. Coverage was similar in all 4 cycles except for Gaoual and Koundara where there was a problem at cycle 4 with a sudden drop in coverage. Coverage in cycles 1 to 3 was high in all prefectures except Siguiiri where only just over half the children received SMC in each of the four cycles. As the population of Siguiiri is much larger than in the other prefectures, the low coverage in Siguiiri reduces the overall mean coverage proportionately. Coverage could be substantially improved by addressing the problems in Siguiiri, and the problems at cycle 4 in Gaoual and Koundara.

**Table 13:** SMC coverage among children eligible for four treatments, by Prefecture:

Prefecture	Mean number of treatments	% that received SMC at each cycle:			
		Cycle 1	Cycle 2	Cycle 3	Cycle 4
Dinguiraye	3.99	100.0	100.0	100.0	99.3
Gaoual	3.10	94.2	92.6	86.1	36.7
Koubia	3.54	82.9	91.4	91.4	88.6
Koundara	2.49	79.7	79.7	68.1	21.4
Labé	3.04	72.8	84.2	69.5	77.8
Lelouma	3.83	94.1	94.1	100.0	94.7
Mali	2.97	68.9	78.2	70.8	78.7
Mandiana	3.49	87.7	87.7	86.6	86.6
Siguiiri	2.12	52.6	54.1	54.4	51.2
Tougé	3.79	92.3	94.7	96.9	95.1
<b>TOTAL</b>	<b>2.93</b>	<b>73.4</b>	<b>76.4</b>	<b>73.5</b>	<b>70.1</b>

Figure 7: SMC coverage by cycle and prefecture

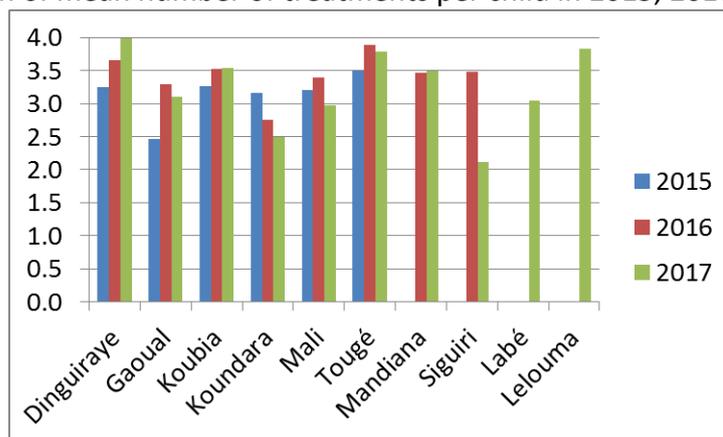


The area covered by the SMC programme increased from 6 prefectures in 2015, to 8 in 2016 and 10 in 2017. Coverage was slightly higher in 2016 than 2015, despite the increase in area, coverage was lower in 2017 than 2016, largely due to the lower coverage in Siguiri.

Table 14: Comparison of coverage with 2015 and 2016: mean number of treatments per child in each year

Prefecture	2015	2016	2017
Dinguiraye	3.25	3.65	3.99
Gaoual	2.46	3.29	3.1
Koubia	3.26	3.52	3.54
Koundara	3.16	2.75	2.49
Labé			3.04
Lelouma			3.83
Mali	3.20	3.40	2.97
Mandiana		3.46	3.49
Siguiri		3.48	2.12
Tougé	3.50	3.89	3.79
<b>TOTAL</b>	<b>3.15</b>	<b>3.46</b>	<b>2.93</b>

Figure 8: Comparison of mean number of treatments per child in 2015, 2016 and 2017



SMC distribution was highly equitable, when compared by wealth ranking, the mean number of treatments was slightly higher in the poorest group than in the richest (3.18 compared to 2.57). Coverage was similar in girls and boys.

