

Seasonal Malaria Chemoprevention in Chad: Coverage surveys 2017

Final report

Acknowledgments.....	3
Summary	4
Background	6
Methods.....	10
Selection of clusters:.....	10
Logistics, training and data collection:.....	10
Statistical methods:	11
Number of treatments administered:	12
Results:.....	14
Cycle 1:	14
Cycle 3:	18
Cycle 4:	20
Awareness about the cycle 4 SMC campaign:	20
SMC coverage at cycle 4:	21
Directly observed treatment (DoT):.....	22
Caregiver knowledge about SMC:.....	22
Adherence by health workers to SMC guidelines as reported by caregivers:.....	23
Time taken to receive SMC:	24
Comparison of results for cycles 1,3 and 4:.....	25
Coverage of SMC at each cycle as determined from the final survey:	26
Adverse events:.....	29
Bednet coverage:	30
Coverage in relation to the number of treatments administered:.....	33
Comparison of estimates of coverage after each cycle and from the final survey:	35
Annex:	39
CSSI survey report	39
Images of Child SMC Treatment Cards – Cycle 1	44
Access database interface showing survey data and corresponding card image.	45
Examples of GIS mapping of dwellings visited.....	46

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Summary

Malaria caused by *Plasmodium falciparum* is the most common cause of health facility attendance in Chad, where there were an estimated 2 million cases of malaria and 7000 deaths due to malaria in 2016 (WHO 2017). Seasonal Malaria Chemoprevention (SMC) was introduced in Moissala district in 2012, and in 2014 SMC was expanded to include the districts of Bouna, Mangalme, Mongo and Bitkine. In 2015, SMC was implemented in a wider area through the ACCESS-SMC project, in Chari-Baguirmi region (in the districts of Massenya, Dourbali and Mandélie) and in Hadjer-Lamis region (in the districts of Massakory, Massaguet and Mani). In 2016 the ACCESS-SMC area was further expanded to cover the city of N'Djamena, Bokoro district in Hadjer-Lamis, and Ba-Illi, Bousso and Kouno in Chari-Baguirmi. In 2017, with the addition of Bongor district in Mayo-Kebbi Est, the total population targeted was 630,000 children.

Coverage of the ACCESS-SMC programme was assessed through surveys at the end of the 2015 and 2016 transmission seasons. These found that in 2015, 96% of children in ACCESS-SMC areas received SMC, but only 24% received four treatments. In 2016, when the city of N'Djamena was included in the programme, 92% of children received SMC at least once, and 12% received 4 treatments. The latter figure was low due to the fact that the first SMC cycle was not fully implemented due to delays in registration of dispersible tablets in 2016. Steps were taken to improve delivery in 2017, including increased supervision and engagement with regional authorities in N'Djamena. Cluster-sample surveys were undertaken after the first, third¹ and fourth SMC cycles, using the same sample clusters, to assess SMC coverage. At the final survey, caregivers were asked about treatment in each of the previous months, and results compared with the estimates obtained immediately after each cycle, to find out whether coverage assessment could be done in future through a single survey after the final SMC cycle.

Sixty clusters were selected with probability proportional to size, with a total of 1012 children were surveyed after cycle 1, 1261 after cycle 3 and 968 after cycle 4. SMC was determined by caregiver recall and from the SMC cards which were available for 61% of children in the cycle 1 survey, 51% in cycle 3 and 44% in cycle 4. In those who had a card, when caregivers were asked about treatments without referring to the card, caregiver-reported treatment each month agreed with the treatments recorded on cards (95% to 99% agreement).

SMC was received by 78% of eligible children surveyed after cycle 1, 93% after cycle 3, and 83% in cycle 4. The first dose of each treatment was administered by the CHW in 88% of cases in cycle 1, 92% in cycle 3, and 89% in cycle 4. Reported adherence to the unsupervised doses of amodiaquine was high, with 95% of children who received SMC in cycle 1, 99% in cycle 3 and 100% in cycle 4 reported to have completed the course of treatment,

The mean coverage per cycle over the 4 cycles, as determined from the final survey, was 86%. A total of 67% of children received four treatments. Coverage was similar in boys and girls. Delivery was equitable, mean coverage per cycle was 86% in the poorest of five wealth rankings and 88% in the highest ranking.

Communication about campaign dates resulted in 64% of households being aware of the date of the cycle 1 campaign in advance, while 63% were aware of cycle 3 dates, and 58% were aware of cycle 4 dates. The main sources of this information were health workers, friends or neighbours, and the radio in N'Djamena, and in rural areas, health workers, friends or neighbours and criers.

¹ Cycle 2 survey was not implemented due to operational delays by the survey firm.

Coverage in N'Djamena Nord and N'Djamena Sud increased sharply from cycle 1 to cycle 3, despite the fact that a similar number of treatments were administered in each cycle. This may reflect a much larger population temporarily present in parts of these districts during cycle 1, but could also reflect treatments being administered outside the age range at cycle 1, which were then corrected before the subsequent cycles. A similar number of treatments was administered in Mayo Kebi Est and N'Djamena Nord in each cycle, but this yielded higher levels of coverage in Mayo Kebi Est, again indicating that populations were under-estimated in N'Djamena, or that more treatments were being administered outside the age range for SMC in N'Djamena, or both.

When coverage determined at cycle 1 and cycle 3 was compared with retrospective estimates of coverage at the same cycles from the final survey, there was close agreement in terms of the mean coverage per cycle, but some differences in terms of the coverage in the individual cycles. To compare the estimates of coverage at cycle 1 and cycle 3 (obtained after each cycle) with the estimates obtained at the final survey, the analysis was restricted to the clusters that were surveyed in all 3 surveys, and to children eligible for 4 treatments (aged 3-59 months at cycle 1). The mean coverage per cycle (cycles 1 and 3) was 86% based on the post-cycle surveys and 88% from the retrospective survey.

The estimate of coverage at cycle 1, from the cycle 1 survey, was 79%, compared to 89% for the retrospective estimate. The corresponding figures for cycle 3 were 93% and 87%. These differences could have arisen if caregivers interviewed in the final survey recalled the number of treatments accurately but may have misclassified the month they were received. This is supported by the fact that in the survey questionnaire, caregivers were asked about the total number of treatments in two different ways, and the responses agreed closely. However, the alternative possibility, that there were changes in population after cycle 1, and that the people who left after cycle 1 tended to be those who did not receive SMC, cannot be excluded. This supports the conclusion from other studies that assessment of coverage at the end of the transmission season gives reliable estimates of the mean coverage per cycle and the number of treatments received. Estimates of cycle-specific coverage could be improved if cards were more widely used and retained and CHWs record treatment dates more consistently.

Caregivers were asked 10 questions about their understanding of SMC. Questions focused on:

- the purpose of SMC and whether it can prevent malaria or malaria and other diseases
- the number of tablets to be taken each day
- the number of months a child should receive SMC
- the importance of adherence and completing the treatment course
- the need to seek care if the child becomes unwell, and
- not to use the tablets to treat another person or someone who is unwell.
-

Most were answered correctly except for the last two questions, which were answered correctly by only 58% and 43% of caregivers respectively.

When caregivers were asked about the steps followed by the health worker when they visited for SMC at cycle 4, most reported that the health worker checked the child's age and explained about administering the tablets. It was less common for them to check for fever or to explain about side effects of the drugs, and few CHWs asked if the child had taken other medications in the last month or had allergies to any medicines.

Bed net use the night before the survey was assessed for all household members. 71% of all household members slept under an LLIN and this was similar in all age groups (the marked dip in

coverage in adolescents seen in other surveys was not evident in this survey). LLIN coverage was lower in Hadjer Lamis and N'Djamena and highest in Mayo Kebbi Est and was slightly higher in the highest socioeconomic group (75%) than the poorest group (71%). There was no difference in LLIN coverage by gender. Access to an LLIN (the percentage of the population that could sleep under a LLIN if one net was shared between two people) was 74%. 93% of households had at least one bed net, 78% had at least one LLIN, and 77% of households had one LLIN for every two household members.

Coverage of SMC improved substantially in 2017. For further improvement, steps may need to be taken to limit treatment to children under 5 years, through training and by highlighting the issue in community sensitisation activities. There may be a need to consider providing SMC for older children above the age of 5 years, using appropriate dosing for the older age groups, but SMC should be limited to under 5s until this can be done in a planned manner. It may be useful in future surveys to ask about SMC treatment of older members of the household. In the 2017 surveys, children up to age 7 were included and the same information was collected for children up to this age, however it may also be useful to add a simple question for older children (up to age 18, for instance) to find out if they received SMC and if so how many times. In the final surveys a household roster was made for checking bed net use. Each person or each child up to age 18 could be asked if they received SMC (without asking for any more detailed information).

It would also be useful to list household members who slept there the night before and note any children whose caregiver was not available to answer questions in order to better document non-response rates. It may also be useful to monitor population movements in SMC distribution areas. This might be done through local informants, or by selecting a sentinel community in each major area of implementation and doing a census each month, to better understand population changes. Health staff were not interviewed systematically as part of the survey. This would have been useful to better understand factors for suboptimal coverage and should be planned as part of future surveys. However, some factors behind variations in coverage were reported to the survey team, which included travel costs for CHWs to reach more remote communities which were reported not to be adequately covered in CHW payments in some rural areas, and in N'Djamena that community sensitisation before each cycle was not enough, which is borne out by the relatively low percentage of households that were aware of campaign dates.

Background

Chad has a population of about 12 million. Malaria is the most common cause of outpatient attendance, which is caused by *P.falciparum* (over 98% of cases) transmitted mainly by *An. arabiensis* and *An.gambiae*. The northern third of the country in the Sahara desert is sparsely populated. The central zone is Sahelian with highly seasonal malaria transmission. The southern zone, which has the highest population, has a longer malaria season. Chad was ranked 185 out of 188 countries in the 2015 UNDP Human Development Index in 2015. The infant mortality rate was estimated to be 72/1000 and the child mortality rate 133/1000 in 2015 (DHS 2014/5), Table 1. Chad hosts displaced people from Sudan, Nigeria and other countries. In 2013 refugees from Darfur fled to Chad. In Dec 2017, UNHCR estimated there are about 600,000 people displaced by crisis living in Chad, in the Lake Chad region, in camps near borders with Sudan and CAR, and in urban areas of N'Djamena and Bongor.

The WHO estimates there were two million cases of malaria and 7000 deaths due to malaria in Chad in 2016 (WHO 2017). The Malaria Atlas Project prevalence estimates for Chad appear to underestimate the malaria burden (<https://map.ox.ac.uk/research-project/the-impact-of-malaria-control-on-plasmodium-falciparum-in-africa-2000-2015/>). They are based on very limited prevalence data (the most recent being a small study in Ndjamenena in 2004 – prevalence has not been measured in

recent DHS and MICS surveys). A study in Bongor district in 2006 estimated an Entomological Inoculation Rate of 311 bites/person/year (Kerah-Hinzoumbé et al., 2009), the majority of these bites occurring between August and October (Figure 1).

SMC was first implemented by MSF in 2012 in Moissala district, and in 2014 was expanded to include Bouna district (by MSF), Mangalme (UNICEF), Mongo and Bitkine districts (Chad government). In 2015, SMC was implemented in a wider area through the ACCESS-SMC project, in Chari-Baguirmi region (districts of Massenya, Dourbali and Mandélie) and in Hadjer-Lamis region (districts of Massakory, Massaguet and Mani). In 2016 the ACCESS-SMC area was expanded to cover the city of N'Djamena, Bokoro district in Hadjer-Lamis, and Ba-Illi, Bousso and Kouno in Chari-Baguirmi. In 2017, Bongor district in Mayo-Kebbi Est were added (Figure 2).

A case control study in NDjamena and Koundoul showed that SMC treatments provide a high degree of personal protection with 78% efficacy against malaria over 4 weeks. Coverage of the ACCESS-SMC programme was assessed through surveys at the end of the 2015 and 2016 transmission seasons. These found that in 2015, 96% of children in ACCESS-SMC areas received SMC at least once, 63% received at least three treatments, and 24% received four treatments. In 2016, when the city of N'Djamena was included in the programme, 92% of children received SMC at least once, 40% of children received at least three treatments, and 12% received four treatments. The latter figure was low due to the fact that the first SMC cycle was not fully implemented due to a shortage of drugs in 2016. Steps were taken to improve delivery in 2017, including increased supervision and engagement with regional authorities in N'Djamena. Cluster-sample surveys were undertaken after the first, third and fourth SMC cycles to assess SMC coverage. At the final survey, caregivers were asked about treatment in each of the previous months, and results compared with the estimates obtained immediately after each cycle, to find out whether coverage assessments could be done in future through a single survey after the final SMC cycle. Preliminary results were reported shortly after each survey was completed. The final results are presented in this report.

Table 1: Population indicators in the regions of Chad, from DHS 2014/15 (SMC regions are highlighted).

