LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Seasonal Malaria Chemoprevention Coverage in Guinea in 2019

University Gamal Abdel Nasser, Conakry, Republic of Guinea

London School of Hygiene & Tropical Medicine, UK

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The survey of SMC coverage in Guinea in 2019 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.

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Survey coordinator: Kovana Marcel Loua[1]
Report prepared by: Paul Milligan[2]

For information about the survey please contact:
Kovana Marcel Loua: louakovanamarcel@gmail.com;
Paul Milligan: paul.milligan@lshtm.ac.uk

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Coordinator: Kovana M Loua
Supervisors: Jean Joseph Théa, Robert Lama
Survey team leaders: Dr Sékou Camara, Dr Charles Louanga Loua, Dr Marie louise Manimou, Jonas Loua, Joséphine Bakama Sangare, Francis Gbanamou
Interviewers: Thierno Abass Barry, Charles Balamou, Dr Clément Gandonou, Dr Marie Gbanamou, Jérôme Loua, Odile Lamah, Kadiatou Kante, Gnèka Haba, Kpitili Haba, Rose Sabine Loua, Sarata Diaby, Mohamed Conte
Data management: Assimiou Tchandikou Tchedre, Paul Snell
Data analysis: Paul Milligan

PNLP: PNLP : Dr Eugène Lama, Pr Alioun CAMARA
CRS : Dr Aliou Ayaba, Dr Djeneba, Dr Zaoro Junior Zogbélémou.

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[1] UGANC, Conakry, Republic of Guinea
[2] LSHTM, UK

Indicators

			2018		2019	
Indicator	Definition	Population	Value (95%CI)	N	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.	71.6% (62.3,80.9)	1771	**71.5%** (65.2%,77.8%)	1893
Mean number of treatments per child	Mean number of SMC treatments received	Children aged 3-59 months at cycle 1.	2.87 (2.49,3.24)	1771	**2.86** (2.61,3.11)	1893
Coverage of 4 cycles	% received 4 treatments	Children aged 3-59 months at cycle 1.	60.7% (50.3,70.3)	1771	**41.4%** (31.7%,51.8%)	1893
Adherence	% received 3 doses at last cycle (if treated)	Children aged 3-59 months at cycle 4	97.5% (95.6,98.6)	1448	**96.1%** (93.4%,97.7%)	1688
Reach of SMC programme	% who received at least one treatment	Children aged 3-59 months at cycle 1.	79.3% (68.7,87.0)	1771	**85.5%** (77.2%,91.2%)	1893
Coverage of cycle 1	% treated at cycle 1	Children aged 3-59 months at cycle 1.	73.8% (63.9,81.8)	1771	**81.0%** (72.8%,87.1%)	1893
Coverage of cycle 2	% treated at cycle 2	Children aged 3-59 months at cycle 1.	73.7% (63.9,81.5)	1771	**78.6%** (69.8%,85.4%)	1893
Coverage of cycle 3	% treated at cycle 3	Children aged 3-59 months at cycle 1.	71.5% (60.6,80.3)	1771	**77.9%** (69.6%,84.4%)	1893
Coverage of cycle 4	% treated at cycle 4	Children aged 3-59 months at cycle 1.	67.6% (56.8,76.7)	1771	**48.6%** (37.9%,59.5%)	1893
Treatment of older children	Mean number of SMC treatments received	Children aged 6-7yrs at the survey	0.63 (0.24,1.02)	327	**0.33** (0.16,0.49)	244
Awareness of SMC dates	% households heard date before last cycle	All households	92.4% (85.9,96.1)	1135	**92.4%** (85.9%,96.1%)	1002
LLIN use in children	% slept under an LLIN last night	Children 3-59 months who slept in the household last night	30.2% (22.6,39.0)	1835	**85.7%** (79.2%,90.4%)	1961
LLIN use (all ages)	% slept under an LLIN	All who slept in the	30.1%	5198	**79.7%**	4906

	last night	household last night	(22.3,39.4)		(71.8%,85.8%)	
ACCESS (% of population)	% that could sleep under LLIN (if 2/net)	All who slept in the household last night	25.4% (18.7,33.5)	5198	**68.2%** (61.78%,74.0%)	4906
% households with an LLIN	% households with an LLIN	All households	39.7% (30.3,49.8)	996	**89.8%** (84.7%,94.8%)	1038
ACCESS (% households)	% household with a LLIN for every two members	All households, all who slept there last night	13.1% (8.4,19.8)	996	**36.8%** (30.6%,42.9%)	1038
Caregiver knowledge about SMC	Mean score out of 10	Carers of children 3-59 months	6.90 (6.26,7.55)	1135	**7.0** (6.5,7.6)	1068
Reported CHW adherence to guidelines	Mean score out of 8	Carers of a child who received SMC last cycle	6.07 (5.41,6.72)	1135	**7.6** (7.3,7.8)	1068
SMC directly observed	% of first doses administered by CHW	Children 3-59 months who received SMC at last cycle	99.0% (97.7,99.6)	1447	**97.2%** (93.0%,98.9%)	1124
Interval between cycle 1 and cycle 2	Mean difference between cycle dates	Dates recorded on SMC cards	34 days	1192	**34 days**	1261
Interval between cycle 2 and cycle 3	Mean difference between cycle dates	Dates recorded on SMC cards	36 days	1150	**32 days**	1231
Interval between cycle 3 and cycle 4	Mean difference between cycle dates	Dates recorded on SMC cards	29 days	969	**33 days**	686
SMC card at survey	% of children with SMC card	Children eligible for SMC	60.9% (52.1,69.1)	1771	**67.1%** (59.0%,74.3%)	1893

CONTENTS

EXECUTIVE SUMMARY and RECOMMENDATIONS

Background:

Seasonal Malaria Chemoprevention (SMC) was introduced in Guinea in 2015 for children aged 3 months to 5 years, in 6 prefectures, and has been expanding to 8 prefectures in 2016, and 10 in 2017 and 13 prefectures in 2018. SMC gives children a high level of personal protection from malaria. Evaluation of SMC programmes by the ACCESS-SMC project showed substantial reductions in malaria cases and malaria deaths in children, associated with introduction of SMC. High coverage of four monthly cycles is needed to maximise the impact of this intervention.

In 2019, four cycles of SMC were delivered in Siguiri, Mandiana, Dabola, Kouroussa and Kankan prefectures, in July, August, September and October. Due to funding delays, only the first three cycles were implemented in Gaoual, Koundara, Mali, Lelouma, Labe, Koubia, Tougué and Dinguiraye.

This survey was conducted to assess coverage of SMC and use of long-lasting insecticide-treated bednets (LLINs) in 2019 in the 13 prefectures. The survey took place from 20 Dec 2019 to 4 Jan 2020. All children aged 3 months to 7 years were included in order to determine coverage in the target age group (aged at least 3months at the time of treatment, and aged not more than 59 months at cycle1) and to determine the proportion of children just above the recommended age limit who received treatment. Caregivers were interviewed about SMC treatments, dates of treatments were recorded from the SMC card, and SMC registers were checked to verify SMC treatments for children who did not have a card for inspection during the survey and for subset of children. 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. A total of 1,893 children eligible to receive 4 treatments were surveyed in 66 clusters. A total of 1038/1164 of households agreed to participate, a response rate of 89%. 244 children too old to be eligible for SMC, were also surveyed.

Administrative data:

A total of almost 3 million treatments were administered in 2019 (2,986,364, of which 454,030 (15.2%) to infants and 2,532,334 to children). The fourth cycle was not implemented in PMI areas. In most prefectures, the number of treatments administered per cycle was similar in each cycle. The variation was greatest (greater than 10% difference between the maximum and minimum per cycle) in Siguiri, Dabola and Kouroussa. Overall, 1.4% of infant treatments and 0.4% of treatments to children 12-59 months, were vomited and a second dose administered. Infants were about 3 times more likely to vomit than older children. The risk of vomiting was highest in the first cycle, and lowest in the fourth cycle. If children are unwell they should be referred so that they can be tested and treated appropriately. However, referrals were relatively uncommon. Infants were twice as likely to be referred due to illness, than older children: 0.34% compared to 0.15%, risk ratio 2.3 (95%CI 1.9,2.7). Referrals were more common during cycle 1 than other cycles. Children are excluded if they are outside the age range for SMC, or have a history of allergy to SMC drugs, or had taken sulfa-containing medicine or amodiaquine (apart from their last SMC) within the last 4 weeks. Infants were more likely to be excluded than children, and the

number excluded was, as is expected, highest in cycle 1. In cycle 1, 3.2% of infants were excluded in the PMI zone and 1.3% in the GF zone. Refusals: These may include children who would not take the medicine and children whose caregiver refused for them to have SMC. There were 288 refusals out of 3,010,437 children seen (about 1 per 10,000). Most of these were in the first cycle.

Assessment of SMC status in the survey:

Of children eligible for four SMC treatments, 88% had received an SMC card, and 68% had a card available for inspection in the survey. There was 83% agreement between caregiver report of the number of treatments and the number indicated on the record card. In 55 clusters where SMC registers were available, an attempt was made to find entries in the SMC register for the children in the survey who did not have an SMC card, this was possible for 339/580 (58%) children, and for these children there was 79% agreement with the caregivers' report. Allowing for the fact that most children who did not receive any SMC treatments will not be listed in the register, it appears that a high proportion of children who received SMC but did not have a card at the survey, were located in registers. We therefore recommend that registers be used in futures surveys to cross-check SMC status, for children who do not have a card, and for children who have a card.

The SMC card is a record and reminder for the caregiver, so it is important that it is completed. Caregivers may use the card to check if their child's treatments are complete, they could then seek treatment at the health centre if they missed the door-to-door campaign. Training of CHWs should emphasise the importance of recording treatments on the SMC card as well as in the register, and the need to remind caregivers to use and retain the card.

Timing of SMC cycles:

The median interval between treatments, based on dates recorded on SMC cards, in PMI areas (Gaoual, Koundara, Mali, Lelouma, Labe, Koubia, Tougué and Dinguiraye) was 35 days between cycle 1 and cycle 2, and 31 days between cycle 2 and 3, and in GF areas (Siguiri, Mandiana, Dabola, Kouroussa and Kankan), 33 days between cycle 1 and 2, 32 days between cycle 2 and 3, and 33 days between cycles 3 and 4. These intervals should be reduced to 28 days, as protection wanes rapidly after 4 weeks and malaria cases will increase in the 5th week.

Awareness of SMC campaigns:

Caregivers need to know the day when SMC will be distributed in their area in order to ensure they are available on that day. Overall, public informaitn campaigns appeared successful, 94.7% of households were aware of the SMC campaign and 92.4% said they knew in advance the date of the campaign for the cycle before the survey. However, communities in PMI areas were not aware that cycle 4 was not being implemented.

Caregiver knowledge about SMC:

Caregivers were asked if they understood key aspects of SMC, they scored 70% overall on a 10-point questionnaire. Most caregivers (84%) knew that SMC is used to prevent malaria and most (81%) knew that there are 2 tablets to be taken on the first day and one on each of the next two days (84%). However there was a widespread view that SMC drugs could be

used for treatment if there was someone unwell in the household (only 44% of caregivers gave the correct response, that SMC drugs should not be used in this way), and only 62% of caregivers (62%) appreciated the importance of completing the 3-day course of treatment.

Community Health Worker (CHW) 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, and the scores were notably better than when the same questions were asked after the 2018 campaign.

Administration of SMC:

In 97% of treated children, the first dose was directly observed (administered by the CHW, 96.9%, or, in a small number, by the caregiver in the presence of the CHW, 0.4%). A small number of children (0.1%) received the first dose from the caregiver later, not observed by the CHW; the reason given was that the child was away at the time the CHW visited. And for 2.6% of children, although the caregiver received the blister pack, the first dose was not administered.

Reported adherence to the unsupervised doses of amodiaquine was very high. Of eligible children treated at cycle 4, caregivers reported that 96.1% received all three daily doses.

Caregivers were asked if the child swallowed all the medicine, spat out some medicine, or vomitted all the medicine. Most responded the child swallowed the medicine without vomitting. Of those who were treated, a total of 93.9% of children were reported to have received and swallowed the 3 daily doses without vomitting.