Table 15: SMC coverage among children eligible for four treatments, by socioeconomic ranking:

Wealth ranking	Mean number of treatments	% that received SMC at each cycle:			
		1	2	3	4
Lowest	3.18	84.2	88.0	73.1	72.4
Low	3.32	83.5	85.8	85.7	77.3
Middle	2.69	64.8	67.6	69.4	67.2
High	3.01	75.7	77.5	74.7	73.1
Highest	2.57	61.9	66.4	66.7	62.1

**Table 16:** SMC coverage among children eligible for four treatments, by gender

	Mean number of treatments	% that received SMC at each cycle:			
		1	2	3	4
<b>Male</b>	2.91	73.0	75.8	73.2	68.7
<b>Female</b>	2.96	73.7	77.0	73.8	71.5

**Table 17:** Number of SMC treatments: percentage of children who received SMC 0,1,2,3,or 4 times

Prefecture	% children who received SMC 0,1,2,3,4 times				
	0	1	2	3	4
<b>Dinguiraye</b>	0.0	0.0	0.0	0.7	99.3
<b>Gaoual</b>	3.9	0.0	13.5	47.9	34.7
<b>Koubia</b>	8.6	0.0	0.0	11.4	80.0
<b>Koundara</b>	20.3	0.0	11.5	46.8	21.4
<b>Labé</b>	2.8	8.4	12.8	33.8	42.2
<b>Lelouma</b>	0.0	0.0	5.9	5.3	88.8
<b>Mali</b>	18.5	3.3	2.8	13.9	61.5
<b>Mandiana</b>	12.3	0.0	1.1	0.0	86.6
<b>Siguiri</b>	45.6	0.0	0.2	4.7	49.4
<b>Tougé</b>	0.0	0.0	4.6	11.7	83.7
<b>TOTAL</b>	21.0	1.3	3.4	11.6	62.6

**Table 18:** Percentage of children by SMC cycles received

Received SMC at cycle:					% of children
1	2	3	4		
0	0	0	0	21.0	
0	0	0	1	1.0	
0	0	1	0	0.2	
0	0	1	1	0.8	
0	1	0	0	0.2	
0	1	1	0	0.2	
0	1	1	1	3.2	
1	0	0	1	0.2	
1	0	1	0	0.1	
1	0	1	1	0.2	
1	1	0	0	2.0	
1	1	0	1	2.0	
1	1	1	0	6.2	
1	1	1	1	62.6	

### Treatment of children above the age of 5

Children who are 5 years of age and above at the time of the first SMC cycle, should not receive SMC. The dose has been calculated according to age and if children above the age of 5 are given the blister pack intended for the 12-59-month group, they may be under-dosed, this can select for resistance as parasites are exposed to sub-therapeutic doses of SMC drugs. Children aged above 6 years at the time of the survey, should not have received SMC. 53.8% of this group received an SMC card and about 40% received SMC at each cycle.

Table 19: Treatment of children above the age limit for SMC (aged 6-7 years at the survey)

Mean number of treatments	Treated at cycle:				Given an SMC card	Number surveyed
	1	2	3	4		
<b>1.68</b>	42.8	43.9	43.5	38.2	53.8	189

### SMC cards

89% of eligible children received an SMC card but only 38% had their SMC card available for inspection in the survey. Assessment of coverage therefore relied on caregiver recall for those who did not have an SMC card. Although agreement between recall and card-documented SMC was good, caregivers should be encouraged to retain SMC cards so that they can be inspected.