Region	Population (2009)	Literacy*	LLIN Use#	5q0	% households by socio-economic ranking				
					lowest	Low	middle	high	highest
Batha	527,031	11.9%	25.0%	101	29.5%	26.4%	20.9%	14.9%	8.2%
Borkou Tibesti	119,221	14.5%	6.0%	106	13.0%	9.4%	24.2%	30.7%	22.8%
Chari Baguirmi	621,785	5.8%	44.5%	178	11.1%	19.8%	28.4%	35.3%	5.4%
Guéra	553,795	14.9%	32.6%	146	27.2%	21.7%	16.3%	14.1%	20.8%
Hadjer-Lamis	562,957	4.6%	13.3%	111	10.5%	15.9%	27.9%	35.6%	10.2%
Kanem	354,603	3.8%	1.8%	99	5.9%	11.7%	25.5%	47.0%	9.9%
Lac	451,369	1.7%	20.9%	104	5.4%	14.7%	32.2%	39.1%	8.5%
Logone Occ.	683,293	31.1%	24.1%	194	26.2%	20.2%	15.6%	10.9%	27.1%
Logone Oriental	796,453	25.0%	40.4%	230	31.4%	22.7%	19.8%	16.5%	9.5%
Mandoul	637,086	22.2%	46.7%	151	31.7%	25.6%	18.7%	16.0%	7.9%
Mayo Kebbi Est	769,178	28.3%	51.9%	149	18.1%	28.7%	21.7%	23.5%	7.9%
MayoKebbi Ouest	565,087	41.8%	47.0%	144	14.7%	20.5%	22.7%	29.2%	12.9%
Moyen Chari	598,284	35.8%	66.6%	163	24.2%	20.4%	13.4%	7.4%	34.5%
Ouaddaï	731,679	5.5%	30.4%	99	32.0%	23.0%	21.5%	10.0%	13.6%
Salamat	308,605	8.0%	32.5%	145	19.5%	21.8%	19.9%	19.1%	19.7%
Tandjilé	682,817	25.6%	27.3%	203	21.5%	26.5%	21.1%	18.3%	12.5%
Wadi Fira	494,933	2.6%	2.7%	67	13.0%	28.2%	31.4%	23.6%	3.8%
N'Djaména	993,492	58.6%	58.3%	138	0.1%	0.0%	0.1%	0.5%	99.4%
Barh El Gazal	260,865	4.6%	9.7%	69	15.0%	12.3%	26.7%	33.8%	12.3%
Ennedi Est/Ouest	173,606	16.8%	3.0%	104	10.1%	11.7%	23.7%	44.9%	9.6%
Sila	289,776	6.8%	35.5%	101	43.2%	26.8%	18.3%	10.0%	1.6%

*Literacy: percentage of women 15-49 years who attended secondary school or can read part of a sentence
 #LLIN use: percentage of children under 5 year of age who slept and an LLIN, of those who slept in the household the night before the survey

Figure 1: Entomological inoculation rate in Bongor district in 2006 and 2007 (Kerah-Hinzoumbé et al. (2009) Malaria vectors and transmission dynamics in Goulmoun, a rural city in south-western Chad. BMC Infectious Diseases 2009, 9:71 doi:10.1186/1471-2334-9-71).

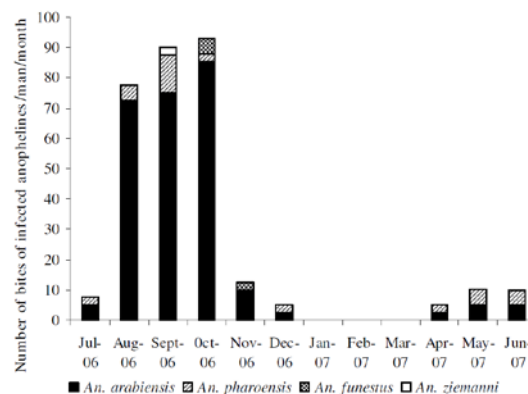


Figure 2: In 2017, SMC was implemented in Hadjer-Lamis, Chari-Biguirmi, Mayo-Kebbi Est regions and in N'Djamena.

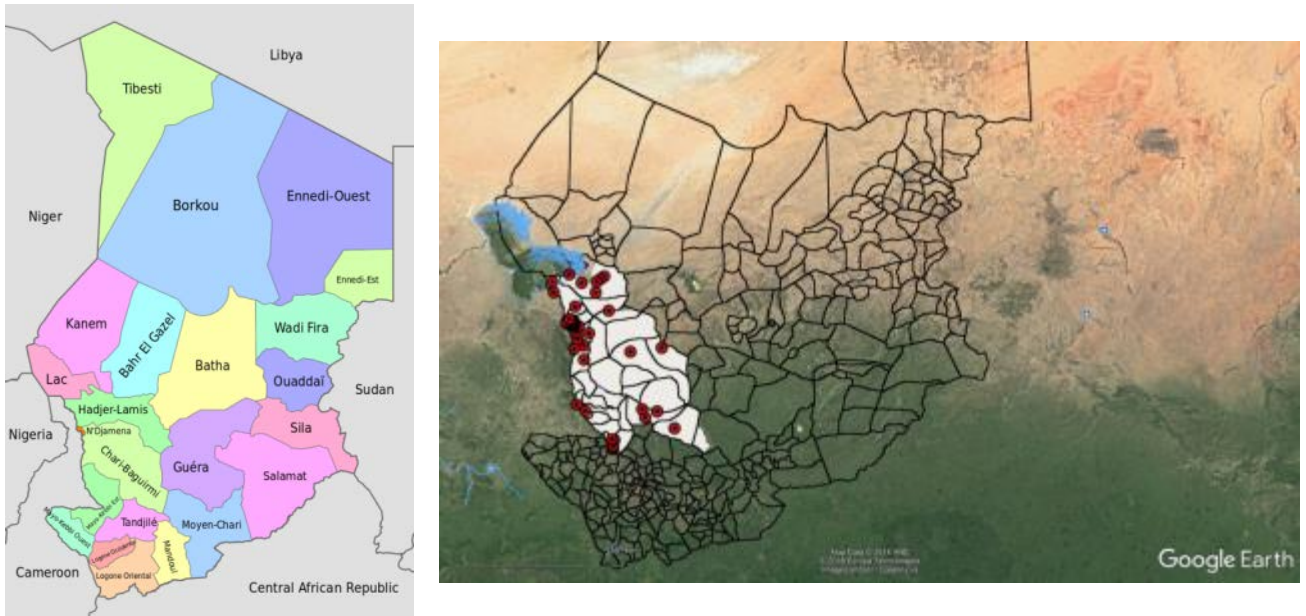
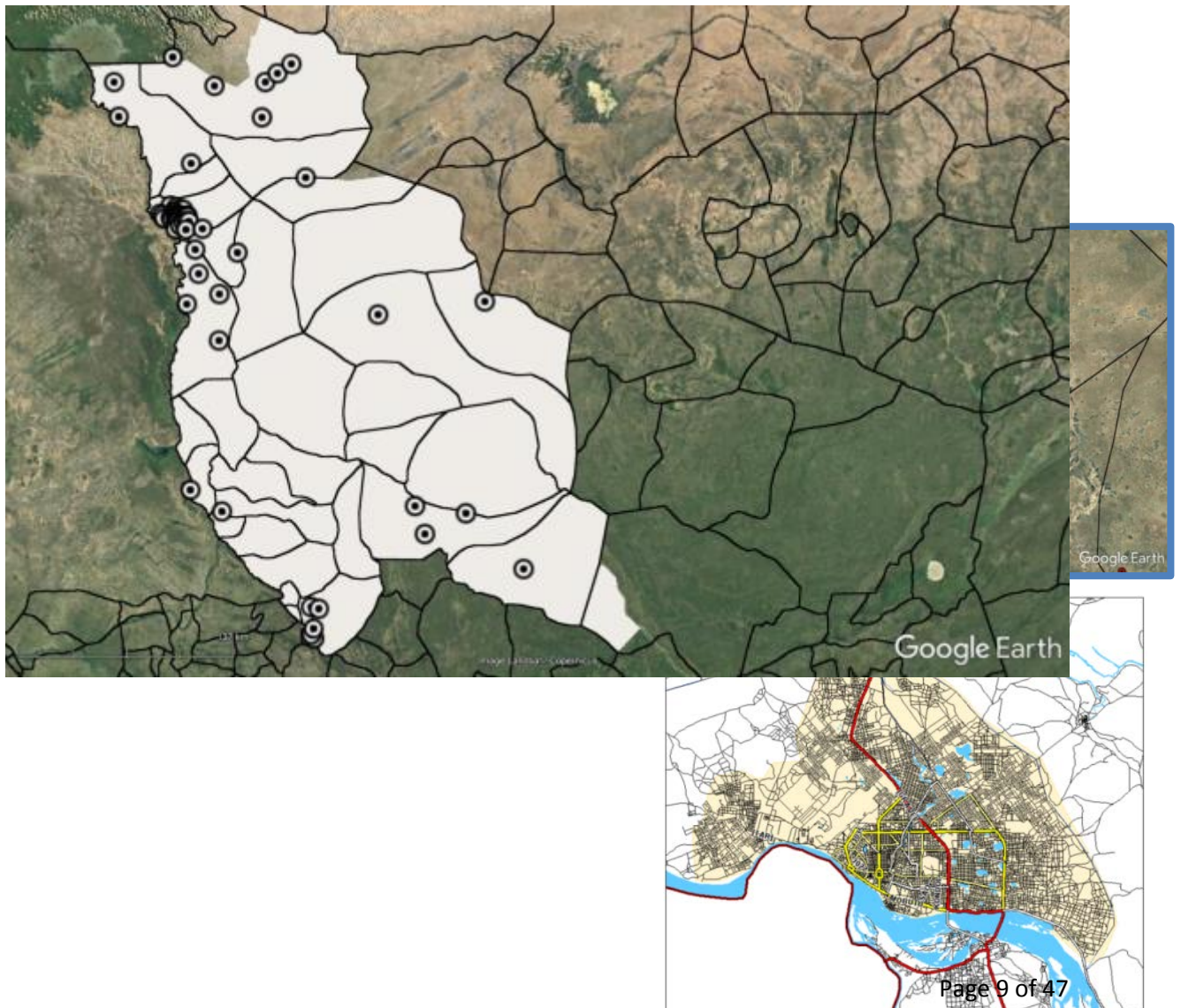


Figure 3: Location of survey clusters in N'Djamena



Methods

Selection of clusters:

The sampling frame for the 2016 survey was used in 2017. Meetings were held with the national malaria control programme and administrative officials from the 14 districts to explain the survey and to obtain updated population estimates from each district. 60 settlements were selected from a list of all settlements in the 14 districts where SMC was implemented (Figure 3), with probability proportional to estimated population size (PPS sampling), by systematic sampling after sorting by district to give an implicit stratification. Larger settlements were divided into *carrés* of approximately equal size, and one of these then chosen at random. For each selected settlement or *carré*, a sketch map was prepared which showed areas of habitation or blocks of compounds, roads, and any schools, mosque and other features. The map was then used to divide the settlement or *carré* into segments of approximately equal population, based on the estimated population of the village in order to have about 100 individuals (of all ages) in each segment. The segments were numbered, the map photographed, and the number of segments entered into the tablet PC which select one by simple random sampling. Each segment was expected to yield, on average, about 20 children aged 3 months to 7 years, the target sample size for the survey required for the survey being 1200 (60 x 20). The same clusters and segments were to be surveyed after cycle 1, 2, 3 and 4. For logistical reasons it was not possible to do the planned survey after cycle 2. All dwellings in the selected segments were to be surveyed, and all children aged 3 months to 7 years included in the survey. The sample size was chosen to have a margin of error of about +/-6% for an overall estimate of coverage, if coverage was about 80% and assuming a rate of homogeneity of 0.3 based on previous surveys, while having adequate precision in important subgroups (e.g. about +/- 10% in each of 3 equal geographical strata if coverage is 80% and somewhat better precision for groupings that are primarily within clusters, for example for 5 wealth rankings if these were within-cluster groupings there would be an expected margin of error on a coverage of 80% of about +/-8%).

Logistics, training and data collection:

Surveys were conducted after the first, third and fourth SMC cycles in 2017. Each survey was preceded by training of interviewers and supervisors, and piloting of survey forms and data collection. The cycle 1 survey took place from the 8th to 14th September 2017, the cycle 3 survey from the 30th October to the 5th November 2017, and the final survey from 15 to 29 December 2017. Staff training was organised before each survey (on Sep 5, Oct 25 and 13 Dec 2017), which included familiarising staff with the survey forms, survey methods, and pre-testing of data collection. A short questionnaire was used in cycle 1 and cycle 3 and a longer questionnaire, including demographic and socioeconomic variables and details of bed net use by all household members, for cycle 4. The iForm platform was used for data capture in the cycle 1 survey, and the Dharma system for the later surveys.

Staff were organised in four teams, each team included a supervisor (one of whom acted as overall survey coordinator), three interviewers and a driver. Local guides were identified in consultation with community leaders in each cluster. Each team was equipped with Google nexus tablets for data collection, a generator to charge the tablets at the end of each day, and an internet connection modem to allow data to be uploaded at the end of each day. At the end of each day, the team supervisor checked the records entered on each tablet before uploading to the server at LSHTM, where the project data manager checked the records received for completeness. Supervisors conducted repeat interviews for quality control and staff supervision (about 3% of interviews), and any discrepancies were discussed with the interviewer. Each dwelling in the selected segment was visited, and signed consent on paper consent forms was sought from each caregiver after explaining

the aims and the nature of the survey questions. All children between the ages of 3 months and 7 years at the time of the survey, were included. Data were collected on Google nexus tablets which were also used to record GPS coordinates of each household, and to photograph SMC record cards. One call-back was arranged if a caregiver was way to minimise non-response. In the cycle 1 and cycle 3 surveys, a short questionnaire was used including details about awareness of campaign dates, SMC treatments received, whether the first dose was administered directly observed, and adherence to the doses on days 2 and 3. At cycle 4, a longer questionnaire was used, which included a household roster with details of bednet use by each person, questions about socioeconomic status, and questions about caregiver knowledge about SMC, side effects of treatments, and questions about the process of SMC administration.

We did not attempt to follow individuals cycle-to-cycle in a cohort study, this would have required issuing individual ID to caregivers or children, which was considered undesirable as, knowing they were part of a cohort, it may have influenced SMC uptake by caregivers, defeating the objective of estimating coverage. SMC cards could not be used as they are linked to receipt of SMC. The same survey segment was visited each time and field workers instructed to include every dwelling, and every child, at each visit.

Statistical methods:

The estimated total population size of the survey area was 2,672,134 based on the population estimates provided by each district. A sampling interval of $2,672,134 / 60 = 44,536$ was used to select 60 settlements with probability proportional to size, using systematic sampling from a list of all 3,590 settlements in the survey area (districts of Bar-illi, Bongor, Bousso, Dourbali, Kouna, Mandelia, Mani, Massaguet, Massakory, Massenya, N'Djamena Centre, N'Djamena Est, N'Djamena Nord and N'Djamena Sud), after sorting by district to give an implicit stratification. Population size of settlements ranged from 97 to 78,226. For 36 larger settlements which were divided into *carrés*, one *carré* was selected by simple random sampling. The number of *carrés* ranged from 2 to 63. A rough sketch map of each selected settlement or *carré* was made showing areas of habitation and local landmarks. Each map was then divided into segments of approximately equal size. The number of segments was chosen so that one segment would be expected to yield approximately the required number of children, based on the estimated total population size.