Reasons for missed treatments:

The most common reasons for not receiving SMC at cycle 4 were that the health worker did not visit (this mainly in PMI areas), or the caregiver was away in the fields or mines.

Caregivers suggestions to improve the SMC programme:

Caregivers were asked for suggestions to improve the SMC programme. There were 178 responses, the points most commonly made were to include older age groups, build new health facilities, improve accessibility of remote areas, increase the quantity of SMC drugs, increase the number of months of SMC, provide SMC in the mines, and provide more bednets.

SMC coverage in 2019:

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. Overall, 81% of children received SMC at cycle 1, 79% at cycle 2, 78% at cycle 3 and 49% at cycle 4. The mean number of treatments per child in 2019 was 2.9.

Cycle 4 was not implemented in PMI areas, although there appeared to be some limited SMC distribution in some PMI areas, as some children had cycle 4 treatment dates for 2019 marked on the SMC cards and in SMC registers. In GF areas, 58% of children received four SMC treatments and coverage was similar from month to month. There was some geographical variation in coverage, with notably lower coverage in Siguiri, with average monthly coverage of 44%. As this prefecture has the largest target population, this brings down the overall national figures of SMC coverage. Overall, 14.5% of children did not receive any SMC treatments, slightly less than in 2018 and 2017 (21%). Most of the children who did not receive any SMC are in Siguiri where 48% of children did not receive SMC, reflecting challenges of reaching children in mining areas.

Treatment above the age limit:

Children who are above 5 years of age at the time of the first SMC cycle, should not receive SMC. The dose has been calculated according to age and if older children 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. 244 children 6years and above were surveyed. 14% received an SMC card, 13% received SMC at least once, 10.9% received SMC in cycle 1, 9.6% in cycle 2, 10.2% in cycle 3 and 1.8% in cycle 4.

Bednet use:

Caregivers were asked about bednet use by their children on the night before the survey. 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). In the survey after the 2017 SMC campaign, 43.6% of children in the survey (children eligible to receive SMC) were reported to have slept under a bednet the night before the survey. In the 2018 survey, 30.2% of children slept under a net the night before the survey. The survey was conducted after the main malaria season and bednet use may be lower at this time than in the main season but nevertheless bednet use was surprisingly low. There were notable variations with very low use of nets in some prefectures. In this 2019 survey, 86% (95%CI 79%,90%) of children slept under an LLIN the night before the survey. 97% of the nets the children were using were less than 8 months old according to caregivers. Coverage was similarly high in all areas except Siguiri where 71% slept under an LLIN.

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. A total of 5,051 household members were surveyed in 1038 households. A total of 4,906 slept in the household the night before the survey. Overall, 79.7% used a LLIN the night before the survey, compared to 28.7% in the 2018 survey.

There was a notable dip in bednet use in children 5-14 years of age, 67% slept under an LLIN the night before the survey compared to 85% of 0-4year-olds and 81% of 15-19-year-olds. This is of concern as children stop receiving SMC when they are 5 years old (if they are more than 59 months old at the time of cycle 1). It is therefore especially important that these children use an LLIN.

Net use was slightly lower among males than females (76.6% compared to 82.4%), and was higher in the lowest wealth ranking (87.9%) than the highest (77.3%).

Of 1038 households surveyed, 89.8% had at least one LLIN but only 36.8% had one LLIN for every 2 persons. This compares with 39.7% had at least one LLIN and 13.1% had one LLIN for every 2 persons in the household, in 2018.

Access to a LLIN, the percentage of the population who could sleep under a LLIN if there were two people per net, was 25.4% in 2018. This has increased to 68.2% in the current survey.

Recommendations:

1. SMC during 2020:

SMC delivery in Guinea has been highly successful. In 2019, apart from a problem implementing cycle 4 in PMI areas, high coverage has been maintained. The ACCESS-SMC project estimated that SMC in Guinea would be expected to avert about 1.2 deaths per 1000 children treated per month. Thus the SMC programme in Guinea could have averted about 4,000 deaths per year in recent years. It is therefore essential that efforts are made to maintain SMC during 2020, adapting the approach to minimise risks associated with the COVID19 epidemic. Effective delivery of SMC could have an even greater impact in 2020, in view of the likelihood that the population may seek to avoid attendance at health facilities during the epidemic, reducing access to malaria treatment, with consequently increased risk of mortality due to malaria.

A coverage survey should be conducted again at the end of the 2020 season, to determine how successfully SMC was implemented in the context of the COVID19 outbreak.

2. LLIN use in older children:

There has been a marked increase in the use of LLINs following the successful distribution campaign in 2019. 85% of children under 5, and 80% of the population (of all ages) slept under a LLIN the night before the survey. However there was a notable dip in LLIN use in children aged 5-14 years. This is of concern, children who stop receiving SMC at age 5 need to be protected with an effective net, and specific efforts need to be made to ensure high levels of LLIN use in this age group.

3. Number of SMC cycles:

In some areas where SMC is currently being implemented, more than 4 cycles of SMC are needed to provide protection throughout the high risk period. Given the success of the current programme and high levels of coverage being achieved each month, extensions to

SMC should be considered, the most urgent priority is to provide 5 cycles in some of the current areas, and to expand the number of prefectures where SMC is implemented.

4. Other adaptations of the SMC strategy:

Inclusion of older children could be considered. This age group is included in SMC in neighbouring Senegal, where it has been found highly effective. In Guinea, surveillance, in selected hospitals and outpatient clinics, is needed to establish the burden of malaria in the 6-10 age group.

Combination with iCCM: SMC guidelines recommend that children who are unwell should be referred to that they can be assessed and given appropriate treatment. However in 2019, only 0.34% of infants and 0.15% of children 1-4 years were referred during SMC. The Government of Guinea has adopted a policy to implement a reformed integrated package of essential prevention and treatment services at community-level, through community-based agents de santé communautaire and relais communautaire, to reduce morbidity and mortality with a focus on rural populations. This provides an opportunity to ensure children who are unwell during SMC visits can be treated; these staff can also help to ensure high coverage of SMC as they are familiar with the local community and maintain a census list of the population.

Screening for malnutrition during SMC visits has been piloted in some countries, but its effectiveness has not been evaluated. This merits further investigation.

Delivery in mining areas: SMC coverage has been consistently low in mining areas, where caregivers were often away from their home on the day of the campaign. Delivery needs to be adapted in these areas to reach families involved mining activities.

5. Monitoring of the efficacy of SMC

should be established. This can be done using case control studies, which measure clinical protection, combined with monitoring of molecular markers of resistance to SMC drugs.

6. Strengthen pharmacovigilance.

As well as working to strengthen the PV system nationally, safety monitoring should be strengthened in selected SMC areas where training and supervision can be provided to ensure that health staff recognise events and report suspected adverse drug reactions.

7. Measuring impact of SMC:

HMIS data on malaria should be regularly assessed to track the impact of the SMC programme on malaria cases, and malaria deaths in hospital. This has been difficult as the structure of datasets prior to DHIS2 do not facilitate comparison of the same facilities year to year but will be possible for new SMC areas where DHSI2 data are available for at least a year prior to SMC introduction.

SOMMAIRE EXÉCUTIF et RECOMMANDATIONS

Contexte : La chimio prévention du paludisme saisonnier (CPS or SMC) a été introduite en Guinée en 2015 pour les enfants âgés de 3 mois à 5 ans, dans 6 préfectures, et s'est étendue à 8 préfectures en 2016, 10 en 2017 et 13 préfectures en 2018. La CPS offre aux enfants un niveau élevé de protection personnelle contre le paludisme. L'évaluation des programmes de la CPS par le projet ACCESS-SMC a montré des réductions substantielles des cas de paludisme et des décès dus au paludisme chez les enfants, associés à l'introduction de la CPS. Une couverture élevée de quatre cycles mensuels est nécessaire pour maximiser l'impact de cette intervention.

En 2019, quatre cycles de la CPS ont été livrés dans les préfectures de Siguiri, Mandiana, Dabola, Kouroussa et Kankan, en juillet, août, septembre et octobre. En raison du retard de financement, seuls les trois premiers cycles ont été mis en œuvre à Gaoual, Koundara, Mali, Lelouma, Labe, Koubia, Tougué et Dinguiraye.

Cette enquête a été menée pour évaluer la couverture de la CPS et l'utilisation de moustiquaires imprégnés d'insecticide à longue durée d'action (MILDA) en 2019 dans les 13 préfectures. L'enquête a eu lieu du 20 décembre 2019 au 04 janvier 2020. Tous les enfants âgés de 3 mois à 7 ans ont été inclus afin de déterminer la couverture dans le groupe d'âge cible (âgés d'au moins 3 mois au moment du traitement et de plus 59 mois au cycle 1) et pour déterminer la proportion d'enfants juste au-dessus de la limite d'âge recommandée qui ont reçu un traitement. Les mères et les gardiens d'enfants ont été interrogés sur les traitements de la CPS, les dates des traitements ont été enregistrées sur la carte CPS et les registres CPS ont été utilisés pour vérifier les traitements CPS pour les enfants qui n'avaient pas de carte pendant l'enquête et pour un sous-ensemble d'enfants. De plus, toutes les personnes qui dormaient dans le ménage la nuit avant l'enquête ont été répertoriées, toutes les moustiquaires appartenant au ménage ont également été répertoriés et inspectés, et pour chaque personne, la moustiquaire sous laquelle ils ont dormi a été noté, le cas échéant. Au total, 1 893 enfants éligibles pour recevoir 4 traitements ont été interrogés dans 66 grappes. Au total, 1038/1164 des ménages ont accepté de participer, soit un taux de réponse de 89%. 244 enfants trop âgés pour être éligibles à la CPS ont également été interrogés.

Données administratives : au total, près de 3 millions de traitements ont été administrés en 2019 (2986364, dont 454030 (15,2%) aux nourrissons et 2532334 aux enfants). Le quatrième cycle n'a pas été mis en œuvre dans les zones PMI. Dans la plupart des préfectures, le nombre de traitements administrés par cycle était similaire dans chaque cycle. La variation était la plus importante (différence supérieure à 10% entre le maximum et le minimum par cycle) à Siguiri, Dabola et Kouroussa. Dans l'ensemble, 1,4% des traitements pour nourrissons et 0,4% des traitements pour enfants de 12 à 59 mois ont été vomis et une deuxième dose a été administrée. Les nourrissons étaient environ 3 fois plus susceptibles de vomir que les enfants plus âgés. Le risque de vomissement était le plus élevé au premier cycle et le plus faible au quatrième cycle. Si les enfants ne sont pas bien, ils doivent être référés afin qu'ils puissent être testés et traités de manière appropriée. Cependant, les renvois étaient relativement rares. Les nourrissons étaient deux fois plus susceptibles d'être référés pour cause de maladie que les enfants plus âgés : 0,34%

par rapport à 0,15%. Les renvois étaient plus fréquents au cours du cycle 1 que les autres cycles. Les enfants sont exclus s'ils sont en dehors de la tranche d'âge pour la CPS, ou si vous avez des antécédents d'allergie aux médicaments CPS, ou si vous avez pris des sulfamides ou de l'amodiaquine (en dehors de leur dernier CPS) au cours des 4 dernières semaines. Les nourrissons étaient plus susceptibles d'être exclus que les enfants, et le nombre d'exclus était, comme prévu, le plus élevé au cycle 1. Au cycle 1, 3,2% des nourrissons étaient exclus dans la zone PMI et 1,3% dans la zone GF. En terme de refus, il peut s'agir d'enfants qui ne prendraient pas le médicament et d'enfants dont la personne qui s'occupe de l'enfant a refusé qu'ils aient la CPS. Il y a eu 288 refus sur 3010437 enfants vus (environ 1 pour 10 000). La plupart d'entre eux étaient dans le premier cycle.