Table 20: Percentage of eligible children who received an SMC card, and the percentage with a card available for inspection during the survey

Prefecture	Given SMC card	Card available for inspection
Dinguiraye	100.0	3.6
Gaoual	92.6	37.1
Koubia	91.4	68.8
Koundara	73.9	22.5
Labé	86.0	69.3
Lelouma	97.3	73.6
Mali	81.5	60.6
Mandiana	87.1	37.5
Siguiri	87.7	25.8
Tougé	98.5	76.5
<b>TOTAL</b>	<b>89.0</b>	<b>38.0</b>

Table 21: Agreement between caregiver report and SMC card:

Cycle	Card 0 Carer 0	Card 1 Carer 1	Card 0 Carer 1	Card 1 Carer 0	% agreement	kappa
<b>1</b>	32	377	6	48	88.34	0.4851
<b>2</b>	23	401	9	30	91.58	0.4979
<b>3</b>	35	390	9	29	91.79	0.6035
<b>4</b>	47	378	6	32	91.79	0.6664

### Bednet use by children and other household members

Bednet use was recorded in the survey for children receiving SMC and for all members of the household. Insecticide-treated bednets are the most cost-effective method of malaria prevention, SMC adds to this protection but does not replace the need to use bednets (ITNs or LLINs (long-lasting insecticide-treated nets). 43.6% of children in the survey (children eligible to receive SMC) were reported to have slept under a bednet (of any type) the night before the survey. 40.6% of all household members slept under a net the night before the survey, almost all of these were LLINs. Females were most likely to use a net than males (43.4% compared to 35.8%). 57.2% of households owned at least one LLIN, but only 14.7% of households had one LLIN for every two persons in the household.

Table 22: Percentage of children 3-59months who slept under a bednet (of any type) the night before the survey

Prefecture	Slept under a net (of any type) last night
Dinguiraye	20.9
Gaoual	93.3
Koubia	88.6
Koundara	93.5
Labé	75.2
Lelouma	31.1
Mali	77.7
Mandiana	36.6
Siguiri	19.6
Tougé	55.9
<b>TOTAL</b>	<b>43.6</b>

Table 23: Percentage who slept under a bednet, out of those who slept in the household the night before the survey, by prefecture

Prefecture	Any net	LLIN	Intact net	Net <2yrs old	No. surveyed
Dinguiraye	20.3	19.6	0.0	19.6	281
Gaoual	92.2	89.8	78.2	0.0	165
Koubia	72.5	66.7	49.0	66.7	102
Koundara	82.2	82.2	59.0	0.0	102
Labé	65.4	64.6	1.8	51.3	450
Lelouma	28.7	28.7	0.0	18.3	100
Mali	68.3	68.3	54.5	52.2	375
Mandiana	30.8	30.2	5.4	29.9	302
Siguiri	16.7	16.2	15.4	0.3	936
Tougé	48.5	48.5	24.1	21.0	197
<b>TOTAL</b>	<b>40.6</b>	<b>40.0</b>	<b>20.8</b>	<b>21.6</b>	<b>3,010</b>

**Table 24:** Percentage who slept under a bednet, out of those who slept in the household the night before the survey, by age group

Age	Any net	LLIN	Intact net	Net <2yrs old	No. surveyed
<10yrs	40.5	39.8	20.0	21.7	1,619
10-14yrs	38.1	37.5	23.8	19.8	182
15-19yrs	35.2	35.2	18.1	17.3	121
20-24yrs	43.8	43.4	21.7	26.9	131
25-29yrs	43.7	42.8	21.0	19.1	216
30-39yrs	40.6	39.9	22.1	21.4	358
40+yrs	41.4	40.3	22.5	23.8	383
<b>TOTAL</b>	40.6	40.0	20.9	21.7	3,010

**Table 25:** Percentage who slept under a bednet, out of those who slept in the household the night before the survey, by wealth ranking

Wealth ranking	Any net	LLIN	Intact net	Net <2yrs old	No. surveyed
Lowest	48.7	47.3	21.1	25.5	480
Low	47.0	45.4	22.0	24.9	520
Middle	40.7	40.7	26.2	23.8	571
High	32.6	32.1	13.6	20.2	663
Highest	41.1	40.8	24.8	17.2	743

**Table 26:** Percentage who slept under a bednet, out of those who slept in the household the night before the survey, by gender