As far as possible, when creating segments, advantage was taken of local features to facilitate identification of segment boundaries on the ground. The number of segments ranged from 1 (i.e. the whole settlement or *carré* was included) to 170. 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 for inclusion. 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. $1000/60 = 17$ children on average from each settlement). Each map was therefore divided into $S = \text{floor}(N_i \times 0.2 / 17)$ segments, where N_i was the estimated population. 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 3 months and 7 years who had stayed in the house the night before the survey was included. 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 17 if the population data were accurate. The sampling probability is $p_i = 60 \times (N_i / NT) \times (1 / C_i) \times (1 / S_i)$ for individuals in settlement i . Here, N_i is the estimated population of village i and NT is the total population of the 14 districts, C_i the number of *carrés* ($C_i = 1$ if no division by *carré*) and S_i is the number of segments. The sampling weight for each child (the number of

children in the population that each child surveyed represents) was 1/π. This approach to sample selection was taken because of the importance of ensuring unbiased selection of participants. The alternative, random selection from a list of dwellings, relies on the listing being complete, if the listing tends to avoid the same hard to reach dwellings that were missed by the door to door delivery teams, coverage estimates will be over-optimistic. Compact segment sampling, whereby all dwellings are included in a defined area, is less prone to subjectivity of selection and easier to monitor by supervisors. This method was therefore chosen despite the drawback that sample size is less predictable.

Coverage was estimated for children eligible for 4 treatments (those aged 3-59 month at cycle 1), and for those eligible for SMC at the particular cycle (aged at least 3 month at the time of the cycle and aged less than 5 years at cycle 1). The definition of these analysis groups, taking into account that age is accurate to the month for children under 1 and to the year for older children, is given in Table 2. 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).

In this report, coverage is reported overall, and for each of the following regions/districts (Chari Baguirmi, Hadjer Lamis, Mayo Kebbi Est, N'Djamena Est, N'Djamena Nord, N'Djamena Centre, N'Djamena Sud), i.e. for each rural regions and in N'Djamena, for each district of the city.

Table 2: Age groups for reporting SMC coverage

Age of children:	Eligibility:	Analysis:
Final survey:		
>3months and <5yrs at survey	definitely eligible for cycle 4	coverage at cycle 4
>3months at cycle 1 and <5yrs at survey	definitely eligible for 4 cycles	coverage of 4 cycles
≥6yrs at final survey	not eligible for SMC	coverage outside age range
<3 months at cycle 4	not eligible	Excluded
>5yrs and <6yrs at survey	possibly eligible	Excluded*
Cycle1:		
<3 months at survey	not eligible	Excluded
>3months and <5yrs at survey	definitely eligible for cycle	coverage at cycle
>5yrs at C1	not eligible	coverage outside age range
Cycle 3:		
<3 months at survey	not eligible	excluded
>3months and <5yrs at survey	definitely eligible for cycle	coverage at cycle
>5yrs and <6yrs at survey	possibly eligible	excluded
≥6yrs at survey	not eligible for SMC	coverage outside age range

*excluded as we can't be certain about eligibility in this age group. A child aged 59 months at cycle 1 would be 5 years and 2 months or 5 years and 3 months in the survey after cycle 4; a child aged 5 years and 4 months at the final survey would not have been eligible at cycle 1. But we may not know the exact age - if the age of the child is given as "5yrs" without the number of months, they may or may not be eligible to have received SMC. For this reason we restrict analysis to those we are sure were eligible to receive 4 treatments.

Number of treatments administered:

The number of treatments administered in each district in each cycle are given in Table 3. A total of 2,750,577 treatments were administered in 2017, to a target population of 634,406 children. A total of 663,893 treatments were administered in cycle 1 and 668,547 in cycle 2. Slightly more (8% more) were administered in cycle 3 (718,737), and 699,400 (5% more than cycle 1) in cycle 4.

Table 3: Number of SMC treatments administered in 2017

Region	District	Target population 3-59 months	Number treated			
			C1	C2	C3	C4
N'Djamena	N'Djamena Est	67,653	73,180	73,739	80,312	81,403
N'Djamena	N'Djamena Centre	73,716	77,695	81,130	83,713	82,458
N'Djamena	N'Djamena Nord	68,629	59,501	62,407	65,555	62,845
N'Djamena	N'Djamena Sud	99,909	113,004	99,557	135,935	119,259
Chari-Baguirmi	Ba-Illi	21,783	23,140	23,207	23,462	23,578
Chari-Baguirmi	Bouso	21,682	22,451	21,569	23,661	19,020
Chari-Baguirmi	Dourbali	45,058	43,373	50,715	52,317	47,717
Chari-Baguirmi	Kouno	7,222	7,867	8,004	8,110	8,068
Chari-Baguirmi	Mandelia	41,195	41,581	40,145	40,804	42,216
Chari-Baguirmi	Massenya	34,493	39,981	39,693	38,545	39,169
Hadjer-Lamis	Massaguet	32,687	32,687	32,825	28,449	33,005
Hadjer-Lamis	Mani	18,543	20,341	20,412	20,523	20,603
Hadjer-Lamis	Massakory	43,633	52,130	55,539	55,648	58,991
Mayo-Kebbi Est	Bongor	58,203	56,962	59,605	61,703	61,068
	TOTAL	634,406	663,893	668,547	718,737	699,400

Results:

Cycle 1:

The cycle 1 survey took place between 8th September and 14 September 2017. A total of 733 households were visited (Table 3), 78% (571/733) agreed to participate in the survey, the reasons for non-response were that the team were unable to find someone to speak with (n=90) or unable to access the compound (n=2); the household refused to participate (n=16); or there were no children aged between 3 months and 7 years in the household (n=54). One village could not be visited at cycle 1.

Overall, 78% of eligible children (aged 3-59 months) received SMC (Table 4) and the first dose was supervised by the CHW in 88% of cases (Table 5) and for 97% of treated children the caregiver reported that both the unsupervised doses were administered (Table 6). 61% of eligible children had an SMC card available for inspection at the survey (Table 7).

In Chari Baguirmi, Hadjer Lamis and Mayo Kebbi Est and N'Djamena, coverage was 91%, 88%, 91% and 52% respectively (Table 4). The most common reason given for not receiving SMC was that the health worker did not visit (Table 8). Among individual districts, coverage was lowest in N'Djamena Sud and N'Djamena Nord (38% and 50% respectively), as shown in Table 9 and Figures 4 and 5. Coverage of SMC amongst older children (ages 6 years or more) was 29% overall (Table 10).

Table 3: Number of households and children surveyed, cycle 1

Households surveyed:	No.
Number of households	733
No response	162 (22%)
Number surveyed	571 (78%)
Children surveyed:	
Number of children surveyed	1330
Number of children eligible for SMC (3mons–5yrs)	1012
Number of children 5-6yrs of age	175
Number of children 6-7 years of age	143

Table 4: Coverage of SMC, cycle 1

Region	No. of eligible children	% received SMC (95%CI)
Chari-Baguirmi	224	92.3% (81.4%,97.1%)
Hadjer-Lamis	226	87.9% (63.2%,96.9%)
Mayo-Kebi Est	132	90.9% (75.9%,96.9%)
N'Djamena Centre	90	81.5% (70.6%,89.0%)
N'Djamena Est	139	65.8% (36.7%,86.5%)
N'Djamena Nord	60	49.8% (10.1%,89.8%)
N'Djamena Sud	141	37.9% (15.8%,66.4%)
TOTAL	1012	77.8% (67.1%,85.8%)

Table 5: Directly observed treatment (DoT):

Administration of dose 1	No.	%
By the CHW	653/757	88.1
By the caregiver, observed by the CHW	1/757	0.1
By the caregiver, not observed	25/757	3.5
Not administered	78/757	8.2

Figure 4: Coverage at cycle 1, by cluster: The percentage of eligible children who received SMC in each cluster is shown (clusters in N'jdamera not shown, these can be seen in Fig 5).

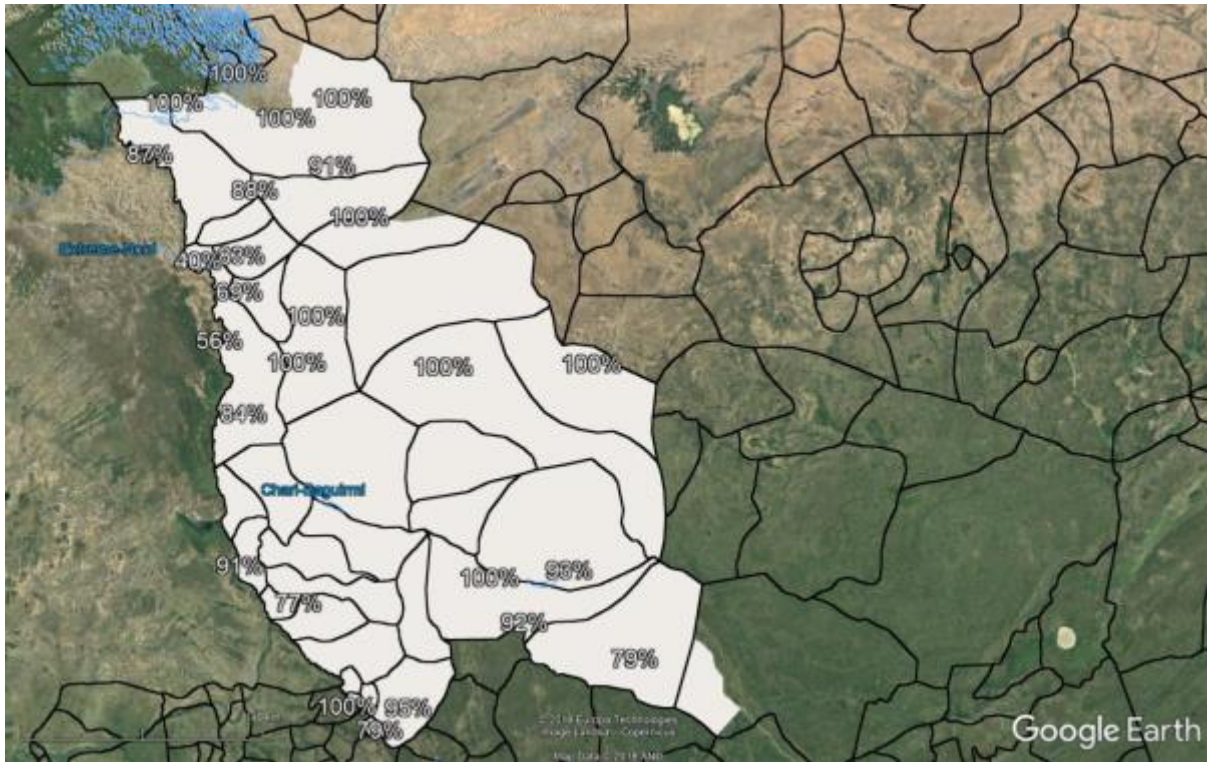


Figure 5: Coverage at cycle 1, by cluster (N'Djamena):

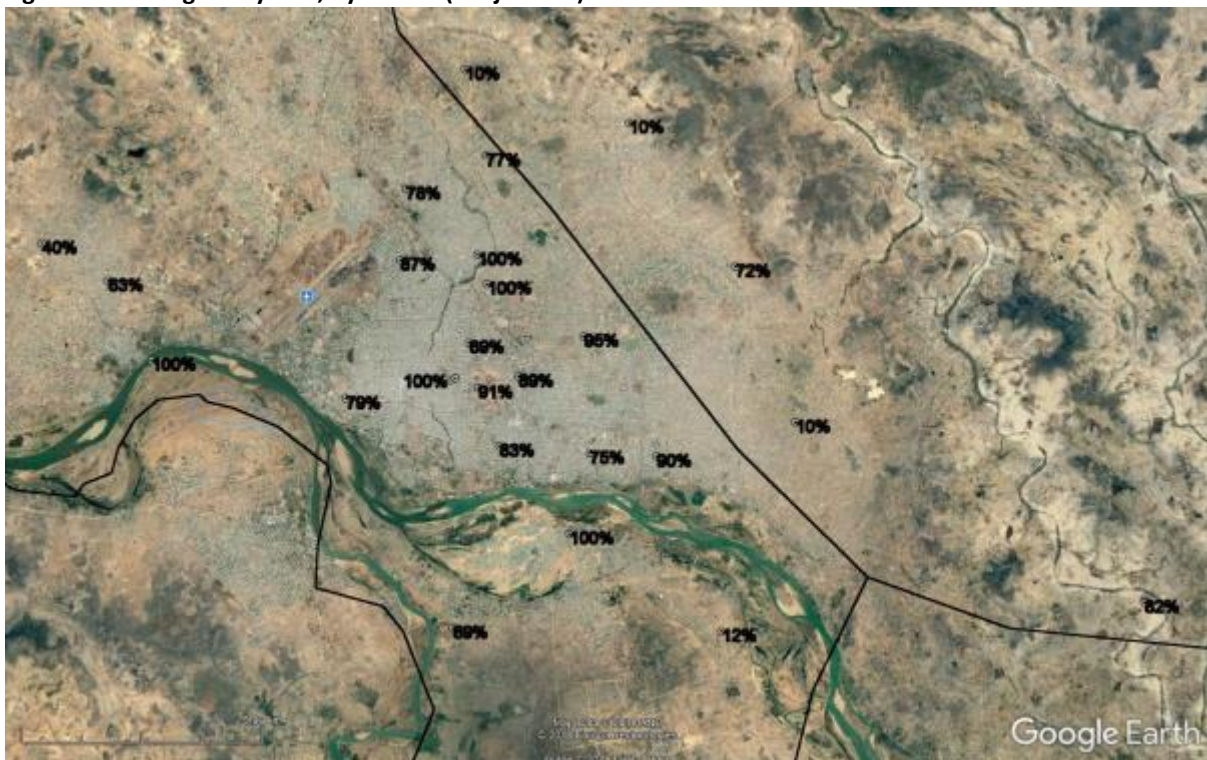


Figure 6: Percentage of SMC treatments in cycle 1 that were supervised by the community health worker in N'Djamena:

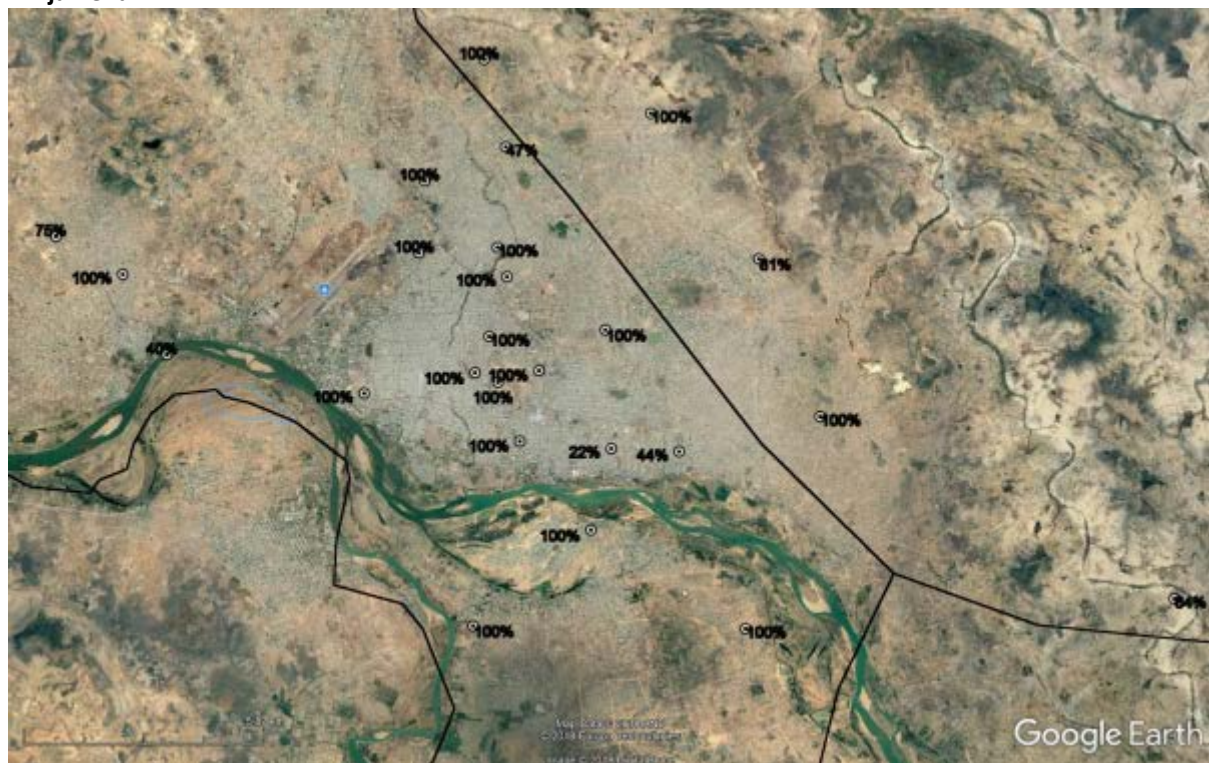


Table 6: Adherence:

Did not complete dose 2 or 3	12/755	2.0%
Completed dose 2 only	7/755	1.2%
Completed dose 3 only	1/755	0.2%
Completed dose 2 and 3	735/755	96.6%

Table 7: Card retention and completion

Given an SMC card	730/1012	72.5%
SMC card retained	588/730	83.0%
Card available at survey	588/1012	61.2%
Card correctly completed	588/730	83.0%

Table 8: Reasons for missed treatment (number of caregivers who responded)

Reason	Chari Baguirmi	Hadjer Lamis	Mayo Kebbi Est	N'Djamena
Child was living away from home	0	3	0	1
Child was away on the day	1	1	2	6
Child was unwell	1	0	1	4
The health worker did not visit the household	14	16	3	130
Family refused: state reason	0	0	0	1
Caregiver not available	1	3	4	5
Other reason - please specify	3	1	2	5
Total	20	29	12	238

Table 9: Coverage of SMC amongst eligible children, by district

	n/N	%	95% CI
SMC Coverage - Overall	783/1012	77.5	(66.8-85.5)
SMC Coverage - by District			
Bai-illi	14/15	93.3	(93.3-93.3)
Bongor	121/132	90.9	(75.9-96.9)
Bouso	36/39	92.3	(91.1-93.4)
Dourbali	45/57	79.8	(42.5-95.5)
Kouno	11/14	78.6	(78.6-78.6)
Mandelia	48/51	95.7	(77.2-99.3)
Mani	49/52	94.0	(75.2-98.8)
Massaguet	55/59	93.1	(84.6-97.1)
Massakory	95/115	81.8	(36.1-97.3)
Massenya	48/48	100.0	
N'Djamena Centre	77/90	81.5	(70.6-89.0)
N'Djamena Est	94/139	65.8	(36.7-86.5)
N'Djamena Nord	29/60	49.8	(10.1-89.8)
N'Djamena Sud	61/141	37.9	(15.8-66.4)

Table 10: Coverage of SMC in older children

	No.	%
No. surveyed		
5-6 years of age	175	
6-7 years of age	143	
SMC Coverage – 6-7 yrs	43/143	29.2
SMC Coverage – 6-7 yrs, by district		
Bai-illi	0/0	0.0
Bongor	5/8	59.1
Bouso	0/1	0.0
Dourbali	0/1	0.0
Kouno	1/2	50.0
Mandelia	4/4	100.0
Mani	4/11	37.1
Massaguet	6/15	39.7
Massakory	5/26	46.1
Massenya	0/0	0.0
N'Djamena Centre	3/11	46.1
N'Djamena Est	5/23	25.6
N'Djamena Nord	4/12	20.1
N'Djamena Sud	6/29	20.1

Cycle 3:

The cycle 3 survey took place between 30th October and 5th November 2018. A total of 703 households were visited and 72.7% (511/703) agreed to participate in the survey. Reasons for non-response were: interviewers unable to access compound (n=5) or unable to find someone to speak with (n=99); household refused to participate (n=15); or no children aged between 3 months and 7 years (n=73). Two villages could not be visited. 1834 children were surveyed of whom 1017 were aged 3 to 59 months (Table 11).

90% of eligible children received SMC. Coverage was 94%, 94% and 99% and 82% in Chari Baguirmi, Hadjer Lamis, Mayo Kebbi Est and N'Djamena respectively (Table 12). The reasons given for not receiving SMC was the health worker did not visit, or that the child was away on the day. Among individual districts (Table 13), coverage was lowest in N'Djamena Est (73%) and Kouno Nord (78%).

87% of first doses were administered by the CHW (Table 14). 13% were left with a caregiver but it is not known if the treatment was administered. 86% of children had received an SMC card, but only 63% had the card available for inspection by the survey team. All of the cards inspected appeared to be correctly completed according to the caregivers report of treatments received (Table 15). When caregivers were asked about adherence to amodiaquine doses on days 2 and 3, 98.5% of children were reported to have taken both doses (Table 16). Coverage of SMC amongst older children (aged 6 or more) was 63% (Table 17).

Table 11: Response rates and number of households and children surveyed at cycle 3.

Households:	
Number of households	703
Number with no response	192
Number surveyed	511
Children:	
Number of children surveyed	1834
Number of children eligible for SMC (3months–5yrs)	1017

Table 12: Coverage at cycle 3.

Region	No. of eligible children	% received SMC (95%CI)
Chari-Baguirmi	306	95.6% (89.0%,98.3%)
Hadjer-Lamis	288	95.6% (90.6%,98.0%)
Mayo-Kebi Est	164	99.5% (97.8%,99.9%)
N'Djamena Centre	127	79.3% (51.3%,93.3%)
N'Djamena Est	141	75.3% (43.8%,92.3%)
N'Djamena Nord	81	83.6% (54.2%,95.6%)
N'Djamena Sud	154	93.6% (81.3%,98.0%)
TOTAL	1261	93.3% (89.4%,95.8%)

Table 13: Coverage of SMC by district

District		
Bai-illi	27/27	100.0%
Bongor	159/161	98.8%
Bouso	43/46	93.5%
Dourbali	65/68	95.6%
Kouno	25/32	78.1%
Mani	26/27	96.3%
Massaguet	70/73	95.9%
Massakory	103/111	92.8%
Massenya	39/39	100.0%
NDjamena Centre	86/104	82.7%
NDjamena Est	103/141	73.0%
NDjamena Nord	55/69	79.7%
NDjamena Sud	110/119	92.4%

Table 14: Directly observed treatment (DoT):

Dose 1 administered by:	%
By the CHW	86.6%
By the caregiver, observed by the CHW	0.2%
By the caregiver, not observed	0.5%
Not Done	12.6%

Table 15: Card retention

Given an SMC card	781/911	85.7%
Card retained	495/781	63.4%
Card correctly completed	495/781	63.4%

Table 16: Adherence

Did not complete dose 2 or 3	8/909	0.9%
Completed dose 2 only	6/909	0.7%
Completed dose 2 and 3	895/909	98.5%

Table 17: Treatment of older children

Number 5-6 years of age	207	
Number 6-7 years of age	90	
Chari Baguirmi	10/12	83.3%
Hadjer Lamis	15/25	60.0%
Mayo Kebbi Est	9/15	60.0%
N'Djamena	23/38	60.5%
TOTAL	57/90	63.3%

Cycle 4:

The cycle 4 survey took place between 15th December and 29th December 2017. A total of 682 households were visited, 65.4% agreed to participate in the survey, the reasons for non-response were: refusal to participate (n=33); no access to compound (n=12); unable to find someone to speak with (n=112); no children between 3 months and 7 years of age (n=79) (Table 18). Two villages could not be visited due to security issues.

A total of 1264 children were included in the survey. 945 were aged at least 3 months and less than 5 years at cycle 4 and were therefore definitely eligible for SMC, 836 were eligible to receive 4 treatments, 174 were aged 5-6 years who may have been eligible to receive SMC at cycle 4, and 142 were aged 6-7 years and therefore above the age limit for SMC. A more detailed questionnaire was used at cycle 4 including questions about caregiver knowledge of SMC, caregiver sociodemographic characteristics, and bednet use by all members of the household.

Table 18: Number of households, caregivers, children and other household members surveyed

Households surveyed	No. of households	%
Agreed to participate	446	65.4
Refused to participate	33	4.8
No access to compound	12	1.8
Unable to find someone to speak with	112	16.4
No children between 3 months and 7 years in the household	79	11.6
TOTAL	682	

Children Surveyed	No. of children
Aged 3-59 months at cycle 4 survey (eligible for SMC at cycle 4)	945
Aged 3-59 months at cycle 1 (eligible for 4 SMC treatments)	836
Aged 5-6 years at cycle 4 survey	174
Aged 6-7 years at cycle 4 survey (>5 years of age at cycle 1)	142
TOTAL (3 months to 7 years at cycle 4 survey)	1264

Caregivers surveyed	845
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Total population surveyed:	No. of household members
Slept in the household the night before the survey	3344
TOTAL	3580

Awareness about the cycle 4 SMC campaign:

In total 65% of households were aware about the date of the SMC campaign. In N'Djamena, they were primarily informed of this from health workers, neighbours and local radio, in other areas from health workers, neighbours, and from criers (Table 19). Awareness was therefore relatively low, with 35% of households not being aware in advance of the date of the cycle 4 campaign.

Table 19: Percentage of households that had heard the date when cycle 4 would start in their village, and the source of the information

Region	Household aware of date of SMC in advance	From friends/ neighbours	From health worker	From crier	Banner/ poster	On the radio	On TV	Mosque/ Church
Chari-Baguirmi	76.2% (60.1%,87.2%)	35.6%	23.3%	17.1%	0.0%	6.3%	0.0%	0.0%
Hadjer-Lamis	55.6% (37.7%,72.2%)	12.2%	45.9%	37.3%	0.0%	1.2%	0.0%	6.9%
Mayo-Kebi Est	58.2% (48.1%,67.6%)	15.1%	31.1%	24.2%	2.9%	3.4%	0.0%	0.0%
N'Djamena Centre	70.0% (50.1%,84.4%)	13.5%	30.8%	4.8%	7.6%	30.8%	3.3%	6.6%
N'Djamena Est	65.3% (49.2%,78.5%)	17.9%	33.6%	11.6%	0.0%	18.7%	0.0%	0.0%
N'Djamena Nord	71.4% (53.0%,84.6%)	25.9%	13.0%	8.4%	8.4%	33.1%	0.0%	0.0%
N'Djamena Sud	65.8% (50.3%,78.6%)	30.1%	29.3%	7.3%	0.0%	25.9%	0.0%	0.0%
TOTAL	64.6% (56.5%,72.0%)	22.9%	33.4%	19.9%	0.7%	12.3%	0.1%	2.4%

SMC coverage at cycle 4:

A total of 81.5% of children aged 3-59 months at cycle 4 received SMC (Table 20). Coverage was highest in Chari Baguirmi (89%) and lowest in Hadjer Lamis (73%). When asked about adherence to the amodiaquine doses, almost all caregivers reported that they had administered both doses (99.9%). The coverage among children eligible for all 4 SMC cycles (aged 3-59 months at cycle 1) was 79.9%.

Table 20: Percentage of children who were definitely eligible at cycle 4 (aged 3-59 months), who received SMC, and of those who received SMC, the percentage who received all 3 daily doses:

Region	% received SMC	% of those treated, reported to have received 3 doses	Number of eligible children
Chari-Baguirmi	89.4% (72.6%,96.4%)	100% (97.4%,100%)	158
Hadjer-Lamis	73.3% (57.2%,85.0%)	100% (97.6%,100%)	205
Mayo-Kebi Est	83.6% (62.2%,94.1%)	100% (95.6%,100%)	100
N'Djamena Centre	92.1% (83.7%,96.4%)	98.7% (89.6%,99.8%)	123
N'Djamena Est	78.7% (63.2%,88.9%)	100% (96.9%,100%)	156
N'Djamena Nord	60.7% (39.2%,78.8%)	100% (86.8%,100%)	43
N'Djamena Sud	87.1% (78.1%,92.7%)	99.4% (95.9%,99.9%)	160
TOTAL	81.8% (75.0%,87.0%)	99.8% (99.1%,100%)	945

The most common reason for not receiving SMC at cycle 4 was that the health worker did not visit (Table 21). For the few that did not administer the second dose, the reasons given were that the CHW had not left the medicine (4) and that the child lost the tablets (1), and for the third dose, that the child refused (3) lost the tablets (1) and did not receive tablets (2).