Évaluation du statut CPS dans l'enquête : Parmi les enfants éligibles à quatre traitements CPS, 88% avaient reçu une carte CPS et 68% avaient une carte disponible pour inspection dans l'enquête. Il y avait 83% d'accord entre le rapport du soignant sur le nombre de traitements et le nombre indiqué sur la fiche d'enregistrement. Dans 55 grappes où des registres CPS étaient disponibles, une tentative a été faite pour trouver des entrées dans le registre CPS pour les enfants de l'enquête qui n'avaient pas de carte CPS, cela a été possible pour 339/580 (58%) enfants, et pour ceux-ci les enfants, il y avait 79% d'accord avec le rapport des soignants . Compte tenu du fait que la plupart des enfants qui n'ont reçu aucun traitement CPS ne seront pas répertoriés dans le registre, il apparaît qu'une forte proportion d'enfants qui ont reçu de la CPS mais qui n'avaient pas de carte lors de l'enquête se trouvaient dans les registres. Nous recommandons donc que les registres soient utilisés dans les enquêtes futures pour recouper le statut CPS pour les enfants qui n'ont pas de carte et pour les enfants qui ont une carte.

La carte CPS est un enregistrement et un rappel pour la mère et le gardien d'enfants, il est donc important qu'elle soit remplie. La mère et le gardien d'enfants peuvent utiliser la carte pour vérifier si les traitements de leur enfant sont terminés, ils pourraient alors demander un traitement au centre de santé s'ils ont raté la campagne de porte à porte. La formation des ASC devrait souligner l'importance de l'enregistrement des traitements sur la carte CPS ainsi que dans le registre, et la nécessité de rappeler aux la mère et le gardien d'enfants d'utiliser et de conserver la carte.

Moment des cycles CPS : L'intervalle médian entre les traitements, basé sur les dates enregistrées sur les cartes CPS, dans les zones PMI (Gaoual, Koundara, Mali, Lélouma, Labé, Koubia, Tougué et Dinguiraye) était de 35 jours entre le cycle 1 et le cycle 2, et 31 jours entre les cycles 2 et 3, et dans les zones de GF (Siguiri, Mandiana, Dabola, Kouroussa et Kankan), 33 jours entre les cycles 1 et 2, 32 jours entre les cycles 2 et 3 et 33 jours entre les cycles 3 et 4. Ces intervalles doivent être réduits à 28 jours, car la protection diminue rapidement 4 semaines et les cas de paludisme augmenteraient au cours de la 5e semaine.

Sensibilisation aux campagnes de la CPS : les mères et les gardiens d'enfants doivent connaître le jour où la CPS sera distribuée dans leur région afin de s'assurer qu'ils sont disponibles ce jour-là. Dans l'ensemble, les campagnes d'information du public ont semblé être fructueuses, 94,7% des ménages étaient au courant de la campagne CPS et 92,4% ont déclaré connaître à l'avance la date de la campagne pour le cycle précédant

l'enquête. Cependant, les communautés des zones PMI ne savaient pas que le cycle 4 n'était pas mis en œuvre.

Connaissances des soignants sur la CPS : on a demandé aux soignants s'ils comprenaient les aspects clés de la CPS, ils ont obtenu un score global de 70% sur un questionnaire en 10 points. La plupart des mères et gardiens d'enfants (84%) savaient que le CPS est utilisé pour prévenir le paludisme et la plupart (81%) savaient qu'il y avait 2 comprimés à prendre le premier jour et un pour chacun des deux jours suivants (84%). Cependant, il y avait une opinion largement répandue que les médicaments CPS pouvaient être utilisés pour le traitement s'il y avait une personne malade dans le ménage (seulement 44% des mères ou gardiens d'enfants ont donné la bonne réponse, que les médicaments CPS ne devraient pas être utilisés de cette manière), et seulement 62% des mères ou gardiens d'enfants (62%) ont apprécié l'importance de terminer le traitement de 3 jours.

Adhésion des agents de santé communautaire (ASC) aux lignes directrices de la CPS, telles que rapportées par les mères ou gardiens d'enfants : les ASC doivent vérifier l'âge de l'enfant, et avant d'administrer le traitement, ils doivent poser des questions sur la maladie et orienter l'enfant en cas de malaise, et doivent vérifier que l'enfant n'a pas eu avant d'effets secondaires graves à la CPS. Ils sont également formés pour expliquer aux mères ou gardiens d'enfants comment administrer les comprimés d'amodiaquine au cours des deux prochains jours, et pour conseiller les mères ou gardiens d'enfants sur les effets secondaires potentiels et pour amener l'enfant à un agent de santé en cas de malaise après CPS. Les mères ou gardiens d'enfants qui ont reçu la CPS ont indiqué que les ASC respectaient généralement correctement les directives de la CPS et que les scores étaient nettement meilleurs que lorsque les mêmes questions avaient été posées après la campagne de 2018.

Administration de la CPS : chez 97% des enfants traités, la première dose a été directement observée (administrée par l'agent de santé communautaire, 96,9%, ou, en petit nombre, par le soignant en présence du CHW, 0,4%). Un petit nombre d'enfants (0,1%) ont reçu, non observée par l'ASC plus tard, la première dose de la mère ou du gardien d'enfants ; la raison invoquée était que l'enfant était absent au moment de la visite de l'ASC. Et pour 2,6% des enfants, bien que la mère ou le gardien d'enfants a reçu les médicaments, le restant de la dose n'a pas été administré.

L'adhésion rapportée aux doses non surveillées d'amodiaquine était très élevée. Parmi les enfants admissibles traités au cycle 4, les mères et gardiens d'enfants ont indiqué que 96,1% avaient reçu les trois doses quotidiennes.

On a demandé aux mères ou gardiens d'enfants si l'enfant avait avalé tout le médicament, craché le médicament ou vomi tout le médicament administré. La plupart ont répondu que l'enfant avait avalé le médicament sans vomir. Parmi ceux qui ont été traités, 93,9% des enfants auraient reçu et avalé les 3 doses quotidiennes sans vomir.

Raisons des traitements manqués : Les raisons les plus courantes pour ne pas recevoir la CPS au cycle 4 étaient que l'agent de santé n'était pas venu (principalement dans les zones

PMI), ou la mère ou le gardien d'enfants était absent à la maison, présent dans les champs ou dans les mines.

Suggestions des soignants pour améliorer le programme de la CPS : On a demandé aux mères ou gardiens d'enfants des suggestions pour améliorer le programme CPS. Il y a eu 178 réponses, les points les plus souvent avancés étant d'inclure des groupes d'âge plus avancés, de construire de nouveaux établissements de santé, d'améliorer l'accessibilité des zones reculées, d'augmenter la quantité de médicaments CPS, d'augmenter le nombre de mois de CPS, de fournir de la CPS dans les mines, et de fournir plus de moustiquaires.

Couverture de la CPS en 2019 : les enfants âgés de 3 à 59 mois au moment du cycle 1 sont éligibles pour recevoir la CPS quatre fois et devraient recevoir tous ces traitements pour maximiser leur protection. Globalement, 81 % des enfants ont reçu la CPS au cycle 1,79% au cycle 2, 78 % au cycle e 3 et 49 % au cycle 4. Le nombre moyen de traitements par enfant en 2019 était de 2,9.

Le cycle 4 n'a pas été mis en œuvre dans les zones PMI, bien qu'il semble y avoir une distribution limitée de la CPS dans certaines zones PMI, car certains enfants ont marqué les dates de traitement du cycle 4 pour 2019 sur les cartes CPS et dans les registres de la CPS. Dans les zones de GF, 58% des enfants ont reçu quatre traitements de la CPS et la couverture était similaire d'un mois à l'autre. Il y avait une certaine variation géographique dans la couverture, avec notamment une couverture plus faible à Siguiri, avec une couverture mensuelle moyenne de 44%. Cette préfecture ayant la population cible la plus importante, cela fait baisser les chiffres nationaux globaux de la couverture de la CPS. Dans l'ensemble, 14,5% des enfants n'ont reçu aucun traitement de la CPS, un peu moins qu'en 2018 et 2017 (21%). La plupart des enfants qui n'ont reçu aucun traitement de la CPS se trouvent à Siguiri où 48% des enfants n'ont pas reçu de la CPS, ce qui reflète les difficultés à atteindre les enfants dans les zones minières.

Traitement au-dessus de la limite d'âge : les enfants âgés plus de 5 ans au moment du premier cycle CPS ne doivent pas recevoir la CPS. La dose a été calculée en fonction de l'âge et si les enfants de plus de 5 ans reçoivent le blister destiné au groupe de 12 à 59 mois, ils peuvent être sous-dosés, ce qui peut augmenter la sélection de parasites résistants, car les parasites sont exposés à des doses thérapeutiques de médicaments CPS. En tout 244 enfants de 6 ans et plus ont été interrogés, dont 14 % ont reçu une carte CPS, 13 % ont reçu CPS au moins une fois, 10,9 % ont reçu la CPS au cycle 1, 9,6% au cycle 2, 10,2% au cycle e 3 et 1,8% au cycle 4.

Utilisation des moustiquaires : les mères ou gardiens d'enfants ont été interrogés sur l'utilisation des moustiquaires par leurs enfants la nuit précédant l'enquête. Les moustiquaires imprégnées d'insecticide constituent la méthode de prévention du paludisme la plus rentable, la CPS s'ajoutent à cette protection mais ne remplacent pas la nécessité d'utiliser les moustiquaires - MILDA (moustiquaires imprégnées d'insecticides à longue durée d'action). Dans l'enquête après la campagne CPS de 2017, 43,6% des enfants interrogés (enfants éligibles pour recevoir la CPS) auraient dormi sous une moustiquaire la nuit précédant l'enquête. Dans l'enquête 2018, 30,2% des enfants ont dormi sous une

moustiquaire la nuit précédant l'enquête. L'enquête a été menée après la saison de haute transmission de paludisme et l'utilisation des moustiquaires peut être plus faible à ce moment que pendant la saison de haute transmission, néanmoins l'utilisation des moustiquaires était étonnamment faible. Il y avait des variations notables avec une très faible utilisation de moustiquaires dans certaines préfectures. Dans cette enquête de 2019, 86des enfants dormaient sous une MILDA la nuit précédant l'enquête. 97% des moustiquaires que les enfants utilisaient avaient moins de 8 mois selon les mères ou gardiens d'enfants. La couverture était également élevée dans toutes les régions, à l'exception de Siguiri où 71% dormaient sous une MILDA.

De plus, toutes les personnes qui ont dormi dans le ménage la nuit avant l'enquête ont été répertoriées, toutes les moustiquaires appartenant au ménage ont également été répertoriées et inspectées, et pour chaque personne, la moustiquaire sous laquelle ils ont dormi, le cas échéant, a été notée. Au total, 5 051 membres du ménage ont été interrogés dans 1 038 ménages. Au total, 4 906 personnes ont dormi dans la maison la nuit précédant l'enquête. Dans l'ensemble, 79,7% ont utilisé une MILDA la veille de l'enquête, contre 28,7% dans l'enquête de 2018.

Il y avait une baisse notable de l'utilisation des moustiquaires chez les enfants de 5 à 14 ans, 67% dormaient sous une MILDA la nuit précédant l'enquête, contre 85% des 0-4 ans et 81% des 15-19 ans.

Cela est préoccupant car les enfants cessent de recevoir la CPS lorsqu'ils ont 5 ans (s'ils ont plus de 59 mois au moment du cycle 1). Il est donc particulièrement important que ces enfants utilisent une MILDA.

La consommation nette était légèrement inférieure chez les hommes que chez les femmes (76,6% contre 82,4%) et était plus élevée dans le classement de richesse le plus bas (87,9%) que dans le classement le plus élevé (77,3%).

Sur 1038 ménages interrogés, 89,8% avaient au moins une MILDA mais seulement 36,8% en avaient une pour toutes les 2 personnes. Cela se compare à 39,7% avait au moins une MILD et 13,1% avait une MILDA pour 2 personnes dans le ménage, en 2018.

Accès à une MILDA, le pourcentage de la population qui pourrait dormir sous une MILDA s'il y en a, a été deux personnes par moustiquaire, était de 25,4% en 2018. Cela est passé à 68,2% dans l'enquête actuelle.