Gender	Any net	LLIN	Intact net	Net <2yrs old	No. surveyed
Male	36.4	35.8	18.0	19.6	1,388
Female	44.2	43.4	23.3	23.4	1,622

**Table 27:** Percentage of the population who could sleep under a net if two people slept under each net: (values in the main part of the table are row percentages)

No. who slept in the household last night	No. of nets in the household (of any type):									No. of households	% could sleep under net if 2/net
	0	1	2	3	4	5	6	7	7		
1										0	
2	21.8	62.4	15.8	0.0	0.0	0.0	0.0	0.0	0.0	21	78.2
3	34.1	50.8	13.0	2.2	0.0	0.0	0.0	0.0	0.0	63	49.0
4	43.3	31.6	20.6	1.9	2.6	0.0	0.0	0.0	0.0	95	40.9
5	35.8	32.5	25.8	4.8	1.1	0.0	0.0	0.0	0.0	102	39.5
6	44.6	17.9	22.8	13.0	1.0	0.7	0.0	0.0	0.0	90	35.9
7	53.1	11.7	17.6	11.7	5.9	0.0	0.0	0.0	0.0	72	29.3
8+	48.8	11.6	12.4	10.5	9.1	2.1	3.4	2.0		86	29.1
<b>Total</b>	42.5	26.9	19.1	7.0	3.1	0.5	0.6	0.3		529	35.6

(The number that could sleep under a net is  $\min(\text{no. who slept in the household, no. of nets} \times 2)$ .)

**Table 28:** Percentage of the population who could sleep under a LLIN if two people slept under each net: (values in the main part of the table are row percentages)

No. who slept in the household last night	No. of nets in the household (LLINs):									No. of households	% could sleep under net if 2/net
	0	1	2	3	4	5	6	7	8+		
<b>1</b>										0	
<b>2</b>	21.8	62.4	15.8	0.0	0.0	0.0	0.0	0.0	0.0	21	78.2
<b>3</b>	34.1	50.8	13.0	2.2	0.0	0.0	0.0	0.0	0.0	63	49.0
<b>4</b>	43.3	31.6	20.6	1.9	2.6	0.0	0.0	0.0	0.0	95	40.9
<b>5</b>	36.8	31.6	25.8	4.8	1.1	0.0	0.0	0.0	0.0	102	39.1
<b>6</b>	44.6	17.9	22.8	13.0	1.0	0.7	0.0	0.0	0.0	90	35.9
<b>7</b>	53.1	11.7	17.6	11.7	5.9	0.0	0.0	0.0	0.0	72	29.3
<b>8+</b>	48.8	11.6	12.4	11.7	8.0	2.1	3.4	2.0	0.0	86	28.9
<b>Total</b>	42.6	26.7	19.1	7.2	2.9	0.5	0.6	0.3	0.0	529	35.5

**Table 29:** Percentage of households with at least one net, and percentage of households with at least one net for every two people who slept in the household the night before the survey

Prefecture	Net of any type		LLIN		Intact net		Net <2yrs old		No. of households
	1 or more	At least 1 per 2	1 or more	At least 1 per 2	1 or more	At least 1 per 2	1 or more	At least 1 per 2	
<b>Dinguira</b>	27.5	0.0	27.5	0.0	0.0	0.0	27.5	0.0	40
<b>Gaoual</b>	97.5	56.5	97.5	56.5	94.9	45.2	0.0	0.0	36
<b>Koubia</b>	92.9	7.1	92.9	7.1	92.9	0.0	92.9	7.1	14
<b>Koundara</b>	83.1	46.4	83.1	46.4	64.5	38.0	0.0	0.0	22
<b>Labé</b>	85.8	20.5	85.8	20.5	9.1	0.0	73.3	14.6	103
<b>Lelouma</b>	47.3	23.2	47.3	23.2	5.4	0.0	41.9	8.9	21
<b>Mali</b>	76.6	20.9	76.6	20.9	63.3	16.6	62.2	16.6	66
<b>Mandiana</b>	40.7	4.4	39.2	4.4	6.1	0.0	39.5	4.4	58
<b>Siguiiri</b>	30.4	2.8	30.4	2.8	29.8	2.2	1.2	0.0	141
<b>Tougé</b>	75.8	18.1	75.8	18.1	58.3	5.5	31.4	6.6	33
<b>Total</b>	57.4	14.7	57.2	14.7	31.9	6.9	32.9	5.9	534