Table 21: Reasons for not receiving SMC at cycle

Reason	%
Caregiver not available	11.1
Child has history of allergies to drugs	0.1
Child was away at the time	5.0
Child was living away from home	0.1
Child was unwell	1.6
Family refused	1.3
Not applicable	2.1
Other reason	20.2
The health worker did not visit the household	58.4
Unable to take child to health worker	0.0

Directly observed treatment (DoT):

The dose of SP and the first dose of AQ were administered by the health worker for 90% children, while for the remaining 10%, the medicine pack was left with the caregiver to administer the first days doses unsupervised. This practice was most common in N'Djamena where only 78% of children who received SMC blister packs had the first dose administered by the health worker (Table 22). However, unlike in Sokoto in Nigeria, where adherence was poorer when the first dose was not supervised, in N'Djamena, caregivers reported a high degree of adherence. The reasons given by the small number of caregivers who did not give the doses of amodiaquine on day 2 or 3 were that they (the caregiver) were away, the child refused, the child had side effects from the treatment, the caregiver did not understand the need to give the second and third dose, and the doses had been given to another person.

Table 22: 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:

Region	First dose administered DoT	Second dose administered	Third dose administered
Chari-Baguirmi	100.0%	100.0%	100.0%
Hadjer-Lamis	100.0%	100.0%	100.0%
Mayo-Kebi Est	92.0%	100.0%	100.0%
N'Djamena Centre	75.0%	100.0%	98.7%
N'Djamena Est	77.8%	100.0%	100.0%
N'Djamena Nord	100.0%	100.0%	100.0%
N'Djamena Sud	77.5%	100.0%	100.0%
TOTAL	90.4%	100.0%	99.9%

Caregiver knowledge about SMC:

Caregiver knowledge was assessed based on correct responses to the following questions:

Question	Correct answer
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

The mean score was 8.1 out of 10 (Table 23), the questions answered less well were Q8 (can I use the tablets to treat someone who is unwell), and Q10 (should I take the child to the health centre if they are unwell after SMC), table 24.

Table 23: Caregivers' knowledge scores on SMC and reported CHW practice scores

Region	Average caregiver knowledge score (out of 10)	Average reported CHW score for adherence to guidelines (out of 8)
Chari Baguirmi	7.7	2.4
Hadjer Lamis	8.3	3.3
Mayo Kebbi Est	7.5	3.5
N'Djamena Centre	7.9	3.1
N'Djamena Est	8.6	2.5
N'Djamena Nord	6.8	4.1
N'Djamena Sud	8.5	3.4
Total	8.1	3.1

Table 24: Percentage giving correct responses on individual knowledge questions:

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Chari-Baguirmi	68%	92%	62%	93%	96%	98%	92%	13%	89%	63%
Hadjer-Lamis	61%	98%	90%	98%	100%	100%	96%	61%	86%	38%
Mayo-Kebi Est	57%	73%	70%	94%	99%	100%	92%	7%	88%	72%
N'Djamena Centre	55%	89%	86%	77%	95%	95%	88%	58%	92%	55%
N'Djamena Est	69%	94%	86%	95%	100%	100%	96%	70%	95%	50%
N'Djamena Nord	30%	100%	51%	88%	88%	88%	79%	25%	71%	58%
N'Djamena Sud	59%	87%	93%	95%	100%	100%	98%	44%	96%	78%
TOTAL	62%	91%	82%	94%	99%	99%	95%	43%	90%	58%

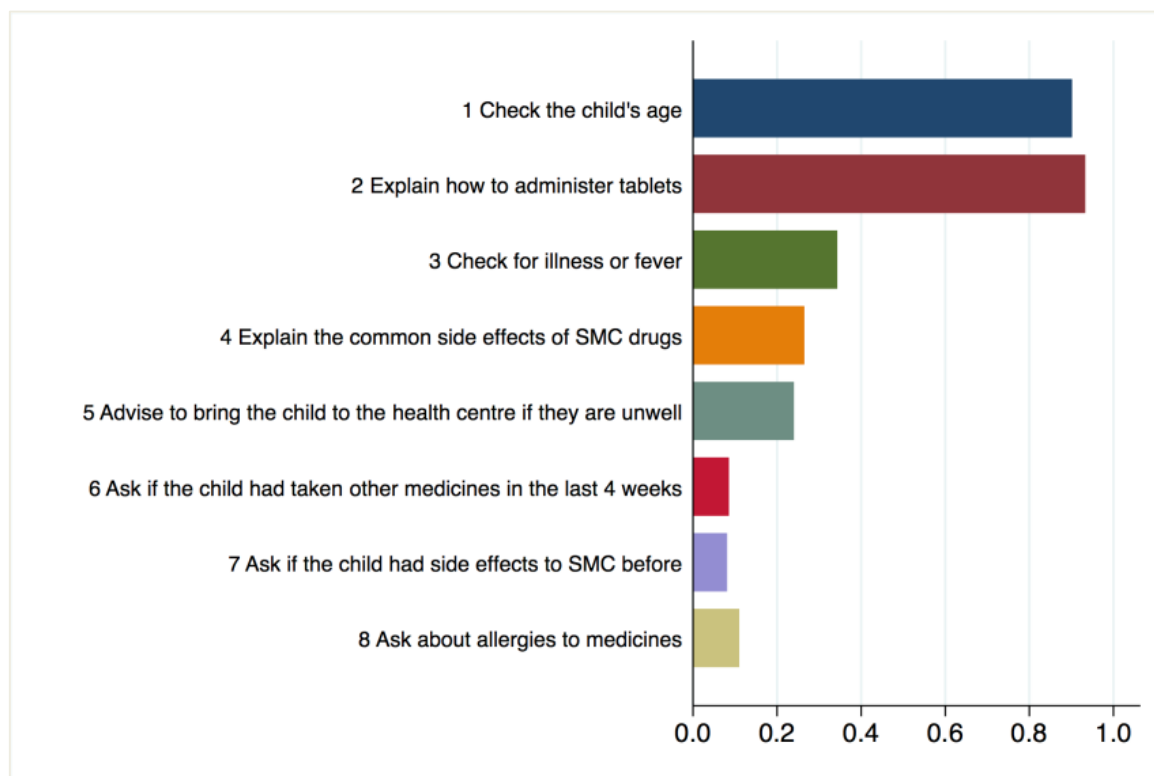
Adherence by health workers to SMC guidelines as reported by caregivers:

When caregivers were asked about the steps followed by the health worker when they visited for SMC at cycle 4, most reported that the health worker checked the child's age and explained about administering the tablets. It was less common to check for fever or to explain about side effects of the drugs, and few asked if the child had taken other medications in the last month or had allergies to any medicines (Table 25, Figure 7).

Table 25: Percentage of caregivers who reported that the action was performed by the CHW at the last visit:

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
	Check age	Check for fever	Ask about allergies	Ask about SMC side effects	Ask if taken other medicine	Explain how to administer	Explain side effects	Advise to seek care if child unwell
Chari-Baguirmi	88%	21%	6%	3%	2%	82%	20%	17%
Hadjer-Lamis	88%	54%	17%	11%	11%	99%	32%	20%
Mayo-Kebi Est	100%	53%	18%	16%	16%	95%	21%	27%
N'Djamena Centre	94%	36%	26%	15%	12%	85%	10%	29%
N'Djamena Est	96%	16%	2%	0%	5%	94%	24%	15%
N'Djamena Nord	100%	49%	42%	14%	14%	100%	42%	43%
N'Djamena Sud	100%	38%	12%	14%	10%	100%	32%	35%
TOTAL	93%	38%	12%	10%	9%	94%	27%	24%

Figure 7: Proportion of caregivers who said CHWs adhered to guidelines on specific tasks:



Time taken to receive SMC:

The household member present during SMC administration was the mother in 95% of cases (Table 26). Of those who responded about the time spent waiting for the health worker to come, and the time taken to administer SMC in the household, most reported they waited less than one hour, and said the CHW spent less than 15 minutes at the household, with few reporting that SMC administration for the household took more than 30 minutes (Table 27).

Table 26: Member of the household present when SMC was administered (one respondent per household)

Who waited with the child	% of households
Aunt	0.8
Father	1.9
Grandmother	2.0
Mother	94.7
Sister	0.7

Table 27: Time spent to receive SMC:

Time waiting for CHW	% households	Time to receive SMC	% households
<1 hour	58.1%	<15 minutes	57.3%
1-2 hours	4.8%	15-30 minutes	12.5%
Up to half a day	1.5%	30 minutes	0.7%
		Long wait	0.4%
Don't know	35.6%	Don't know	29.1%

Comparison of results for cycles 1,3 and 4:

The key results from the cycle 1, 3 and 4 surveys are presented in Table 28. Higher coverage of SMC was associated with better communication in advance of the cycle (Figure 8).

Table 28: Key results from each survey

*Percentage of households that knew the date of the SMC campaign in advance

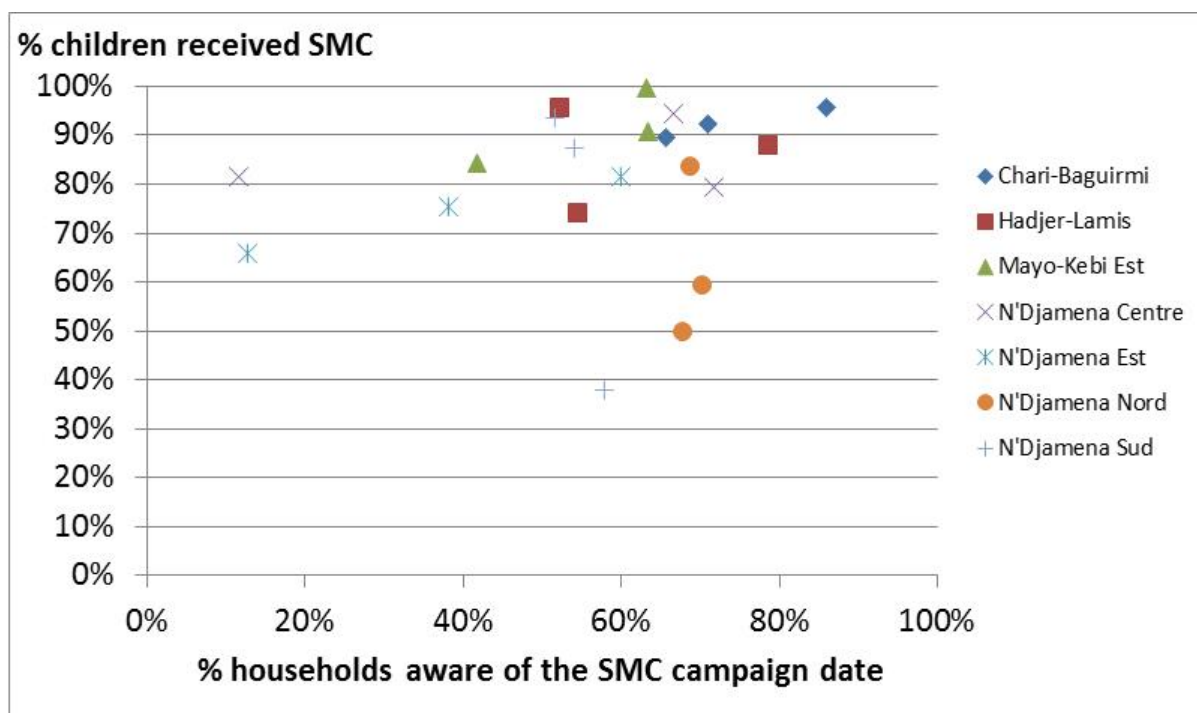
	Chari- Baguirmi	Hadjer- Lamis	Mayo- Kebi Est	N'Djamena Centre	N'Djamena Est	N'Djamena Nord	N'Djamena Sud	TOTAL
Cycle 1:								
No. of clusters	12	10	7	7	8	5	10	59
No. of households	113	120	72	53	72	32	83	545
No. of children	224	226	132	90	139	60	141	1012
Aware date SMC*	71%	79%	63%	12%	13%	68%	58%	64%
Received SMC†	92%	88%	91%	81%	66%	50%	38%	78%
Dot‡	89%	91%	80%	100%	84%	51%	85%	88%
Adherence#	99%	99%	92%	94%	86%	98%	80%	95%
Card available	77%	76%	62%	32%	44%	44%	25%	61%
Cycle 3:								
No. of clusters	12	10	7	7	8	5	9	58
No. of households	128	128	76	60	58	36	75	561
No. of children	306	288	164	127	141	81	154	1261
Aware date SMC*	86%	52%	63%	72%	38%	69%	52%	63%
Received SMC†	96%	96%	100%	79%	75%	84%	94%	93%
Dot‡	98%	99%	77%	100%	57%	70%	89%	92%
Adherence#	99%	97%	98%	99%	100%	100%	99%	99%
Card available	59%	56%	57%	16%	26%	49%	42%	51%
Cycle 4:								
No. of clusters	13	10	7	6	8	5	9	58
No. of households	75	88	49	54	56	17	84	423
No. of children	161	197	106	128	157	47	172	968
Aware date SMC*	66%	55%	42%	67%	60%	70%	54%	58%
Received SMC†	90%	74%	84%	95%	82%	60%	87%	83%
Dot‡	100%	100%	91%	76%	78%	100%	75%	89%
Adherence#	100%	100%	100%	99%	100%	100%	99%	100%
Card available	45%	57%	72%	28%	23%	20%	34%	44%

†Percentage of children 3-59 months who received SMC

‡Percentage of treatments that were supervised by the community health worker

#Percentage of children 3-59 months who received SMC who were reported to have received both doses of amodiaquine on days 2 and 3

Figure 8: The relationship between community awareness of SMC dates in advance of each cycle and the percentage of children who received SMC.



Children were more likely to receive SMC if caregivers had heard the date of the campaign in advance (odds ratio from logistic regression 2.4, 95%CI 1.4,4.1, adjusted for district and cycle).

Coverage of SMC at each cycle as determined from the final survey:

Coverage of SMC at cycle 1, cycle 2, and cycle 3 were determined retrospectively in the final survey by inspection of SMC cards and asking caregivers about treatments at the earlier cycles. For cycles 1 and 3, these estimates can be compared to the estimates of coverage obtained immediately after those cycles (no survey was done after cycle 2).

Coverage among children eligible to receive four treatments was 89% at cycle 1, 87% at cycle 2 and 3, and 80% at cycle 4 (Table 29, Figure 9). In the first three cycles, coverage was lower N'Djamena than in other areas, but at cycle 4, coverage was lowest in Mayo Kebbi Est and Hadjer Lamis. Coverage was equitable (Table 30) with similar levels of coverage in each socio-economic group in each cycle, although at cycle 4 coverage was slightly lower in the poorest group. Coverage was similar in boys and girls (Table 31). 67% of children received SMC on four occasions, while only 3.5% of children did not receive SMC at all (Table 32). Table 33 shows the number of children according to the pattern of monthly treatments they received.