Recommandations :

1. CPS en 2020 : la livraison de la CPS en Guinée a connu un grand succès. En 2019, en dehors d'un problème de mise en œuvre du cycle 4 dans les zones PMI, une couverture élevée a été maintenue. Le projet ACCESS-SMC a estimé que la CPS en Guinée devraient éviter environ 1,2 décès pour 1000 enfants traités par mois. Ainsi, le programme CPS en Guinée aurait pu éviter environ 4 000 décès par an ces dernières années. Il est donc essentiel que des efforts soient faits pour maintenir la CPS en 2020, en adaptant l'approche

pour minimiser les risques associés à l'épidémie de COVID19. La prestation efficace de la CPS pourrait avoir un impact encore plus important en 2020, compte tenu de la probabilité que la population cherche à éviter de fréquenter les établissements de santé pendant l'épidémie, réduisant l'accès au traitement antipaludique, avec par conséquent un risque accru de mortalité due au paludisme.

Une enquête de couverture devrait être menée à nouveau à la fin de la saison 2020, afin de déterminer le succès de la mise en œuvre de la CPS dans le contexte de l'épidémie de COVID19.

2. Utilisation de MILD chez les enfants plus âgés : il y a eu une augmentation marquée de l'utilisation des MILDA après la campagne de distribution réussie en 2019. 85% des enfants de moins de 5 ans et 80% de la population (de tous âges) ont dormi sous une MILDA la nuit avant l'enquête. Cependant, il y avait une baisse notable de l'utilisation des MILDA chez les enfants âgés de 5 à 14 ans. Cela est préoccupant, les enfants qui cessent de recevoir de la CPS à l'âge de 5 ans doivent être protégés avec une moustiquaire efficace, et des efforts spécifiques doivent être faits pour garantir des niveaux élevés d'utilisation des MILDA dans ce groupe d'âge.

3. Nombre de cycles de la CPS : Dans certaines zones où la CPS est actuellement mise en œuvre, plus de 4 cycles de la CPS sont nécessaires pour assurer une protection tout au long de la période à haut risque. Compte tenu du succès du programme actuel et des niveaux élevés de couverture atteints chaque mois, des extensions de la CPS devraient être envisagées, la priorité la plus urgente est de prévoir 5 cycles dans certaines des zones actuelles et d'augmenter le nombre de préfectures où la CPS est mis en œuvre.

4. Autres adaptations de la stratégie de la CPS :

L'inclusion d'enfants plus âgés pourrait être envisagée. Ce groupe d'âge est inclus dans la CPS au Sénégal voisin, où il s'est révélé très efficace. En Guinée, la surveillance, dans les hôpitaux et les cliniques externes sélectionnés, est nécessaire pour établir la charge du paludisme dans la tranche d'âges de 6-10.

Combinaison avec la Prise en charge intégrée des maladies de l'enfance (PCIME):

Les lignes directrices de la CPS recommandent que les enfants malades soient référés afin qu'ils puissent être évalués et recevoir un traitement approprié. Cependant, en 2019, seulement 0,34% des nourrissons et 0,15% des enfants de 1 à 4 ans ont été référés pendant la CPS. Le gouvernement de Guinée a adopté une politique visant à mettre en œuvre un ensemble intégré réformé de services essentiels de prévention et de traitement au niveau communautaire, par le biais d'agents de santé communautaire et de relais communautaires, afin de réduire la morbidité et la mortalité en mettant l'accent sur la population rurale. Cela permet de garantir le traitement des enfants qui ne se sentent pas bien lors des visites pour la CPS ; ce personnel peut également aider à assurer une couverture élevée de la CPS car il connaît la communauté locale et tient une liste de recensement de la population.

Le dépistage de la malnutrition lors des visites pour la CPS a été expérimenté dans certains pays, mais son efficacité n'a pas été évaluée. Cela mérite une enquête plus approfondie.

Accouchement dans les zones minières : la couverture de la CPS a toujours été faible dans les zones minières, où les mères et gardiens d'enfants étaient souvent loin de leur domicile le jour de la campagne. La livraison doit être adaptée dans ces zones pour atteindre les familles impliquées dans les activités minières.

5. Une surveillance de l'efficacité de la CPS doit être établie. Cela peut être fait en utilisant des études cas-témoins, qui mesurent la protection clinique, combinée à la surveillance des marqueurs moléculaires de la résistance aux médicaments CPS.

6. Renforcer la pharmacovigilance. En plus de travailler au renforcement du système photovoltaïque au niveau national, la surveillance de la sécurité devrait être renforcée dans certains domaines de la CPS où la formation et la supervision peuvent être assurées pour s'assurer que le personnel de santé reconnaît les événements et signale les effets indésirables suspectés des médicaments.

7. Mesurer l'impact de la CPS : les données d'enquête indicateurs multiples sur le paludisme doivent être régulièrement évaluées pour suivre l'impact des programmes de la CPS sur les cas de paludisme et les décès dus au paludisme à l'hôpital. Cela a été difficile car la structure de l'ensembles de données avant DHIS2 ne facilite pas la comparaison des mêmes structures de sante d'année en année mais sera possible dans les nouvelles zones de la CPS où les données DHSI2 sont disponibles pendant au moins un an avant l'introduction de la CPS.

BACKGROUND AND OBJECTIVES

The Republic of Guinea is one of 18 high burden countries which account for more than 80% of deaths due to malaria worldwide (WHO 2019). Malaria occurs year-round with a highly seasonal pattern in the north of the country. The main vectors are *Anopheles gambiae*, *An. funestus*, *An. melas* and *An. arabiensis*. The prevalence of malaria infection in children in a national survey in 2016, showed that 22% of children aged 6 to 59 months, surveyed between August and November, tested positive for *Plasmodium falciparum* by rapid diagnostic test indicating current or recent infection and 15% were positive by microscopy. The prevalence of anaemia (Hb<8g/dL) was 18% (Table 1). WHO estimated* there were 3,524,261 cases of malaria and 8,203 deaths caused by malaria in 2018 in a population of 12.4million. The estimated 2019 population is 12.8million in total including 2.1million children under 5 years of age (United Nations Department of Economic and Social Affairs, 2019). Under-5 mortality was estimated to be 111 per 1000 live births in the 2018 DHS survey (over the 5-year period with midpoint 2016), and 80.7 (for the 5-year period with midpoint 2018) in the UN projections (United Nations Department of Economic and Social Affairs, 2019).

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. Therapeutic efficacy testing in 2015-2016 indicated both drugs retain a high level of effficacy, and further monitoring is being undertaken (Camara *et al.* 2019). 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. The Demographic and Health Survey (DHS) in 2018, showed that coverage of key primary health interventions (childhood vaccination, access to prompt and effective case management of childhood illnesses, and prenatal and postnatal care) were low (Table 2). In 2017, the Government of Guinea adopted a policy to implement a reformed integrated package of essential prevention and treatment services at community-level, to reduce morbidity and mortality with emphasis on the rural population, and a strategic plan (2018-2022) and three-year operational plan (2018-2020) were developed to guide implementation (Ministere de la Sante, Republique de Guinea, 2018a,b).

Seasonal Malaria Chemoprevention (SMC) was introduced in 2015. SMC involves the administration of a treatment course of sulfadoxine-pyrimethamine plus amodiaquine once a month to children aged 3–59 months during the high risk period each year to prevent malaria (WHO 2013). SMC was introduced initially in 6 prefectures, scaling up to 13 prefectures by 2018. A survey in the 13 prefectures with SMC in 2018 showed that 79% of children received SMC at least once, and 61% received four treatments. There were geographical variations with lower coverage in mining areas. Use of bednets (LLINs) was low, only 30% of children slept under an LLIN the night before the survey, 40% of

households owned an LLIN, 13% of households had one LLIN per 2 persons, and 25% of the population had access to an LLIN (Loua and Milligan 2019).

Using predictions from the Imperial College malaria model, the ACCESS-SMC project estimated that SMC in Guinea would be expected to avert about 1.2 deaths per 1000 children treated per month. Thus the SMC programme in Guinea in 2018, which administered 3.4million treatments in 2018, could have averted about 4,000 deaths.

The present survey was conducted in the same 13 prefectures at the end of the 2019 transmission season to determine SMC coverage and use of LLINs, following national distribution of LLINs in 2019. The survey aimed to determine the percentage of children who received SMC in each cycle, the percentage who received the full four treatments, the adherence to the SMC regimen, and the use of insecticide-treated bednets by all household members, and to ask caregivers of children who did not receive four treatments, the reasons their children missed SMC treatments. During the survey, the feasibility of using SMC registers to validate caregiver report of SMC treatments, was investigated.

Table 1: Prevalence of malaria infection, anaemia and malnutrition, from DHS surveys in Aug-Nov 2016.

Region	*P.falciparum*		Other plasmodium	Anaemia	Stunting	Wasting
	Slide	RDT	(vivax,malaria,ovale) RDT	Hb<8g/dL	(ht for age, z<-2)	(wt for age, z <-2)
Boke	8.0%	12.9%	3.9%	14.5%	39.1%	20.4%
Conakry	1.9%	1.4%	0.4%	13.6%	20.5%	11.5%
Faranah	24.9%	31.7%	6.0%	24.6%	29.0%	17.1%
Kankan	19.4%	19.1%	7.3%	21.9%	30.5%	19.7%
Kindia	10.3%	21.6%	2.6%	21.0%	29.0%	15.1%
Labe	7.9%	12.7%	1.3%	12.5%	32.5%	18.4%
Mamou	18.4%	31.5%	1.0%	14.0%	27.0%	16.1%
Nzerekore	30.2%	46.7%	4.5%	16.7%	33.5%	12.2%
TOTAL	15.3%	21.9%	3.6%	17.5%	30.3%	16.3%

Source: Institut National de la Statistique (INS), Programme National de Lutte contre le Paludisme (PNLP) et ICF (2017).

Table 2: Vaccination coverage and bednet coverage, DHS 2018:

Region	DTP3	Measles 1	All basic vaccines*	Households with an LLIN	Households with 1 LLIN per 2 persons
Boke	29.6%	32.5%	16.9%	52.9%	22.7%
Conakry	55.1%	56.6%	36.5%	24.8%	7.8%
Faranah	39.4%	36.2%	20.6%	52.1%	13.6%
Kankan	46.6%	58.1%	36.2%	33.1%	8.1%
Kindia	39.8%	21.1%	11.7%	48.7%	25.3%
Labe	19.2%	17.1%	8.4%	54.0%	24.4%
Mamou	24.5%	30.8%	13.3%	45.5%	17.3%
Nzerekore	51.4%	50.0%	35.0%	49.5%	17.1%
TOTAL	40.2%	39.5%	23.9%	43.9%	16.7%

* BCG, three doses of pentavalent (DTP-HepB-Hib), three doses of oral polio (not including the dose at birth) and one dose of measles vaccine. Source: Institut National de la Statistique (INS) et ICF. (2018)

Description of Seasonal Malaria Chemoprevention

SMC involves administration of a course of treatment of sulfadoxine-pyrimethemine 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 of 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.

Scaling-up of SMC in Guinea

SMC was introduced in Guinea in 2015, in 6 prefectures with a target population of 210 107 children. The area covered was increased to 8 prefectures in 2016, 10 in 2017, and 13 in 2018 (Tables 3-4 and Figure 1). In 2018 the target population of children was 825 994, an increase of about 40% compared to the target number in 2017. Siguiri and Kankan are the largest prefectures accounting for about one third of the target population of children in the 13 prefectures.

Table 3: Expansion of SMC in Guinea 2015-2019

Prefecture	2015	2016	2017	2018	2019
Dinguiraye	X	X	X	X	X
Gaoual	X	X	X	X	X
Koubia	X	X	X	X	X
Koundara	X	X	X	X	X
Mali	X	X	X	X	X
Tougue	X	X	X	X	X
Mandiana		X	X	X	X
Siguiri		X	X	X	X
Labe			X	X	X
Lelouma			X	X	X
Dabola				X	X
Kankan				X	X
Kouroussa				X	X
Target population	**210107**	**438123**	**591071**	**825994**	**818502**

The delivery of SMC from 2015 to 2018 is summarised in the table below. The estimated percentage of children who received four SMC treatments was 57% in 2015 and 73% in 2016 and 63% in 2017 and 61% in 2018.