## RECOMMENDATIONS

- 1) High coverage of SMC has been achieved in most prefectures in most cycles. SMC distribution door to door is highly equitable with good coverage in the poorest sections of the community. Despite the challenges of SMC delivery, the programme is effective, this should encourage expansion of the SMC programme to other prefectures.
- 2) In areas with poor coverage (Siguiiri in all cycles, and Gaoual and Koundara in cycle 4), the reasons should be investigated and steps taken to resolve the problems. Because Siguiiri has a large population the low coverage there has a proportionately large effect on overall coverage figures.
- 3) SMC treatment provides a high degree of protection for 4 week but protection falls off rapidly in the 5<sup>th</sup> week, it important therefore to ensure adequate supplies of drugs to complete all four cycles on schedule.
- 4) In some areas caregivers had not heard of the dates of SMC campaigns, steps to improve communication, through greater use of criers and other channels such as local radio and mosques and churches, should be taken.
- 5) SMC training should emphasise the importance of checking the age of the child to avoid treating children above the age of 5. The child-strength blister packs are not suitable for children above 5 years of age.
- 6) LLIN coverage was low. Reasons behind this should be explored and steps taken to improve LLIN coverage. CHWs distributing SMC should be trained to remind caregivers the importance of sleeping under an LLIN. Estimates of LLIN coverage from this survey are slightly lower than in the 2016 MICS (44.8% Kankan, 61.5% Labe, 54% Boke, 52.8% Faranah).
- 7) SMC coverage should continue to be monitored. Areas with low coverage, and any new areas of SMC implementation, should be surveyed at the end of the 2018 transmission season. In areas with high coverage, delivery can be monitored through administrative records (compiled from tally sheets and SMC drug utilisation), with a coverage survey every two years.
- 8) It will be important to put in place a system to monitor efficacy of SMC, using case control studies to measure clinical protection in children, combined with monitoring of molecular markers of resistance to SMC drugs in the parasite population. Monitoring of molecular markers can be done most efficiently and effectively through antenatal clinics. It will also be important to strengthen pharmacovigilance, building on progress made through the ACCESS-SMC project. As well as working to strengthen the PV system nationally, safety monitoring can be strengthened in selected areas where training and supervision can be provided to ensure that health staff recognise events and report suspected adverse drug reactions.
- 9) HMIS data on malaria should be regularly assessed to track the impact of the SMC programme of malaria cases and malaria deaths. As part of the ACCESS-SMC project, data were collected on individual malaria cases at selected health facilities, these data are useful because they allow more detailed analysis of age distribution and seasonality that is possible with HMIS data since the HMIS records cases only on broad age groupings (under 5 and 5 and above), by calendar month. It is recommended to continue data collection from selected 'sentinel' sites in order to permit more detailed analysis of trends.