Table 29: SMC coverage among children eligible for four treatments, by region:

Region	Mean number of treatments	C1	C2	C3	C4
Chari-Baguirmi	3.65	93.2%	91.4%	91.2%	89.7%
Hadjer-Lamis	3.58	95.1%	95.1%	91.9%	75.4%
Mayo-Kebi Est	3.65	95.1%	96.8%	89.8%	83.4%
N'Djamena Centre	3.71	91.0%	92.2%	94.1%	94.1%
N'Djamena Est	3.14	79.6%	77.5%	76.0%	80.4%
N'Djamena Nord	2.89	79.0%	79.0%	71.7%	59.3%
N'Djamena Sud	3.20	79.5%	72.2%	81.1%	86.8%
TOTAL	3.45	88.9%	86.7%	87.0%	82.7%

Figure 9: SMC coverage by region as determined at the final survey

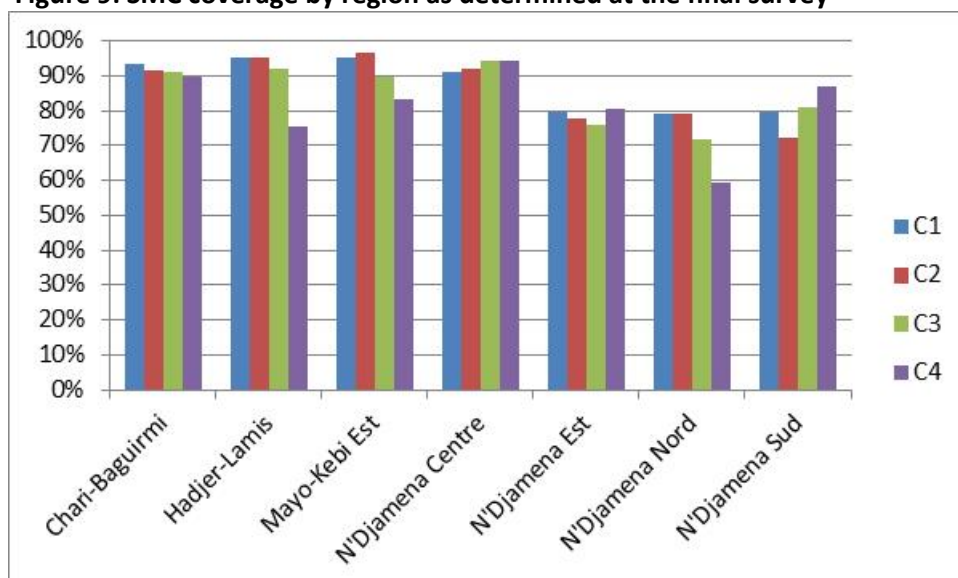


Table 30: SMC coverage among children eligible for four treatments, by socioeconomic ranking:

Wealth ranking	Mean number of treatments	% that received SMC at each cycle:			
		Cycle 1	Cycle 2	Cycle 3	Cycle 4
Lowest	3.45	89.1	88.1	93.8	73.7
Low	3.34	91.1	83.2	79.8	80.1
Middle	3.43	84.5	82.6	89.2	86.5
High	3.43	88.5	89.1	87.8	77.4
Highest	3.53	93.6	92.7	85.7	81.0

Table 31: SMC coverage among children eligible for four treatments, by gender:

Gender	Mean number of treatments	% that received SMC at each cycle:			
		Cycle 1	Cycle 2	Cycle 3	Cycle 4
Female	3.46	89.1	88.0	89.2	79.6
Male	3.41	89.6	86.3	85.3	80.3

Table 32: Number of SMC treatments: percentage of children who received SMC 0,1,2,3, or 4 times

No. of treatments	0	1	2	3	4
Chari-Baguirmi	2.3%	1.4%	2.6%	16.0%	77.7%
Hadjer-Lamis	3.8%	0.5%	2.7%	20.4%	72.6%
Mayo-Kebi Est	0.5%	2.1%	1.1%	24.5%	71.8%
N'Djamena Centre	3.7%	2.2%	1.9%	3.4%	88.8%
N'Djamena Est	9.3%	13.1%	1.5%	6.7%	69.4%
N'Djamena Nord	21.0%	0.0%	0.0%	27.0%	52.0%
N'Djamena Sud	1.9%	4.0%	20.6%	19.5%	54.0%
TOTAL	3.7%	3.1%	6.5%	17.3%	69.3%

Table 33: Percentage of children by SMC cycles received

Received SMC at cycle:				% of children
1	2	3	4	
0	0	0	0	3.5
0	0	0	1	2.3
0	0	1	0	0.0
0	1	0	0	0.0
1	0	0	0	0.8
1	1	0	0	2.9
1	0	1	0	0.0
1	0	0	1	0.9
0	1	1	0	0.9
0	1	0	1	0.9
0	0	1	1	3.5
1	1	1	0	12.9
1	1	0	1	2.9
1	0	1	1	1.9
0	1	1	1	1.4
1	1	1	1	67.4

Of children aged 6-7 years, 55% had received an SMC card. The percentage of this older group who were treated varied between regions, being highest in Chari Baguirmi (72.1%) and lowest in Hadjer Lamis (34.7%, Table 34).

Table 34: Treatment of children above the age limit for SMC (aged 6-7 years at the survey)

Region	Mean number of treatments	% Treated at cycle				Given an SMC card	Number surveyed
		Cycle 1	Cycle 2	Cycle 3	Cycle 4		
Chari Baguirmi	3.0	75.2	75.2	71.8	75.5	72.1	21
Hadjer Lamis	1.5	40.6	40.6	40.6	32.0	34.7	36
Mayo Kebbi Est	2.2	64.6	64.6	52.5	37.3	40.0	13
N'Djamena*	2.5	64.5	61.4	63.8	62.9	67.6	72
Overall	2.2	58.0	56.8	56.5	53.0	55.2	142

*Not subdivided due to small numbers

When caregiver recall about the monthly SMC treatments and the card record were compared for children who had a card, agreement was found to be high for each cycle, with kappa values (measuring the degree of agreement beyond chance agreement) ranging from 0.62 at cycle 1 to 0.93 at cycle 4, Table 35.

Table 35: 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
1	5	414	2	4	98.6	0.618
2	21	390	11	3	96.7	0.733
3	42	363	18	2	95.3	0.782
4	75	341	8	1	97.9	0.930

Adverse events:

26 children (2.6%) were reported to have been unwell since they received SMC at cycle 4 (Table 36). The symptoms were fever (23 children), vomiting (14 children), diarrhoea (5 children), yellow eyes (2 children), rash (5), abdominal pain (8), loss of appetite (10) and drowsiness (1).

Table 36: Reported adverse reactions to SMC drugs

Total number of children eligible at cycle 4	945						
Number of children unwell since the first day of this SMC cycle? n (%)	26 (2.8)						
Symptom name	Vomiting	Diarrhoea					
Number of children (%) reporting symptom out of unwell children	14 (53.8)	5 (20.8)					
Times per day							
1	0 (0.0)	0 (0.0)					
2	7 (0.7)	3 (60.0)					
3	5 (0.5)	1 (20.0)					
4	2 (0.2)	1 (20.0)					
>4	0 (0.0)	0 (0.0)					
Symptom name	Yellow eyes	Rash	Abdominal Pain	Appetite	Fever	Drowsiness	Itchiness
Number of children (%) reporting symptom out of unwell children	2 (7.7)	5 (19.2)	8 (30.8)	10 (38.5)	23 (88.5)	1 (3.8)	0 (0.0)
Severity							
mild, does not prevent play	1 (50.0)	5 (100.0)	6 (75.0)	5 (50.0)	17 (73.9)	0 (0.0)	0 (0.0)
moderate, prevents normal play	1 (50.0)	0 (0.0)	2 (25.0)	5 (50.0)	6 (26.1)	0 (0.0)	0 (0.0)
thought child needed to see someone about these symptoms	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)

Bednet coverage:

89% of children eligible for SMC slept under a bed net the night before the survey (Table 37). 71% of all household members slept under a LLIN (Table 38) and this was similar in all age groups (Table 39). LLIN coverage was lower in Hadj Lamis and N'Djamena and highest in Mayo Kebbi Est (Table 38). LLIN coverage was similar in all age groups (Table 24), the marked dip in coverage in adolescents seen in other surveys was not evident in this survey. LLIN coverage was slightly higher in the highest socioeconomic group (75%) than the poorest group (71%), Table 40. There was no difference in LLIN coverage by gender (Table 41). Access to a net (the percentage of the population that could sleep under a net if one net was shared between two people) was 88% (for any type of net, Table 42), and 74% (for LLINs, Table 43). 93% of households had at least one bed net, 78% had at least one LLIN, and 77% of households had one LLIN for every two household members (Table 44).

Table 37: Percentage of children 3-59months who slept under a bednet (of any type) the night before the survey

Region	Slept under a net (of any type) last night
Chari Baguirmi	99.6
Hadjer Lamis	73.8
Mayo Kebbi Est	98.9
N'Djamena	94.3
TOTAL	89.1

Table 38: Percentage who slept under a bednet, out of those who slept in the household the night before the survey, by region

Region	Any net	LLIN	Intact net	Net <2yrs old	No. surveyed
Chari Baguirmi	98.6	74.1	69.3	63.0	485
Hadjer Lamis	71.9	67.8	61.6	60.1	598
Mayo Kebbi Est	97.9	93.0	76.9	88.2	328
N'Djamena	94.5	68.4	60.8	49.1	1878
TOTAL	89.1	71.0	63.7	57.3	3289

Table 39: 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	88.7	71.0	62.5	57.1	1510
10-14yrs	86.9	67.3	60.3	53.7	303
15-19yrs	92.1	73.5	65.9	59.6	271
20-24yrs	91.9	65.6	68.2	62.1	221
25-30yrs	88.8	71.9	61.9	57.3	256
30-39yrs	90.3	73.3	66.9	58.3	409
40+yrs	87.4	72.4	65.5	56.1	319
TOTAL	89.1	71.0	63.7	57.3	3289

Table 40: Percentage who slept under a bednet, out of those who slept in the household the night before the survey, by wealth ranking

Wealth quintile	Any net	LLIN	Intact net	Net <2yrs old	No. surveyed
Lowest	82.8	70.6	60.2	57.9	457
Low	79.5	70.1	63.3	61.7	579
Middle	84.6	61.8	62.1	56.2	420
High	92.5	74.0	62.9	50.4	535
Highest	98.6	74.6	66.3	58.6	1283

Table 41: 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	88.7	70.4	62.8	55.9	1570
Female	89.4	71.5	64.4	58.6	1719

Table 42: 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	8+			
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
2	0.0	0.00	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1	100.0
3	19.2	0.00	0.0	80.8	0.0	0.0	0.0	0.0	0.0	0.0	35	80.8
4	13.1	0.00	0.0	0.0	86.9	0.0	0.0	0.0	0.0	0.0	63	86.9
5	11.1	0.00	0.0	0.0	1.8	83.5	3.6	0.0	0.0	0.0	61	88.9
6	15.0	0.00	0.0	0.0	0.0	2.1	82.9	0.0	0.0	0.0	55	85.0
7	9.4	0.00	0.0	0.0	0.0	0.4	2.0	86.1	2.0	0.0	51	90.6
8+	8.3	0.00	1.1	0.0	0.0	0.0	0.0	66.9	23.7	0.0	168	88.5
TOTAL	11.4	0.00	0.7	6.9	14.1	11.5	12.1	34.4	8.8	0.0	434	87.5

Table 43: 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+		
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0
2	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	1	100.0
3	26.2	0.0	7.1	66.7	0.0	0.0	0.0	0.0	0.0	35	73.8
4	36.3	5.0	10.3	1.8	46.5	0.0	0.0	0.0	0.0	63	61.2
5	18.2	6.8	4.4	0.0	11.7	55.3	3.6	0.0	0.0	61	76.8
6	25.7	4.2	7.6	5.8	8.1	2.9	45.6	0.0	0.0	55	69.0
7	14.1	2.7	2.8	2.0	14.9	10.8	8.1	44.5	0.0	51	82.4
8+	17.6	0.1	2.7	2.1	1.7	3.7	3.6	51.9	16.6	168	77.4
TOTAL	22.1	2.7	5.5	7.8	12.6	10.4	9.0	24.0	6.0	434	73.9

Table 44: 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

Region	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	
Chari Baguirmi	98.0	98.0	83.8	77.6	82.5	74.2	82.4	72.9	75
Hadjer Lamis	73.3	72.1	69.7	67.1	69.0	62.8	65.5	60.6	88
Mayo Kebbi Est	97.7	97.7	97.7	94.3	88.5	76.3	94.0	94.0	51
N'Djamena	93.1	93.1	77.5	65.4	78.2	57.4	65.1	50.1	220
TOTAL	88.6	88.2	77.9	70.5	77.1	63.8	70.9	61.0	434

Coverage in relation to the number of treatments administered:

Figure 10 shows the coverage at each cycle as determined in the final survey, in relation to the number of treatments that were administered. Coverage was lower than expected for the number administered in C4 in Hadjer Lamis and in C4 in N'Djamena Nord. Coverage was lower in N'Djamena Nord, Est and Sud compared with other areas where a similar number of treatments were administered, suggesting that the population was greater than had been estimated and/or treatments were being administered to older age groups in N'Djamena.

When the same graph is plotted for cycles 1, 3 and 4 using coverage estimated after each cycle (Figure 11), coverage is seen to be much lower in cycle 1 in N'Djamena Sud than in other cycles when a similar number of treatments were administered, and in N'Djamena Nord in cycle 1 and cycle 4 compared to cycle 3 when a similar number of treatments were administered, suggesting either changes in population between the cycles, or drugs being administered to older groups, in those cycles.