Table 4: SMC delivery in Guinea 2015-2019

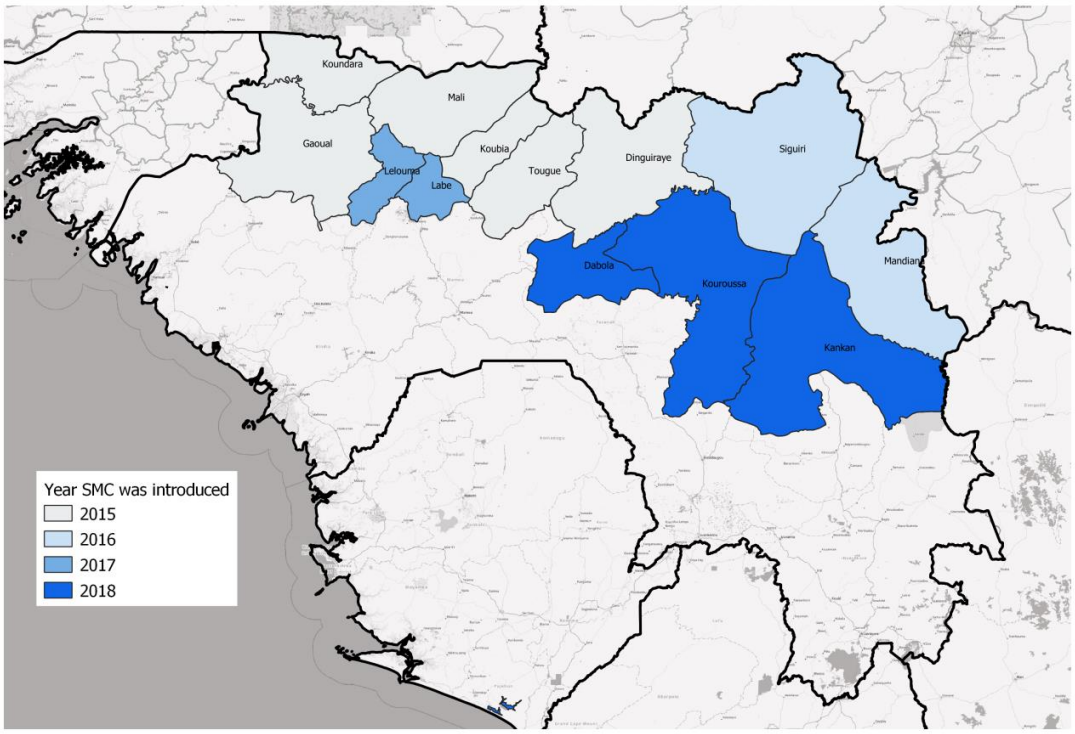
Year[‡]	Prefectures	Target population	Doses administered	Mean coverage per cycle	% treated at least once	% treated four times	Number eligible reached[*]	Number fully protected[#]
2015	6	210,107	805,131	80%	94%	57%	197,501	119,761
2016	8	438,123	1,750,224	88%	96%	73%	420,598	319,830
2017	10	591,071	2,303,709	73%	79%	63%	466,946	372,375
2018	13	825,994	3,356,780	72%	79%	61%	655,013	501,378
2019	13	818,502[†]	2,986,364	72%	86%	41%	699,819	338,860

*The target population multiplied by the estimate proportion of children who received at least one SMC treatment. #The target population multiplied by the proportion of children who received four treatments. [†]Population updated based on bednet campaign estimates.

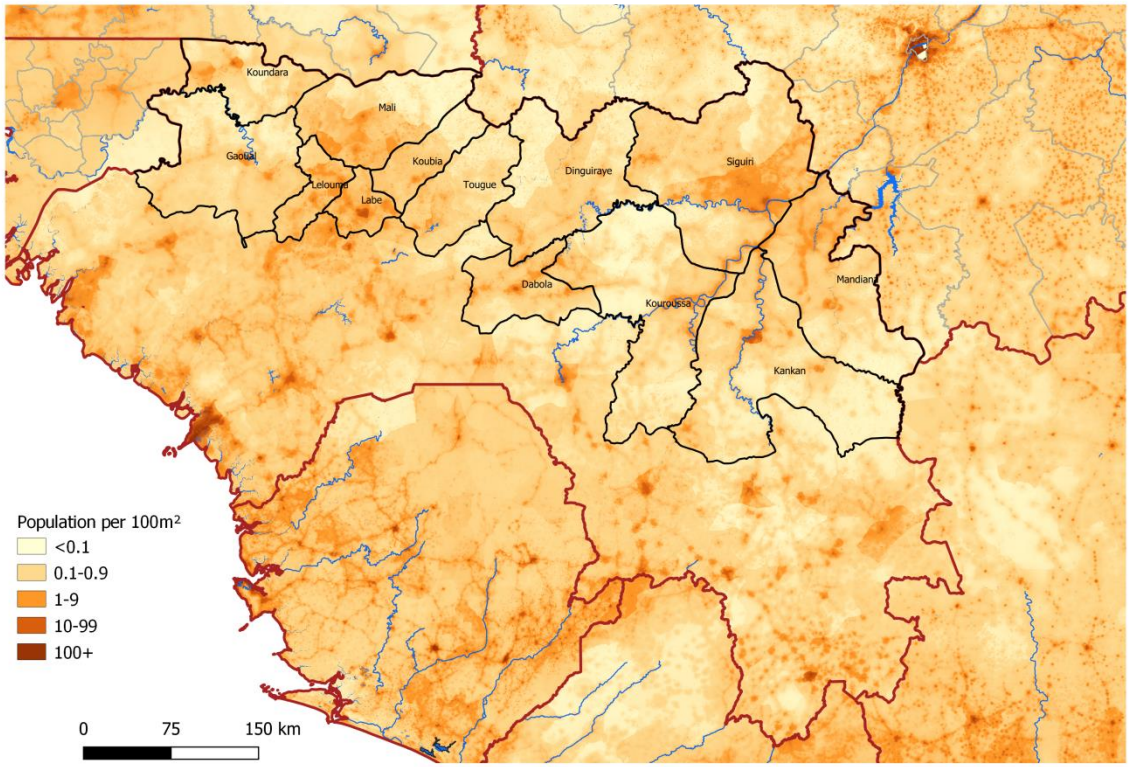
[‡]Sampling for the 2015 and 2016 surveys was based on the 1996 census, whereas for the surveys conducted since 2017, population data from the 2014 census were used. The earlier census did not reflect the increased population in mining areas. The apparent decrease in the percentage of children who received SMC in 2017 reflects a more representative sampling frame for the selection of survey villages, which included mining areas in Siguiri where SMC has been most challenging. These areas were not included in the 2016 survey.

Figure 1: A - Scale-up of SMC 2015-2018. B- Population distribution in SMC areas

A: Scaling up of SMC in Guinea



B: Spatial distribution of population in SMC areas



Source for spatial population data: Worldpop (2019)

SMC target population in 2019

The total estimated population of children to be treated was 818,503 (Table 5). The 2014 census estimates of the population were used for probability proportional to size selection of survey clusters and for calculation of survey weights.

Table 5: Target population for SMC in 2018, by prefecture

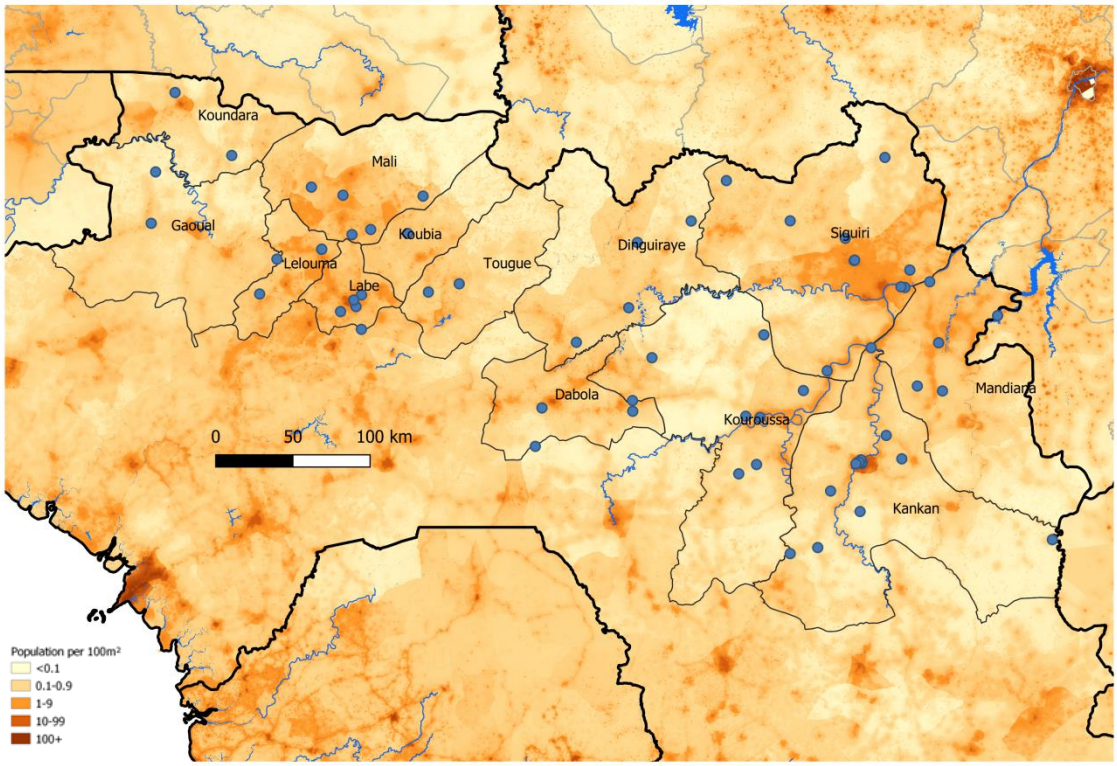
Prefecture	Target population 2019	Cumulative %	Target population 2018	Clusters	2014 Census population
Siguiri	157,639	19.3%	179,333	11	708,506
Kankan	109,713	13.4%	105,578	15	963,264
Mandiana	78,161	9.5%	77,431	5	335,921
Labe	76,221	9.3%	73,786	5	318,938
Mali	70,937	8.7%	68,741	5	290,614
Kouroussa	62,446	7.6%	64,442	8	545,212
Gaoual	47,103	5.8%	45,819	3	196,190
Dinguiraye	46,804	5.7%	45,797	4	199,465
Lelouma	43,473	5.3%	42,084	2	163,069
Dabola	42,142	5.1%	41,734	3	181,129
Koundara	31,184	3.8%	30,335	2	131,388
Tougue	29,468	3.6%	28,484	2	125,405
Koubia	23,212	2.8%	22,430	1	101,293
TOTAL	818,503		825,994	66	4,260,394

METHODS

The survey was conducted from 20 Dec 2019 to 4 Jan 2020 in 13 prefectures. Sixty-six settlements were selected from 13 prefectures where SMC was implemented in 2018 in the country (Figure 2), 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 (aged at least 3months at the time of treatment, and aged not more than 59 months at cycle1) 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 2: Location of SMC Coverage survey clusters.

(Note there are 66 clusters: Siguiri 11, Kankan 15, Mandiana 5, Labe 5, Mali 5, Kouroussa 8, Gaoual 3, Dinguiraye 4, Lelouma 2, Dabola 3, Koundara 2, Tougue 2, Koubia 1).



Training, piloting and data collection

Training took place over 2 days, 17-18 Dec 2019. The training covered the use of the survey tools, understanding the questionnaires, and field methods. 30 participants participated in the training: 18 interviewers, 2 NMCP staff, 5 supervisors, 3 substitute interviewers, and 2 trainers. The first day covered operation of tablet PCs, tablet settings, and the use of the data entry software, and comprehension and practice in the use of the data entry forms. The second day covered taking photographs of SMC cards, recording GPS coordinates, saving and finalizing a form, making corrections and field methods. Data collection was then piloted in the field on Dec 19, 2019, teams were trained in identifying segments of the survey villages, and administration of survey questionnaires. For the main survey, which started Dec 20 and ended on 4 Jan 2020, survey staff were organised in 6 teams.