## Annex: Sampling methods

The survey was conducted in the prefectures of Gaoual, Koundara, Mali, Lelouma, Labe, Koubia, Tougué, Dinguiraye, Siguiri and Mandiana, which had implemented SMC in July, August, October and November of 2017. The estimated total population size of the 10 prefectures was 2,570,789 based on the 2014 census. A sampling interval of  $2,570,789/40 = 64269.725$  was used to select 40 settlements with probability proportional to size, using systematic sampling from a list of all 9352 settlements in the 10 prefectures, after sorting by prefecture to give an implicit stratification. A rough sketch map of each selected settlement was made showing areas of habitation and local landmarks. Each map was then divided into segments of approximately equal size, the number of segments being chosen so that one segment would be expected to yield approximately the required number of children, based on the estimated total population size, while as far as possible taking advantages of local features to facilitate identification of segment boundaries on the ground. Children aged at least 3 months at SMC cycle 1, (hence at least 7 months at the time of the survey, conducted one month after cycle 4) and less than 7 years at the time of the survey, were eligible to be included. It was assumed that this age group represents about 20% of the total population. A total sample size of about 1000 children was required, i.e.  $1000/40 = 25$  children on average from each village. Each village was therefore divided into  $S = \text{floor}(N_i \times 0.2 / 25)$  segments, where  $N_i$  was the population from the 2014 census. The segments were numbered on the map and then the number of segments created was entered into a tablet PC which used simple random sampling to select a segment number to be surveyed. Every dwelling within the chosen segment was then visited and every child between the age of 7 months and 7 years, who had stayed in the house the night before the survey, was included in the survey. The GPS location of each dwelling visited was automatically recorded by the tablet PC used to collect interview data. The number surveyed in each settlement therefore could vary but the average was expected to be about 25 if the population data were accurate. There were eight settlements that were selected which were too large for segmentation to be practical, and there was no information available about sub-divisions of these segments that could be used to select a smaller area. For these settlements, the total area was estimated by taking GPS locations around the perimeter of the inhabited area. A single location was then chosen, by randomly generating an x and y coordinate within the settlement (this was done independently of the survey team and the location sent to them by email). Interviewers surveyed houses around this point, recording the GPS location of each dwelling, and continuing outwards, without missing any dwellings, until the required number of children (25) had been reached. In the final dwelling, all children eligible for the survey were included so the final sample size could exceed 25.

In villages which were segmented, the sampling probability is  $p_i = 40 \times (N_i / N_T) \times (1/S)$ , for individuals in settlement  $i$ . Here,  $N_i$  is the population of village  $i$  from the 2014 census and  $N_T$  is the total population of the 10 prefectures. In villages which were too large to segment, it was assumed population density was uniform, so the sampling probability is  $40 \times (N_i / N_T) \times (a_i / A_i)$ , where  $a_i$  is the sampled area in village  $i$  calculated from the convex hull of the coordinates of dwellings that were visited and the start point, and  $A_i$  is the total area of the settlement. The sampling weight for each child (the number of children in the population that each child surveyed represents) was  $1/p_i$ .

Standard errors of estimates of indicators were computed using linearized variance formulae for ratio estimators. For binary variables, confidence intervals for proportions were obtained after using a logit transformation, to ensure the confidence limits fell in the range (0,1).