Figure 10: Relationship between coverage per cycle as determined from the final survey, and the number of treatments administered, for cycles 1-4 in each region:

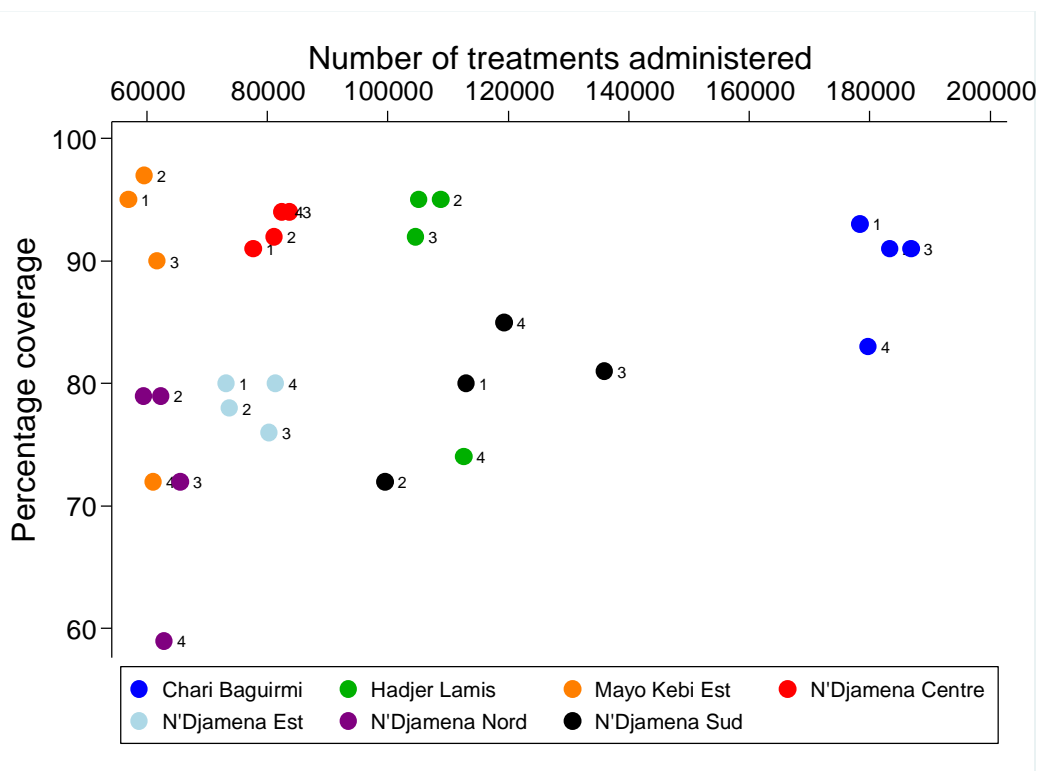
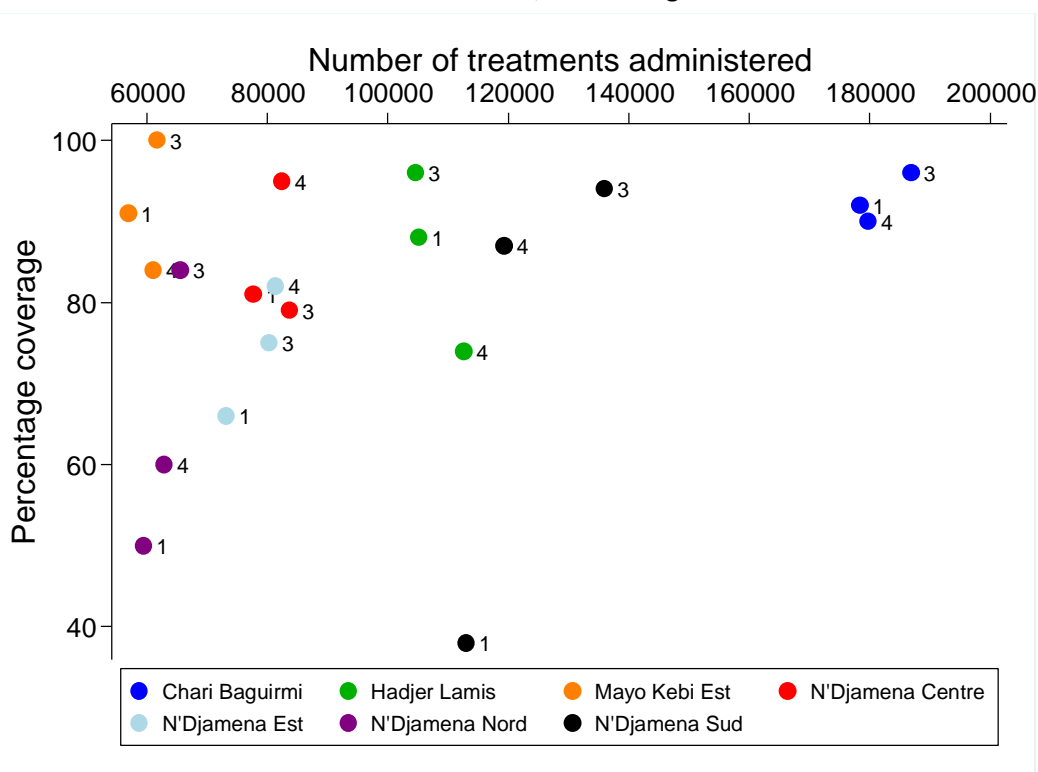


Figure 11: Relationship between coverage per cycle as determined from post-cycle surveys (1,3 and 4), and the number of treatments administered, in each region:



Treatment above the age limit was common (Table 45). The survey did not include children above the age of 7, so we cannot assess the extent of treatment above this age.

Table 45: SMC coverage in children in eligible children and children above the age limit

Region	C1		C3		C4	
	3-59m	6+yrs	3-59m	6+yrs	3-59m	6+yrs
Chari-Baguirmi	92%	67%	96%	81%	90%	82%
Hadjer-Lamis	88%	28%	96%	60%	74%	43%
Mayo-Kebi Est	91%	59%	100%	59%	84%	58%
N'Djamena Centre	81%	46%	79%	80%	95%	77%
N'Djamena Est	66%	26%	75%	48%	82%	60%
N'Djamena Nord	50%	20%	84%	76%	60%	37%
N'Djamena Sud	38%	20%	94%	85%	87%	73%

Comparison of estimates of coverage after each cycle and from the final survey:

The percentage of children who received SMC at cycle 1 and at cycle 3 was estimated in surveys conducted shortly after each cycle, and then retrospectively in the survey conducted at the end of the transmission season (after cycle 4) when caregivers were asked about treatment in each of the previous 4 cycles. To compare the estimates of coverage at cycle 1 and cycle 3, obtained after each cycle, with the estimates obtained at the final survey, the analysis is restricted to the clusters that were surveyed in all 3 surveys, and to children eligible for 4 treatments (aged 3-59 months at cycle 1). The mean coverage per cycle was 86% based on the post-cycle surveys and 88% from the retrospective survey (Table 46). The estimate of coverage at cycle 1, from the cycle 1 survey, was 79%, compared to 89% for the retrospective estimate. The corresponding figures for cycle 3 were 93% and 87%. These differences (i.e. 10.0% (95%CI -0.3%,20.4%) and -6.2% (95%CI -11.1%,-1.3%) respectively) could have arisen if caregivers interviewed in the final survey recalled the number of treatments accurately but may have misclassified the month they were received. This is supported by the fact that in the survey questionnaire, caregivers were asked about the total number of treatments in two different ways, and the responses agreed closely (Table 47). The alternative possibility, that there were changes in population after cycle 1, and the people who left after cycle 1 tended to be those who did not receive SMC, is less likely as there do not seem to have been large changes in population.

Table 47: Agreement between the number of SMC treatments received, asked in different ways in the survey questionnaire:

Sum of number of treatments declared for each month or from the SMC card	How many blister packs have you received for this child this year?					
	Missing	0	1	2	3	4
0	2	130	0	0	0	0
1	0	0	51	0	0	2
2	0	0	0	83	0	1
3	0	0	0	1	190	3
4	0	0	2	0	4	797

Table 46: Coverage among children eligible for 4 treatments (analysis limited to the clusters that were included in all 3 surveys).

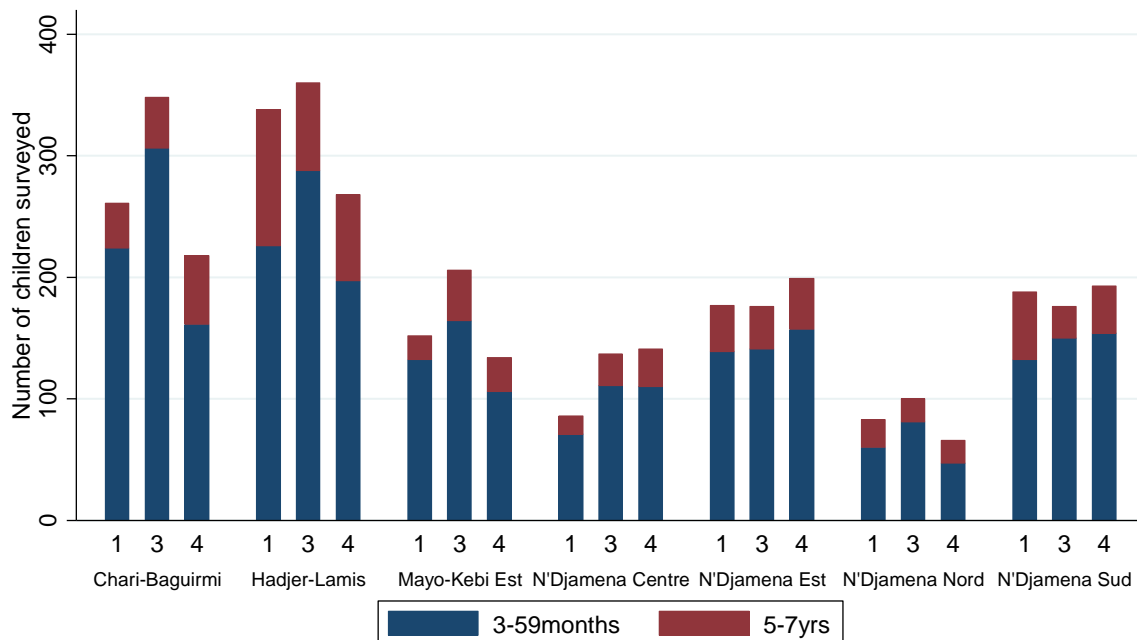
Region	Per cycle		Final survey		Difference (Final - per cycle)		Mean of C1 and C3		
	C1	C3	C1	C3	C1	C3	Per cycle	Final survey	Difference
Chari-Baguirmi	92.3%	95.6%	93.2%	91.2%	0.9% (-8.7%,10.5%)	-4.4% (-12.4%,3.5%)	94.0%	92.2%	-1.78% (-14.2%,10.7%)
Hadjer-Lamis	87.9%	95.6%	95.1%	91.9%	7.2% (-8.3%,22.7%)	-3.7% (-9.6%,2.2%)	91.8%	93.5%	1.76% (-14.8%,18.3%)
Mayo-Kebi Est	90.9%	99.5%	95.1%	89.8%	4.3% (-5.6%,14.2%)	-9.8% (-16.6%,-3.0%)	95.2%	92.5%	-2.75% (-14.8%,9.3%)
N'Djamena Centre	80.8%	78.6%	90.7%	94.5%	9.9% (-1.0%,20.9%)	15.9% (-6.4%,38.2%)	79.7%	92.6%	12.9% (-12.0%,37.8%)
N'Djamena Est	65.8%	75.3%	79.6%	76.0%	13.8% (-17.1%,44.6%)	0.8% (-28.5%,30.1%)	70.6%	77.8%	7.26% (-35.3%,49.8%)
N'Djamena Nord	49.8%	83.6%	79.0%	71.7%	29.2% (-30.1%,88.4%)	-11.9% (-40.9%,17.2%)	66.7%	75.4%	8.64% (-57.4%,74.7%)
N'Djamena Sud	41.4%	93.4%	78.3%	80.1%	36.9% (3.8%,70.0%)	-13.3% (-22.7%,-3.8%)	67.4%	79.2%	11.8% (-22.6%,46.2%)
TOTAL	78.9%	93.2%	88.9%	87.0%	10.0% (-0.3%,20.4%)	-6.2% (-11.1%,-1.3%)	86.1%	88.0%	1.90% (-9.6%,13.4%)

The differences in the estimates of coverage at cycle 1 and cycle 3 between the final survey and post-cycle surveys were greatest in N’Djamena. The total number of treatments administered in N’Djamena, as recorded from tally sheets, increased by only 2% from cycle 1 to cycle 3 (309,907 in cycle 1 and 316,833 in cycle 3), while the coverage in N’Djamena was 54% (estimated after cycle 1) and 86% (estimated after cycle 3), a rise of 59%. A possible explanation is that a larger population was present at cycle1, who moved away by the time of cycle 3. If this occurred, it should be reflected in the number of children surveyed. In the surveys, field teams were trained to visit all dwellings in the cluster and include all children who slept in the household the night before the survey, so the numbers surveyed should reflect the number present at that time. The numbers surveyed shown in Figure 12 below, indicate that there was no marked change in population size in the surveyed clusters, but there could have been temporary populations in other parts of the districts who ‘used up’ many of the SMC treatments in cycle 1. Response rates were lower than in previous surveys (Table 48) so it is possible that differences in the populations surveyed in each of the 3 surveys contributed to the differences in estimated coverage. (The surveys were not designed to follow cohorts, it was felt this might turn into an intervention in itself, cohort members being more likely to get SMC for their children and therefore no longer useful for monitoring coverage.)

Table 48: Response rates in each survey:

	C1	C3	C4
Households identified	733	703	682
No response	162	192	236
Households surveyed	571	511	446
% households responding	77.9%	72.7%	65.4%

Figure 12: Number of children included in the cycle1, cycle 3 and cycle 4 surveys.



It is possible that at cycle 1, a large number of treatments were administered to older age groups, or wasted, or used outside the designated area, which were then corrected at later cycles. A larger number of older children treated at cycle 1 than cycle 3 was not evident from the coverage among

6-7- year olds (Table 45) but our surveys included children only up to age 7, so we cannot rule out the possibility that a larger number of older individuals above 7 years were being treated.

In summary, the retrospective estimates of coverage for the ACCESS-SMC areas overestimated the coverage at cycle 1 by 10% and underestimated the coverage at cycle 3 by 6%, compared to coverage estimated shortly after each cycle. There was greater disagreement in the estimates for some individual regions, particularly N'Djamena. The retrospective estimate of the mean coverage over the two cycles, for the whole SMC area, agreed very closely with the mean from the two post-cycle surveys, and differed by 2% to 13% for individual regions. Differences in the estimated coverage for individual cycles were consistent with caregivers recalling the number of treatments accurately but misclassifying the month they were received, but may also reflect population movement.