Data management

Data were collected using Android tablets (Nexus 7 (4 devices) and Samsung T285 Galaxy Tab A (17 devices)). Software used was ODK. The ODK form metadata are available from the authors. The form used nested repeat structures to enable the capture of data at the household, caregiver and child levels – with linkage between the levels implemented directly through the ODK tool. The ODK aggregate server was based at the London School of Hygiene and Tropical Medicine. The devices used strong encryption so that if devices were

lost the data could not be seen by non-team members. Encryption was also used on the aggregate server, and the only way to retrieve the meaningful data was by using suitably setup ODK Briefcase – which allowed the decryption of the data from the server. The data were delivered as CSV files (in UTF 8 format). These files were then inserted into spreadsheet workbooks (separate sheet for each level). These spreadsheets were made available to members of LSHTM team and the data manager based in Guinea so that the data could be reviewed (for cleaning purposes) and for analysis. A separate MS Access version of the data sets was created, again using the source csv files, so that the images of the cards could also be reviewed against the data entered. This was used to identify missing data from the cards. The MS Access database became the cleaned version of the database, and it was the source used for analysis. The data were extracted from the Access database using MS PowerBI – which enabled the decoding of the data gathered into the meaningful labels (e.g. so Male and Female were generated, rather than 1 and 2), and the merging of the data from the different levels. All data sharing between teams was implemented using MyFiles – the secure sharing platform used by LSHTM.

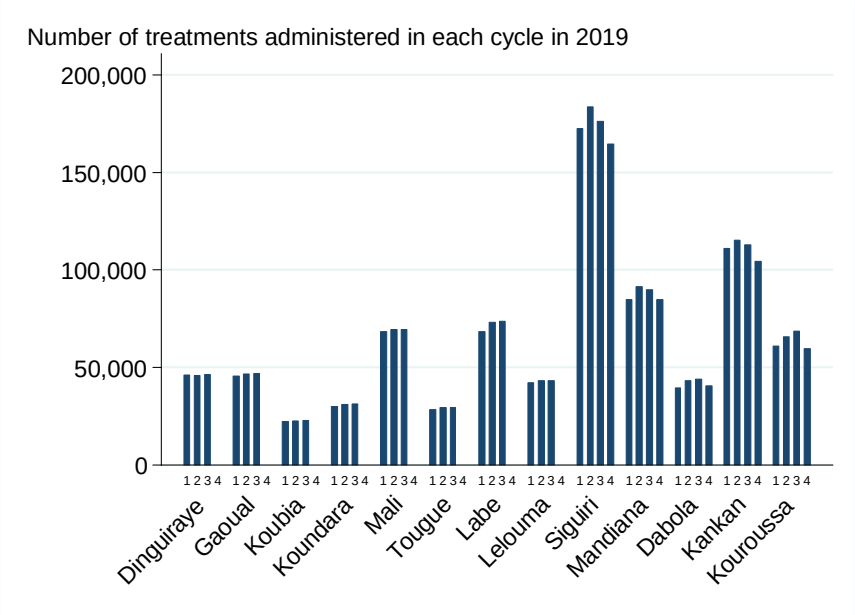
Administrative data

A total of almost 3 million treatments were administered in 2019 (2,986,364, of which 454,030 (15.2%) to infants and 2,532,334 to children). The fourth cycle was not implemented in PMI areas. In most prefectures, the number of treatments administered per cycle was similar in each cycle. The variation was greatest (greater than 10% difference between the maximum and minimum per cycle) in Siguiri, Dabola and Kouroussa.

Table 6: Number of treatments administered in 2019

Prefecture	1	2	3	4	Total	% variation (max-min)/max
Dinguiraye	46138	45774	46219			0.96%
Gaoual	45595	46654	46832			2.64%
Koubia	22090	22412	22773			3.00%
Koundara	29885	30915	31318			4.58%
Mali	68432	69243	69367			1.35%
Tougue	28222	29339	29432			4.11%
Labe	68425	73133	73689			7.14%
Lelouma	41976	43173	43029			2.77%
Siguiri	172590	183523	176172	164491		10.37%
Mandiana	84790	91278	89870	84705		7.20%
Dabola	39460	43100	44041	40497		10.40%
Kankan	110898	115207	112716	104300		9.47%
Kouroussa	60984	65661	68542	59474		13.23%
Total	819485	859412	854000	453467	2986364	

Figure 3: Number of SMC treatments in 2019



Administrative data from SMC reports from the 2019 campaign provided by the PNLP, are summarised in Tables 7-14. Results are presented separately for PMI and GF areas as the number of cycles differed.

Vomitting: Overall, 1.4% of infant treatments and 0.4% of treatments to children 12-59 months, were vomited and a second dose administered. Infants were about 3 times more likely to vomit than older children. The risk of vomiting was highest in the first cycle, and lowest in the fourth cycle.

Table 7: % of children who vomited (PMI zone)

	3-11months		12-59months			
Cycle	Treated	Vomitted and re-dosed	Treated	Vomitted and re-dosed	Risk ratio (95%CI) (both ages combined)	Risk ratio (95%CI) (infants:children)
1	54446	1045 (1.92%)	296317	2041 (0.69%)	1	2.9 (2.4,3.3)
2	56540	990 (1.75%)	304103	1570 (0.52%)	0.80 (0.68,0.94)	3.4 (2.8,4.0)
3	56341	979 (1.74%)	306318	1558 (0.51%)	0.79 (0.66,0.95)	3.3 (2.9,3.8)
TOTAL	167327	3014 (1.80%)	906738	5169 (0.57%)		3.2 (2.9,3.5)

Table 8: % of children who vomited (GF zone)

	3-11months		12-59months			
Cycle	Treated	Vomitted and re-dosed	Treated	Vomitted and re-dosed	Risk ratio (95%CI) (both ages combined)	Risk ratio (95%CI) (infants: children)
1	70808	1146 (1.62%)	397914	2133 (0.54%)	1	3.0 (2.5,3.6)
2	77759	879 (1.13%)	421010	1368 (0.32%)	0.64 (0.54,0.75)	3.5 (3.1,4.1)
3	74821	819 (1.09%)	416520	1221 (0.29%)	0.59 (0.54,0.66)	3.7 (3.1,4.5)
4	63315	667 (1.05%)	390152	832 (0.21%)	0.48 (0.40,0.58)	4.9 (4.1,5.8)
TOTAL	286703	3511 (1.22%)	1625596	5554 (0.34%)		3.6 (3.2,4.0)

Referral: Referrals were relatively uncommon. Infants were twice as likely to be referred, due to illness, than older children (both zones combined: 0.34% compared to 0.15%, risk ratio 2.3, 95%CI 1.9,2.7). Referrals were more common during cycle 1 than other cycles.

Table 9: % of children who were referred (PMI zone)

	Infants 3-11 months		Children 12-59 months			
	Seen	Referred	Seen	Referred	Risk ratio (95%CI) (both ages combined)	Risk ratio (95%CI) (infants:children)
1	56796	488 (0.86%)	300114	1102 (0.37%)	1	2.3 (1.7,3.2)
2	58027	207 (0.36%)	306813	613 (0.20%)	0.50 (0.35,0.73)	1.8 (1.3,2.3)
3	57456	208 (0.36%)	308447	465 (0.15%)	0.41 (0.28,0.62)	2.3 (1.6,3.3)
TOTAL	172279	903 (0.52%)	915374	2180 (0.24%)		2.2 (1.8,2.7)

Table 10: % of children who were referred (GF zone)

	Infants 3-11 months		Children 12-59 months			
	Seen	Referred	Seen	Referred	Risk ratio (95%CI) (both ages combined)	Risk ratio (95%CI) (infant:children)
1	72075	294 (0.41%)	401376	897 (0.22%)	1	1.9 (1.5,2.6)
2	78564	135 (0.17%)	422724	262 (0.06%)	0.31 (0.18,0.54)	2.9 (1.9,4.3)
3	75396	117 (0.16%)	417743	224 (0.05%)	0.27 (0.11,0.62)	2.7 (1.6,4.5)
4	63755	116 (0.18%)	391151	186 (0.05%)	0.26 (0.09,0.77)	3.6 (2.2,5.7)
TOTAL	289790	662 (0.23%)	1632994	1569 (0.10%)		2.4 (1.9,3.1)

Exclusions for reasons other than sickness: Children are excluded if they are outside the age range for SMC, or have a history of allergy to SMC drugs, or had taken sulfa-containing medicine or amodiaquine (apart from their last SMC) within the last 4 weeks. Infants were more likely to be excluded than children, and the number excluded was, as is expected, highest in cycle 1. In cycle 1, 3.2% of infants were excluded in the PMI zone and 1.3% in the GF zone.

Table 11: % of children who were excluded (PMI zone)

	Infants 3-11 months		Children 12-59 months			
	Seen	Excluded	Seen	Excluded	Risk ratio (95%CI) (both ages combined)	Risk ratio (95%CI) (infants:children)
1	56796	1822 (3.21%)	300114	2615 (0.87%)	1	4.1 (3.3,5.0)
2	58027	1259 (2.17%)	306813	2034 (0.66%)	0.72 (0.60,0.86)	3.5 (3.1,4.0)
3	57456	906 (1.58%)	308447	1658 (0.54%)	0.56 (0.43,0.72)	3.0 (2.6,3.5)
TOTAL	172279	3987 (2.31%)	915374	6307 (0.69%)		3.6 (3.2,4.1)

Table 12: % of children who were excluded (GF zone)

	Infants 3-11 months		Children 12-59 months			
	Seen	Excluded	Seen	Excluded	Risk ratio (95%CI) (both ages combined)	Risk ratio (95%CI) (infants:children)
1	72075	962 (1.33%)	401376	2512 (0.63%)	1	2.2 (1.9,2.5)
2	78564	668 (0.85%)	422724	1445 (0.34%)	0.57 (0.48,0.67)	2.6 (2.1,3.1)
3	75396	458 (0.61%)	417743	999 (0.24%)	0.40 (0.35,0.45)	2.6 (1.9,3.5)
4	63755	324 (0.51%)	391151	809 (0.21%)	0.34 (0.24,0.49)	2.4 (1.4,4.1)
TOTAL	289790	2412 (0.83%)	1632994	5765 (0.35%)		2.4 (2.1,2.7)

Refusals: These may include children who would not take the medicine and children whose caregiver refused for them to have SMC. There were 288 refusals out of 3,010,437 children seen (about 1 per 10,000). Most of these were in the first cycle.

Table 13: % of children who refused (PMI zone)

	Infants 3-11 months		Children 12-59 months			
	Seen	Refused	Seen	Refused	Risk ratio (95%CI) (both ages combined)	Risk ratio (95%CI) (infants:children)
1	56796	40 (0.07%)	300114	80 (0.03%)	1	2.6 (1.4,5.0)
2	58027	21 (0.04%)	306813	63 (0.02%)	0.68 (0.12,3.8)	1.8 (0.5,6.5)
3	57456	1 (0.00%)	308447	6 (0.00%)	0.06 (0.01,0.36)	0.9 (0.3,2.5)
TOTAL	172279	62 (0.04%)	915374	149 (0.02%)		2.2 (1.2,4.1)

Table 14: % of children who refused (GF zone)

	Infants 3-11 months		Children 12-59 months			
	Seen	Refused	Seen	Refused	Risk ratio (95%CI) (both ages combined)	Risk ratio (95%CI) (infants:children)
1	72075	11 (0.02%)	401376	53 (0.01%)	1	1.2 (0.6,2.3)
2	78564	2 (0.00%)	422724	7 (0.00%)	0.1 (0.0,0.5)	1.5 (0.3,6.8)
3	75396	0 (0.00%)	417743	0 (0.00%)	0.0 (0.0,0.0)	-
4	63755	0 (0.0%)	391151	4 (0.00%)	0.1 (0.0,0.5)	-
TOTAL	289790	13 (0.00%)	1632994	64 (0.00%)		1.1 (0.6,2.1)

RESULTS

Layout of the results

Results for the key indicators are presented overall (average value for all 13 prefectures), and for each of four areas defined as follows:
Area 1 - prefectures which started SMC in 2015 (Gaoual, Koundara, Koubia, Mali, Dinguiraye, Tougué);
Area 2 – prefectures which started SMC in 2016 (Mandiana and Siguiri)
Area 3 – prefectures which started SMC in 2017 (Labé, Lelouma)
Area 4 – prefectures which started SMC in 2018 (Dabola, Kouroussa, Kankan)

Areas 1 and 3 are supported by PMI and Areas 2 and 4, Global Fund. In 2019, the fourth cycle was not implemented in PMI areas, therefore in this report for some analyses, results are presented grouping together areas 1 and 3 (PMI) and areas 2 and 4 (Global Fund, GF).