**Table A1: List of clusters**

Region	Prefecture	Sousprefecture	Quartier	Settlement
KANKAN	DINGUIRAYE	Banora	Boubère	Boubère Centre
KANKAN	DINGUIRAYE	Diatifere	Mamoudouya I	Bandianya
KANKAN	DINGUIRAYE	Dinguiraye-centre	Tinkisso	Souloukoufalan
KANKAN	DINGUIRAYE	Selouma	Selouma Centre	Sakabari
KANKAN	MANDIANA	Balandougouba	Sidikila II	Sidikila II Centre
KANKAN	MANDIANA	Dialakoro	Samory Touré	Samory TOURE
KANKAN	MANDIANA	Kinieran	Mbalia	Mbalia Centre
KANKAN	MANDIANA	Koundian	Koundian I	Namafouada
KANKAN	MANDIANA	Morodou	Samakofara	Samakofara Centre
KANKAN	SIGUIRI	Doko	Kouremalé	Kouremalé Centre
KANKAN	SIGUIRI	Franwalia	Franwalia Centre	Franwalia Centre
KANKAN	SIGUIRI	Kintinian	Balato III	Balato Centre III
KANKAN	SIGUIRI	Kintinian	Fatoya	Fatoya Centre
KANKAN	SIGUIRI	Malea	Maléah Centre	Maléah Centre
KANKAN	SIGUIRI	Niagassola	Kignekourou	Faraboloni
KANKAN	SIGUIRI	Norassoba	NanenTraoré	Nanen Traoré Centre
KANKAN	SIGUIRI	Sigui-centre	Dankakoura	Dankakoura Centre
KANKAN	SIGUIRI	Sigui-centre	Saourou	Saourou Centre
KANKAN	SIGUIRI	Sigui-centre	Sougoula	Sougoula Centre
KANKAN	SIGUIRI	Siguirini	Talabé	Talabé Centre
LABE	GAOUAL	Foulamory	Tabadian	Nyor Nyor
LABE	GAOUAL	Koumbia	Dara Bowé	Dara Bowé Centre
LABE	GAOUAL	Malanta	Kounsi	Peguéty
LABE	KOUBIA	Matakaou	Matakaou Centre	Dougouwoulen
LABE	KOUNDARA	Guingan	Kifaya	Angona
LABE	KOUNDARA	Sambailo	Sambailo Centre	Thiuopoutel
LABE	LABE	Garambe	Garambé Centre	Bassanya II
LABE	LABE	Labé centre	Daka II	Secteur II
LABE	LABE	Labé centre	Madina	Dianyabhè Mosquée
LABE	LABE	Noussy	Kassangui	Dow Kougue
LABE	LABE	Tountouroun	Tounny	Gadha Thiolliwel
LABE	LELOUMA	Lafou	Bombi Bourou	Yalaya
LABE	LELOUMA	Sagale	Bamikountou	Gnekori
LABE	MALI	Donghol Sigon	Dougaya	Dioma Roundé
LABE	MALI	Fougou	Kansaghel	Laami
LABE	MALI	Madina Wora	Pellissaré	Donghol Doubhi
LABE	MALI	Salambande	Koya	Koya Centre
LABE	MALI	Yembereng	Sinthiourou	Diaguitarè
LABE	TOUGUE	Konah	Bourouwal	Kounsen
LABE	TOUGUE	Tougue centre	Tougué I	Dioloki

**Table A2: Sampling weights**

Settlement	Population (2014 census)	No. of segments	Area of settlement (m <sup>2</sup> )	Area surveyed (m <sup>2</sup> )	Sampling probability	Weight
Boubère Centre	793	7			0.00176	567.32
Bandianya	531	5			0.00165	605.18
Souloukoufalan	257	2			0.00200	500.15
Sakabari	557	5			0.00173	576.93
Sidikila II Centre	3616	36			0.00156	639.85
Samory TOURE	3794	37			0.00160	626.77
Mbalia Centre	12710		1807561	6643	0.00073	1375.91
Namafouada	131				0.00204	490.61
Samakofara Centre	1199	11			0.00170	589.63
Kouremalé Centre	8784		2585632	13099	0.00069	1444.20
Franwalia Centre	5807		1128427	31777	0.00254	393.02
Balato Centre III	6354		1202149	21979	0.00181	553.22
Fatoya Centre	11449		1830130	14269	0.00139	720.00
Maléah Centre	2245	22			0.00159	629.81
Faraboloni	436	4			0.00170	589.63
Nanen Traoré Centre	4362		1086426	8944	0.00056	1789.74
Dankakoura Centre	1734	17			0.00159	630.10
Saourou Centre	4372		297145	4635	0.00106	942.45
Sougoula Centre	2362	23			0.00160	625.83
Talabé Centre	648	6			0.00168	595.09
Nyor Nyor	668	6			0.00173	577.27
Dara Bowé Centre	1315	13			0.00157	635.37
Peguéty	247	2			0.00192	520.40
Dougouwoulen	334	3			0.00173	577.27
Angona	87	1			0.00135	738.73
Thiuopoutel	497	4			0.00193	517.26
Bassanya II	644	6			0.00167	598.79
Secteur II	7182		741157	67814	0.01022	97.80
Dianyabhè Mosquée	1525	15			0.00158	632.16
Dow Kougue	16	1			0.00025	4016.86
Gadha Thiolliwel	174	1			0.00271	369.37
Yalaya	103	1			0.00160	623.98
Gnekori	85	1			0.00132	756.11
Dioma Roundé	413	4			0.00161	622.47
Laami	121	1			0.00188	531.15
Donghol Doubhi	131	1			0.00204	490.61
Koya Centre	139	1			0.00216	462.37
Diaguitarè	113	1			0.00176	568.76
Kousen	234	2			0.00182	549.31
Dioloki	285	2			0.00222	451.02