The retrospective survey gave reliable estimates of overall coverage and of the number of treatments received (the primary indicators of coverage), but were less reliable for understanding differences in coverage at individual cycles in urban area of N'Djamena. The accuracy of assessment of SMC status in surveys could be improved by wider use of SMC cards, and training health workers to record the date on the card when they treat a child. This is an important record for the caregiver who may wish to seek treatment for their child if they miss the monthly campaign. Coverage at cycle 1 in N'Djamena was considerably lower than expected on the basis of the number of treatments administered, this could occur if there had been widespread treatment of older children at cycle 1, or blister packs were often being distributed to households at cycle 1 without the health worker administering the treatment, or a temporary population present at cycle 1 who left the areas by cycle 3, but this could not be verified.

It may be useful in future surveys to ask about SMC treatment of older members of the household. We included up to age 7 and asked all the same questions for children up to this age, however it may be useful to add a simple question for older children (say up to age 18), such as 'did you receive SMC and if so how many times?'. In the final surveys, a household roster was made for checking bed net use: each person or each child up to age 18 would be asked if they received SMC (without asking for any more detailed information). It would also be useful to list household members who slept there the night before and note any children whose caregiver was not available to answer questions in order to better document non-response rates. It may also be useful to monitor population movements in SMC distribution areas. This might be done through local informants, or by selecting a sentinel community in each major area of implementation (in Chad perhaps one rural village and one urban enumeration area) and do a census each month, to better understand population changes.

Annex:

CSSI survey report

Institution: CSSI

Lead investigator: Dr Daugla Doumagoum Moto

Country: CHAD

Start and end dates of surveys:

- Enquête couverture cycle 1 CPS: **8 au 14 septembre 2017**
- Enquête couverture cycle 3 CPS: **30 octobre au 5 novembre 2017**
- Enquête couverture cycle 4 CPS: **15 au 29 décembre 2017**

Description of work

Le Centre de Support en Santé Internationale (CSSI) dans le cadre de son partenariat avec le London School (LSHTM) et le Malaria Consortium a mis en œuvre les enquêtes de couverture de la CPS 2017 dans 14 districts sanitaires du Tchad. Les cycles de la CPS évalués sont notamment le 1^{er} cycle, le 3^{ème} et le 4^{ème}. Pour des raisons organisationnelles, l'évaluation du 2^{ème} cycle de la CPS n'a pu être réalisée.

Toutes les enquêtes d'évaluation de couverture furent précédées par des étapes préparatoires, comprenant la formation des enquêteurs et superviseurs, les pré-test des formulaires et la collecte des données.

La formation des équipes de collecte des données a porté essentiellement sur l'application Dharma et les formulaires d'enquête et le pré-test des formulaires de collecte des données.

Des activités préparatoires, notamment des réunions de travail avec les instances du Ministère de la Santé (PNLP) et les responsables des 14 districts, ainsi que la collecte des données démographiques actualisées des districts ont été menées avant les enquêtes de couverture de CPS.

Please provide a brief narrative overview/introduction of your work to date.

Process and implementation of the surveys

Please include details under each of the following areas:

Dates of the survey

Le CSSI a organisé trois (3) enquêtes d'évaluation de la couverture de la CPS 2017. Ces enquêtes de couverture ont concerné le 1^{er}, 3^{ème} et 4^{ème} cycle de la CPS 2017. Les dates relatives de ces enquêtes de couverture sont les suivantes:

- Enquête couverture cycle 1 CPS: **8 au 14 septembre 2017**
- Enquête couverture cycle 3 CPS: **30 octobre au 5 novembre 2017**
- Enquête couverture cycle 4 CPS: **15 au 29 décembre 2017**

Description of mapping and segmentation, and household selection

Pour la cartographie des villages, la segmentation des grappes et la sélection des ménages, l'équipe du CSSI a procédé selon les orientations définies dans le SOP. A l'arrivée dans chaque village retenu pour l'étude, l'équipe de collecte des données procède à la cartographie rapide du village. Sur la carte sont ressortis les principaux éléments (routes, mosquées, églises, écoles etc.).

Les blocs de concessions sont indiqués pour avoir une idée approximative des habitations. Ensuite, la carte du village est segmentée par bloc approximatif de 100 individus pour obtenir un nombre des segments en fonction de la taille démographique du village.

Dans chaque segment de 100 individus, on s'attend à au moins 20 enfants du groupe d'âge ciblé de 3 mois à 7 ans. Après avoir décidé du nombre de segments, un segment est choisi de façon aléatoire pour la collecte des données. Tous les ménages du segment sélectionné sont visités par les enquêteurs et tous les enfants cibles sont enquêtés.

Description of the organisation of the data collection

Pour toutes les enquêtes d'évaluation de couverture, le mode opératoire a été le même. Ce mode opératoire consiste à la constitution des équipes, leur déploiement dans les grappes, et la mise en œuvre de l'enquête selon la stratégie retenue. La collecte des données suit une stratégie simple, dont les principales étapes sont les suivantes:

- information préalables des autorités administratives, sanitaires et coutumières des zones de collecte des données;
- identification des guides des enquêteurs de concert avec les notables traditionnels des grappes retenues;
- la segmentation de chaque grappe retenue pour le choix du segment à enquêter;
- la numérotation des segments obtenus et le choix d'un segment de façon aléatoire ;
- l'encadrement et la mention "segment sélectionné" du segment retenu pour enquête;
- la visite de tous les ménages du segment sélectionné;
- l'inclusion de tous les enfants cibles de l'enquête par les enquêteurs;
- la notification des ménages refus pour plaider auprès du chef du village;
- la vérification des enregistrements le soir et transmission des données au serveur.

Dates and content of training

Il faut souligner que la mutation de l'application iForm à Dharma, d'une part, et le changement du formulaire court au formulaire long, d'autre part, ont exigé du CSSI l'organisation des activités formations à l'attention de l'équipe de collecte des données préalablement à la mise en œuvre de l'évaluation de chaque cycle de la CPS. Les différentes formations avaient pour but de revisiter les formulaires afin d'analyser et d'appréhender les modifications apportées par rapport à l'ancienne version utilisée par l'équipe du CSSI pour les évaluations des cycles CPS de 2015 et 2016. La formation de l'équipe de collecte des données a porté également sur les SOP de mise en œuvre de l'enquête proposé par London School.

Les différentes formations de l'équipe de collecte des données furent assurées par le Chercheur principal de l'étude. Ces formations étaient axées sur trois étapes principales:

- l'analyse et l'appropriation des formulaires courts et longs de l'évaluation des cycles CPS 2017;
- le rappel des orientations globales du SOP des enquêtes de couverture CPS;
- les pré-test des formulaires.

Au total le CSSI a organisé 3 formations à l'attention de l'équipe de collecte des données de couverture CPS 2017. La 1^{ère} formation a eu lieu le 5 septembre 2017 en prélude à l'enquête de couverture du 1^{er} cycle de la CPS. Cette formation a mis l'accent sur le formulaire court et sur application iForm.

La 2^{ème} formation a eu lieu le 25 octobre 2017 en prélude à l'enquête du cycle 3. Cette formation a porté sur l'appréhension de la nouvelle application de collecte de données DHARMA utilisant la version courte de formulaire de collecte des données.

La 3^{ème} formation était consacrée à la version longue du formulaire de collecte des données avec l'application DHARMA utilisée pour l'évaluation du cycle 4. Cette formation s'est déroulée le 13 décembre 2017. La formation a porté essentiellement sur l'appréhension des variables complémentaires de l'étude, notamment les sections socioéconomiques des ménages, les caractéristiques des moustiquaires et leur état, etc.

Photo: séance de formation des enquêteurs et superviseurs



Number of staff and organisation in teams

Au total le CSSI a mis en place une équipe constituée de 20 personnes pour les activités de collecte des données de couverture de la CPS 2017. Cette équipe est répartie comme suit:

- 12 enquêteurs

- 3 Superviseurs
- 4 Chauffeurs
- 1 Coordinateur

Du point de vue organisationnel, le staff est reparti en 4 équipes. Les 4 équipes sont composées chacune de 3 enquêteurs et 1 superviseur. La 4^{ème} équipe a comme superviseur le Coordinateur de l'étude. Chaque équipe dispose des tablettes pour la collecte des données et d'un groupe électrogène pour charger les batteries des tablettes à chaque fin de journée. Toutes les équipes disposent d'un Modem de connexion internet pour envoyer les données chaque soir après leur vérification.

À chaque fin de journée, les superviseurs de la collecte des données ramassent les tablettes avec les enquêteurs et procèdent au contrôle des enregistrements. A l'issue de la vérification des enregistrements, les superviseurs procèdent à l'envoi des données au serveur de London School. Au lendemain de chaque envoi des données, le coordonnateur de l'étude vérifie les données envoyées au serveur grâce à la collaboration de Paul Snell du London School.

Details of how call-backs were arranged

Supervision arrangements

Quality control

Pendant chaque enquête de collecte des données des cycles CPS, les superviseurs de la collecte des données effectuent des visites de contrôle qualité dans les ménages visités par les enquêteurs. De façon pratique, les superviseurs prennent un échantillon entre 3% et 5% de l'ensemble des ménages visités par les enquêteurs pour les revisiter. Pendant les visites des superviseurs dans les ménages enquêtés, les superviseurs refont les interviews auprès des ménages enquêtés pour obtenir des données de comparaison avec les données enregistrées par les enquêteurs. Les enregistrements de contrôle qualité réalisés par les superviseurs sont par la suite envoyés au serveur.

Un autre travail de contrôle qualité concerne le contrôle partiel qu'effectue le coordonnateur de l'enquête, qui intervient en aval pour vérifier les enregistrements effectués par les superviseurs avant transmission des données au serveur.

Any problems encountered

Please give details of any problems you encountered and any action taken.

Au cours des différentes enquêtes de couverture de la CPS 2017, l'équipe de collecte des données n'a pas rencontré de problèmes majeurs. Mais il faut retenir que la difficulté rencontrée par l'équipe de collecte des données est liée surtout à l'enregistrement des coordonnées géographiques GPS des ménages visités qui n'a pas marché comme il se doit. Cette difficulté de capture de GPS est apparemment tributaire à l'application DHARMA. En plus de ce problème, l'application DHARMA semble être lente en ce qui concerne la connexion internet qui ne facilite pas les envois des données comme pour l'application iForm.

Lessons learned

Please give details of any lessons learned during this process.

La principale leçon apprise est que la mutation de l'application iForm à l'application DHARMA a été brusque, de l'évaluation du cycle 1 aux évaluations des autres cycles de la CPS 2017.

Any recommendations to improve quality of SMC programmes &/or survey data collection

Please detail any recommendations you may have, based on your experiences carrying out this survey.

A l'issue des différentes enquêtes conduites pour les évaluations des cycles CPS 2017 au Tchad, l'équipe de collecte des données du CSSI après analyse de la performance des 2 applications (iForm et Dharma) recommande l'usage de l'application iForm qui semble être plus pratique que Dharma. Cette recommandation se justifie par rapport aux problèmes capture de GPS et de connexion internet.

Any other comments

Il n'y a pas des commentaires particuliers par rapport à la collecte des données réalisée au cours des cycles de la CPS 2017.

Images of Child SMC Treatment Cards – Cycle 1

maliana consortium TCHAD - CARTE CPS DE L'ENFANT

DSR: *Chari-baye* DS: *...* ZR: *...*

Village/Quartier: *...*

Carré: *...*

Nom de l'enfant: *...*

Age: *1 an* Sexe: M F

Mère/Tuteur/Tutrice: *...*

Numéro d'identification de l'enfant: **N° 135528**

Année	Cycle	Exclu	Jour 1 SP + AQ	Date de traitement	Jour 2 AQ	Jour 3 AQ
2017	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<i>16/5/2017</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

maliana consortium TCHAD - CARTE CPS DE L'ENFANT

DSR: *Chari-baye* DS: *...* ZR: *...*

Village/Quartier: *...*

Carré: *...*

Nom de l'enfant: *...*

Age: *2 ans* Sexe: M F

Mère/Tuteur/Tutrice: *Melita*

Numéro d'identification de l'enfant: **N° 135132**

Année	Cycle	Exclu	Jour 1 SP + AQ	Date de traitement	Jour 2 AQ	Jour 3 AQ
2017	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<i>16/5/2017</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

maliana consortium TCHAD - CARTE CPS DE L'ENFANT

DSR: *Nouamella* DS: *...* ZR: *...*

Village/Quartier: *...*

Carré: *...*

Nom de l'enfant: *...*

Age: *2 ans* Sexe: M F

Mère/Tuteur/Tutrice: *Saminia*

Numéro d'identification de l'enfant: **N° 132028**

Année	Cycle	Exclu	Jour 1 SP + AQ	Date de traitement	Jour 2 AQ	Jour 3 AQ
2017	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<i>16/5/2017</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

maliana consortium TCHAD - CARTE CPS DE L'ENFANT

DSR: *Chari-baye* DS: *...* ZR: *...*

Village/Quartier: *...*

Carré: *...*

Nom de l'enfant: *...*

Age: *4 mois 2017* Sexe: M F

Mère/Tuteur/Tutrice: *Suleh*

Numéro d'identification de l'enfant: **N° 139235**

Année	Cycle	Exclu	Jour 1 SP + AQ	Date de traitement	Jour 2 AQ	Jour 3 AQ
2017	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<i>16/5/2017</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<i>...</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Access database interface showing survey data and corresponding card image.

The screenshot shows the Microsoft Access interface for a database named 'chad_cov_2017_20170917'. The 'All Access Objects' pane on the left shows the 'Forms' section with 'qryimages' selected. The main window displays the 'qryimages' table with the following record:

ID	treated_1	date_1	date_blank_1	FilePathFront	child_id	FilePathBack	smc_treatment
352	1	2017-08-17	1	C:\Users\user\Dropbox\icons\157237_data\157237_smc_cov	176066		1

Below the record, a thumbnail image of a yellow card titled 'CHAD - CARTE CPS DE L'ENFANT' is shown. The card contains a table with columns for 'Année', 'Epile', 'Date', 'Date de l'acte', 'Nom de l'enfant', 'Sexe', 'Date de naissance', 'Date de l'acte', 'Date de l'acte', and 'Date de l'acte'. The table has 4 rows of data, with the first row starting with '2017'.

Examples of GIS mapping of dwellings visited