Estimates for each prefecture separately are also provided but for some prefectures the number of clusters is small and the survey is not designed to produce reliable estimates in these prefectures.

95% confidence intervals are presented for the key indicators which show the degree of uncertainty in the estimated value.

Response rates

A total of 1,038 households participated in the survey (Table 15), 89% of all households visited. The location of the clusters is shown in Figure 2. A total of 2536 children were included, of these 1893 were aged 3-59 months at the time of cycle 1 and hence eligible to have received four SMC treatments. 244 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 15: Response rates and the number of households, children and other household members surveyed:

Households surveyed:	No. of households	%
Agreed to participate	1038	89.2%
No children of eligible age	82	7.0%
Refused to participate	0	0.0%
Unable to find someone to speak with/no access	44	3.8%
TOTAL	1164	
Children surveyed:	No. of children	
Aged 3-59 months at cycle 1 (eligible for 4 SMC treatments)	1893	
Aged 5-6 years at survey	252	
Aged 6-7 years at survey (more than 5 years of age at cycle 1)	244	
Aged <3months at cycle 1	147	
TOTAL (3 months to 7 years at survey)	2536	
Aged at least 3 months at cycle 4 and <5yrs (eligible at C4)	2040	
Caregivers surveyed:	868	

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 28 days (the first day of the cycle starting 28 days after the first day of the previous cycle), to ensure children remain protected. Cycle 1 took place in July, cycle 2 in August, cycle 3 in September and cycle 4 in October (Figure 4). The median interval between treatments, based on dates recorded on SMC cards, in PMI areas was 35 days between cycle 1 and cycle 2, and 31 days between cycle 2 and 3, and in GF areas, 33 days between cycle 1 and 2, 32 days between cycle 2 and 3, and 33 days between cycles 3 and 4. These intervals should be reduced to 28 days. Cases will increase in the 5th week as protection wanes rapidly after 4 weeks.

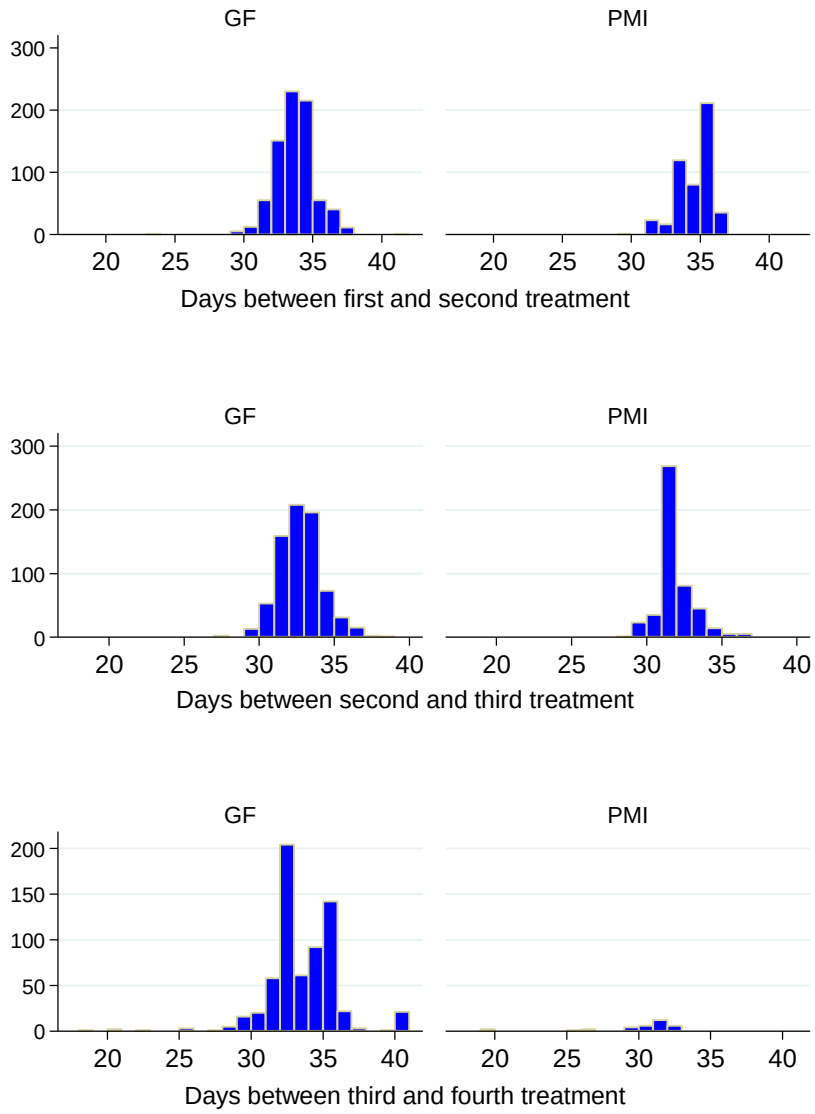
Table 16: Planned timing of cycles:

	1	2	3	4
GF zone (Areas 2 and 4)	16 Jul-20 Jul	18 Aug-22 Aug	20 Sep-24 Sep	22 Oct-26 Oct
PM zone (Areas 1 and 3)	13 Jul-17 Jul	17 Aug-21 Aug	17 Sep-21 Sep	

Table 17: Median interval between treatments (min-max), in days, determined from dates SMC record cards

	GF	PMI
Cycle 1 to cycle 2	33 (23-37)	35 (29-37)
Cycle 2 to cycle 3	32 (27-39)	31 (28-37)
Cycle 3 to cycle 4	33 (18-41)	

Figure 4: Interval between cycles



Retention of SMC cards

Of 1893 children eligible for 4 SMC treatments who were surveyed, 12% did not receive an SMC card (compared to 9% in 2018), 88% received an SMC card (91% in 2018). Of those who received a card, 76% retained the card (compared to 69% in 2018). A total of 68% (1294) had a card available for inspection in the survey.

Agreement between caregiver recall, the SMC card, and registers

To assess the reliability of SMC status determined during the survey, the number of SMC treatments reported by the caregiver was compared with the number recorded on the SMC card (for those children who had a card for inspection in the survey), and, for a subset of children, the number recorded in the SMC register. Caregivers were asked about the number of treatments, before looking at the SMC card or register. Out of the 1893 children in the survey who were eligible for four treatments, a total of 1294 children had a card for inspection in the survey. In 55 clusters where SMC registers were available, an attempt was made to find entries in the SMC register for the children in the survey who did not have an SMC card, and for some who did have a card. This was possible for 339/580 (58%) children without a card. The survey estimate, based on caregiver recall, of the percentage of children who received SMC at least once, among those who did not have a card available for inspection at the survey, was 56%. Therefore the number found in registers is what we would have expected, bearing in mind that most children who did not receive SMC are not included in registers. Register entries were also found for some children who had an SMC card (264/1064, 25%) although this was not done for all children with a card.

	Card	No card	Total
Eligible for 4 treatments	1294	599	1893
Register available	1064	580	1644
Found in register	264	339	603

In method comparison studies, two measures of the degree of agreement are commonly used, the percentage agreement, (the percentage of children for whom the methods of assessing SMC status agree), and the kappa statistic. The kappa statistic is an index of agreement which allows for there being a degree of agreement due to chance, and is relevant when there may be an element of guesswork - for example if caregivers did not know the number of treatments and guessed - there will be then be some agreement with the card or register, just by chance. Percentage agreement of 80% or more, and a kappa value of 0.6 or more, is generally considered to be an acceptable level of agreement between methods (McHugh 2012).

None of the methods used in our survey is perfect, registers and cards may not always be completed, there could be a tendency to complete registers before children have been treated, and there could be errors such as completing the card for a different child, or the entering treatment in the wrong line in the register. Caregivers may be expected to know if their child has been treated at all this year, and whether the child was treated in the last cycle before the survey, but they might be expected to recall less reliably the number of times the child was treated this year, and least reliably, whether the child was treated in each of the four months. We do not have a gold standard, but we seek to show there is good agreement between

methods to justify their use. We are primarily interested in the number of treatments received by a child; the coverage in individual cycles is also important but is of secondary interest.

The percentage agreement between caregiver's recall and SMC record card, with regard to the number of treatments, for the 1,294 children with a card, was 83% (95% confidence interval 0.80 to 0.85), with a kappa value of 0.73 (95%CI 0.69 to 0.76), indicating an acceptable level of agreement.

Table 18: Agreement between recall and card, for children in the survey with an SMC record card:

	Number of treatments on the SMC card					
	0	1	2	3	4	Total
Number of treatments according to caregiver						
0	1	15	3	18	61	98
1	0	41	0	2	0	43
2	0	13	55	8	0	76
3	0	13	15	436	13	477
4	0	15	25	25	535	600
Total	1	97	98	489	609	1,294

For those children who did not have an SMC record card, agreement between caregiver's recall and the register, in the 339 children who could be found in registers, was 79% (95%CI 74% to 83%), with a kappa value of 0.64 (95%CI 0.56 to 0.71), again indicating an acceptable level of agreement.

Table 19: Agreement between recall and register, for children without an SMC record card:

	Number of treatments in the SMC register					
	0	1	2	3	4	Total
Number of treatments according to caregiver						
0	0	3	8	41	52	
1	1	0	0	2	3	
2	1	8	2	1	12	
3	0	3	89	4	96	
4	1	1	4	170	176	
Total	3	15	103	218	339	

Children who did not receive SMC at all, will not be listed in registers (except those few who were seen by the CHW, entered in the register, but did not get SMC). Out of the 580 children in clusters where a register was available, who did not have a card, 339 (58%) were found in the register and 241 (42%) were not found in the register. Of the 241 who were not found, 72% (173/241) did not receive SMC according to the caregiver, compared to 15% (52/339) of those who were found in the register.

For those that had a card and were found in the register, agreement between the card and register was less good, there was 56% agreement (95%CI 50% to 62%), and a kappa of 0.38 (95%CI 0.31 to 0.44). Where there was disagreement, there tended to be more treatments in the register than on the card, suggesting that CHWs may not always record treatments on the card. There were few cases where treatments were recorded on the card but not in the register. However, the survey team did not attempt to find register entries for every child who had a card so these data may not be representative.

Table 20: Agreement between card and register:

	Number of treatments in the SMC register					
	0	1	2	3	4	Total
Number of treatments according to SMC card						
0	0	0	0	0	1	1
1	1	16	4	8	26	55
2	0	1	12	8	30	51
3	0	0	3	35	33	71
4	0	0	0	1	85	86
Total	1	17	19	52	175	264

Taken together, these results suggest we should combine the information from the card and caregiver recall, considering the child to have been treated when a treatment is recorded on the card, and when the caregiver reports the child was treated even if no treatment is marked on the card. Applying this rule to the 603 children found in registers, led to 77% agreement and a kappa of 0.61. In contrast, recall alone on the same 603 children gave 75% agreement with registers and a kappa value of 0.58. Caregivers appear to be able to recall the number of treatments quite reliably.

The results also suggest that finding register entries for children who did not have a card, was successful. Allowing for the fact that most children who did not receive any SMC treatments will not be listed in the register, it appears that a high proportion of children who received SMC but did not have a card at the survey, were located in registers. We therefore recommend that registers be used in futures surveys to cross-check SMC status, for children who do not have a card, and for children who have a card. Registers are of course useful during SMC distribution, as having a list of children to be treated helps the community health worker ensure that children seen at one cycle are not missed in subsequent cycles, but they also serve a purpose for verifying SMC status during surveys.

The SMC card is a record and reminder for the caregiver, so it is important that it is completed. Caregivers may use the card to check if their child's treatments are complete, they could then seek treatment at the health centre if they missed the door-to-door campaign. Training of CHWs should emphasise the importance of recording treatments on the SMC card as well as in the register, and the need to remind caregivers to use and retain the card.