Population 3 months to 7yrs of age: unweighted 1,484; weighted 938,345.

Total population (all ages, slept in the household the night before the survey): unweighted 3,010; weighted 1,874,896. Census estimate (2014) total population: 2,570,789.

**Table A3: Standard error, design effect and rate of homogeneity for the main indicators**

Indicator	Value	s.e.	95%CI	Deff	Deff <sub>weight</sub>	Deff <sub>cluster</sub>	roh	b
<b>Mean number of treatments per child</b>	2.93	0.247	2.44,3.43	27.55	1.173	23.48	0.579	39.81
<b>Coverage of 4 cycles</b>	0.626	0.063	0.492,0.743	20.22	1.287	15.71	0.308	48.74
<b>Adherence</b>	0.734	0.066	0.583,0.845	26.94	1.381	19.51	0.467	40.63
<b>Reach of SMC programme</b>	0.790	0.065	0.629,0.892	30.12	1.217	24.76	0.612	39.81
<b>Coverage of cycle 1</b>	0.734	0.062	0.592,0.839	23.06	1.177	19.59	0.479	39.81
<b>Coverage of cycle 2</b>	0.764	0.063	0.615,0.868	25.99	1.194	21.76	0.535	39.81
<b>Coverage of cycle 3</b>	0.735	0.063	0.592,0.842	23.74	1.391	17.07	0.414	39.81
<b>Coverage of cycle 4</b>	0.701	0.064	0.559,0.813	22.93	1.222	18.77	0.458	39.81
<b>Awareness of SMC dates</b>	0.886	0.037	0.787,0.943	7.24	1.501	4.82	0.220	18.39
<b>LLIN coverage in children</b>	0.432	0.053	0.329,0.542	13.61	1.179	11.55	0.272	39.81
<b>LLIN coverage (all ages)</b>	0.400	0.048	0.307,0.499	28.95	1.147	25.25	0.251	97.64
<b>Proportion that could sleep under LLIN (if 2/net)</b>	0.355	0.040	0.278,0.440	21.43	1.149	18.65	0.183	97.64
<b>Proportion of households with an LLIN</b>	0.574	0.055	0.461,0.679	6.50	1.232	5.28	0.245	18.47
<b>Proportion of households with a 1 LLIN per 2 people</b>	0.148	0.030	0.098,0.218	3.64	0.958	3.80	0.160	18.47
<b>Caregiver knowledge about SMC</b>	8.0	0.201	7.6,8.4	4.82	1.188	4.06	0.176	18.39
<b>Reported CHW adherence to guidelines</b>	7.2	0.083	7.6,7.9	3.76	0.884	4.25	0.163	20.87
<b>SMC directly observed</b>	0.826	0.066	0.653,0.923	36.84	1.266	29.10	0.709	40.63

The rate of homogeneity, roh, was calculated as  $(Deff_{cluster}-1)/(b-1)$ , where  $Deff_{cluster}$  is the design effect due to clustering, calculated from the overall design effect, and the design effect due to weighting,  $Deff_{clustering} = Deff_{overall} / Deff_{weighting}$ , and b is the weighted mean cluster size,  $b = \sum n_i^2 / \sum n_i$  (where  $n_i$  is the number of respondents in cluster i).

Figure A1: Example of a cluster showing GPS location of dwellings surveyed





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