When caregivers reported more SMC treatments than were recorded on the SMC card, it is plausible that treatments were received but not recorded on the card by the community health worker, or that caregivers did not accurately recall the exact number of treatments. In the cases where the caregiver said the child had not received any SMC, but there were several SMC treatments recorded on the card, it is possible that the respondent was not the same person that cared for the child during the SMC campaigns, or that cards for different children had been swapped during SMC delivery. Overall, there was a high level of agreement between recall and card, as has been observed in previous surveys.

In most of the cases where there was disagreement between combined card and caregiver recall, and the register, the number of treatments was greater according to the register, that is, there were more treatments in the register than according to either the card or the caregiver. This could occur if health workers enter treatments in the register before children have been treated, but we have no independent evidence of this happening. There could also be linkage errors, the wrong record in the register being used.

In this report, we have used a combination of recall and card; the child was assumed to have been treated in a particular month if there was a treatment recorded on the card (even if the caregiver disagreed); if the caregiver stated the child had been treated, but there was no record in the card, it was assumed the child had been treated but the treatment had not been recorded.

Figure 5: Example of an SMC card and register

Awareness about the SMC campaign

Caregivers should be 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. The survey asked one caregiver in each household if the household was aware about SMC and, for the most recent cycle (cycle 4 in GF areas and cycle 3 in PMI areas) if they knew in advance the date the health workers would come. Overall, 94.7% of households were aware of the SMC campaign and 92.4% said they knew in advance the date of the campaign.

Table 21: Public awareness about SMC: the percentage of households that were aware of the SMC programme, and the percentage that heard the last campaign date in advance.

Area	% households aware of SMC (95%CI)	% households who heard date of last cycle in advance (95%CI)
Dinguiraye, Gaoual, Koubia, Koundara, Mali, Tougue	93.0% (88.1%,96.0%)	92.6% (85.3%,96.4%)
Labe, Lelouma	99.4% (95.6%,99.9%)	100.0% (95.8%,100.0%)
Siguiri, Mandiana	88.3% (68.6%,96.3%)	80.5% (62.3%,91.2%)
Dabola, Kankan, Kouroussa	99.4% (97.7%,99.8%)	99.5% (97.7%,99.9%)
Total	94.6% (89.0%,97.4%)	92.3% (85.7%,96.0%)

The most common sources of information about campaign dates were health workers, friends and neighbours, criers, the radio, and the mosque or church (Table 22). In Siguiri, households were less likely to have heard from the health worker. Radio messages reached about 40% of households.

Table 22: Public awareness about SMC: sources of information

	From a health worker	From friends/ neighbours	From public crier	From banners posters	On the radio	On TV	At the mosque/ church	Other
Dinguiraye, Gaoual, Koubia, Koundara, Mali, Tougue	87.1%	34.0%	43.4%	0.4%	46.6%	0.8%	69.7%	6.9%
Labe, Lelouma	80.6%	39.4%	46.3%	0.0%	27.0%	1.0%	7.4%	0.0%
Siguiri, Mandiana	32.1%	39.8%	81.0%	0.0%	33.4%	0.4%	75.9%	0.4%
Dabola, Kankan, Kouroussa	92.0%	66.4%	51.2%	3.5%	37.6%	1.9%	78.6%	4.5%
Total	74.4%	47.8%	55.9%	1.4%	37.6%	1.1%	66.6%	3.6%

Characteristics of caregivers

The caregiver was usually the child's mother. 27% of caregivers looked after one child under the age of 5 years, 37% two children under 5, and 35% three or more children under 5. When asked how long they had been resident in the area, almost all (>99%) said they had lived there for at least 6 months. Only 43% of caregivers had had any formal (or Koranic) education.

Table 23: Characteristics of caregivers

Characteristic	Categories	%
Age	<18yrs	2.0%
	18-24yrs	22.5%
	25-34yrs	47.1%
	35-44yrs	22.7%
	45+yrs	5.8%
Gender	Male	1.4%
	Female	98.7%
Relationship to child	Parent	92.9%
	Sister/Brother	0.3%
	Aunt/Uncle	0.1%
	Grandparent	6.6%
	Neighbour	0.1%
	Other	0.1%
Resident	<6months	0.3%
	6months+	99.7%
No. of children <5yrs in their care	0	0.8%
	1	27.4%
	2	36.6%
	3	22.6%
	4	8.3%
	5	3.1%
	6	0.9%
	7	0.3%
Any education	None	57.0%
	Any formal/Koranic education	43.0%
Years of education	None	56.9%
	1-5yrs	31.8%
	6-10yrs	8.0%
	11+yrs	3.3%
Marital status	Unmarried	0.9%
	Married	97.3%
	Widowed	1.8%
	Divorced	0.0%

Caregivers' knowledge about SMC

Caregivers were asked if they understood key aspects of SMC, they scored 70% overall on a 10-point questionnaire. Most caregivers (84%) knew that SMC is used to prevent malaria and most (81%) knew that there are 2 tablets to be taken on the first day and one on each of the next two days (84%). However there was a widespread view that SMC drugs could be used for treatment if there was someone unwell in the household (only 44% of caregivers gave the correct response, that SMC drugs should not be used in this way), and only 62% of caregivers (62%) appreciated the importance of completing the 3-day course of treatment.

Table 24: 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 25: Caregivers' knowledge scores on SMC and adherence to guidelines by CHW:

Area	Average caregiver knowledge score (out of 10) (95%CI)	Average CHW score for adherence to guidelines (out of 8) (95%CI)
Dinguiraye, Gaoual, Koubia, Koundara, Mali, Tougue	7.4 (6.5,8.4)	7.1 (6.4,7.7)
Siguiri, Mandiana	5.6 (3.7,7.5)	7.9 (7.8,8.0)
Labe, Lelouma	7.0 (6.2,7.9)	7.9 (7.9,8.0)
Dabola, Kankan, Kouroussa	7.5 (7.0,7.9)	7.6 (7.2,8.0)
TOTAL	7.0 (6.5,7.6)	7.6 (7.3,7.8)

Table 26a: Caregiver knowledge, % correct answers to each question

	% correct	
Question	2018	2019
For how many months should the child take SMC (4)	59.9%	61.1%
SMC is given to prevent malaria	82.0%	83.5%
SMC can prevent other diseases (correct answer No)	68.9%	70.2%
How many tablets should the child take on the first day? (2)	79.4%	80.9%
How many tablets should the child take on the second day? (1)	82.8%	84.3%
How many tablets should the child take on the third day? (1)	82.8%	84.3%
The child should swallow all the medication (Yes)	67.7%	68.9%
I can give the tablets to someone else who is unwell (No)	43.7%	44.4%
The child should complete the 3-day course of treatment	60.9%	61.7%
I should take the child to the health centre if unwell after SMC	62.3%	63.4%

Table 26b: Caregiver knowledge, % correct answers to each question, by area

Question	**Dinguiraye, Gaoual, Koubia, Koundara, Mali, Tougue**	**Labe, Lelouma**	**Siguiri, Mandiana**	**Dabola, Kankan, Kouroussa**
For how many months should the child take SMC	59%	56%	39%	86%
SMC is given to prevent malaria	79%	61%	88%	97%
SMC can prevent other diseases	75%	57%	76%	68%
How many tablets should the child take on the first day?	81%	61%	77%	95%
on the second day?	82%	61%	88%	97%
on the third day?	82%	61%	88%	97%
The child should swallow all the medication	76%	59%	58%	78%
I can give the tablets to someone else who is unwell	60%	36%	52%	28%
The child should complete the 3-day course of treatment	73%	54%	73%	46%
I should take child to the health centre if unwell after SMC	76%	57%	65%	55%

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 and the scores were notably better than when the same questions were asked after the 2018 campaign.

Table 27: CHW adherence to guidelines

	Action	% of caregivers who reported that the CHW performed the action at the last visit:		
		2017	2018	2019
1	Check the child's age	100.0%	80.1%	99.7%
2	Explain how to administer tablets	99.6%	79.8%	99.6%
3	Check for illness or fever	98.9%	79.6%	99.1%
4	Explain the common side effects of SMC drugs	97.0%	75.7%	94.7%
5	Advise to bring the child to the health centre if they are unwell	97.0%	77.5%	96.6%
6	Ask if the child had taken other medicines in the last 4 weeks	95.8%	71.1%	89.2%
7	Ask if the child had side effects to SMC before	92.9%	70.1%	88.1%
8	Ask about allergies to medicines	91.7%	72.8%	90.9%

Table 28: CHW adherence to guidelines, by area

Action	Total	Dinguiraye, Gaoual, Koubia, Koundara, Mali, Tougue	Labe, Lelouma	Siguiri, Mandiana	Dabola, Kankan, Kouroussa
Check the child's age	99.7%	99.0%	100.0%	100.0%	100.0%
Explain how to administer tablets	99.6%	99.5%	100.0%	99.1%	99.8%
Check for illness or fever	99.1%	97.7%	98.7%	100.0%	99.8%
Explain the common side effects of SMC drugs	94.7%	89.6%	98.9%	99.2%	94.1%
Advise to bring the child to the health centre if they are unwell	96.6%	95.0%	99.0%	96.3%	97.1%
Ask if the child had taken other medicines in the last 4 weeks	89.2%	77.8%	100.0%	100.0%	86.4%
Ask if the child had side effects to SMC before	88.1%	73.1%	98.7%	100.0%	87.5%
Ask about allergies to medicines	90.9%	77.8%	95.4%	100.0%	93.3%

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 questions about administration of SMC drugs were asked specifically about SMC treatment at the fourth cycle (reported for GF areas only).

In 97% of treated children, the first dose was directly observed (administered by the CHW (96.9%) or by the caregiver in the presence of the CHW (0.4%)). A small number of children (0.1%) received the first dose from the caregiver later, not observed by the CHW; the reason given was that the child was away at the time the CHW visited. And for 2.6% of children, the caregiver received the blister pack but did not administer the first dose.

Table 29: Percentage of SMC treatments directly observed (cycle 4)

Area	% of treatments with first dose directly observed (DoT)
Siguiri, Mandiana	99.5% (98.1%,99.9%)
Dabola, Kankan, Kouroussa	95.3% (88.5%,98.1%)
TOTAL	96.9% (92.7%,98.7%)

Table 30:Administration of the first daily dose of cycle 4

Administration of the first dose of Cycle 4	% of children
By the CHW	96.9%
By caregiver, observed by CHW	0.4%
By caregiver, unobserved	0.1%
By caregiver, but not done	2.6%

The most common reason for not receiving SMC at cycle 4 were the caregiver was working in the fields or mines. One reported the grandmother refused to allow the child to receive SMC.

Adherence

Reported adherence to the unsupervised doses of amodiaquine was very high. Of eligible children treated at cycle 4, caregivers reported that 96.1% received all three daily doses.

Caregivers were asked if the child swallowed all the medicine, spat out some medicine, or vomitted all the medicine. Most responded the child swallowed the medicine without vomitting. Of those who were treated, a total of 93.9% of children were reported to have received and swallowed the 3 daily doses without vomitting.

The most common reasons for not receiving SMC at cycle 4 were that the health worker did not visit, or the caregiver was away in the fields or mines.

Table 31: Reasons for missed treatments

Reason	%
The health worker did not visit the household	58.9%
Child was away at the time	26.5%
Child was living away from home	7.3%
Caregiver not available	2.5%
Child was unwell	1.5%
Family refused	1.5%
Other reasons	0.9%
Child has history of allergies to drugs	0.6%
Problems at distribution point	0.3%

Caregivers' comments of the SMC programme

Caregivers were asked for suggestions to improve the SMC programme. There were 178 responses, the points most commonly made were to include older age groups, provide new health facilities, improve accessibility of remote areas, increase the quantity of SMC drugs, increase the number of months of SMC, provide SMC in the mines, and provide more bednets.

Table 32: Caregivers' comments on the SMC programme

Comment	%
Include older age groups (older children, adults)	40.4%
Build health centre/hospital/health post	7.9%
Improve road access	7.3%
Increase quantity of SMC drugs	6.7%
Increase number of monthly cycles	5.1%
Deliver in the fields	3.9%
Bring bednets	3.9%
Increase number of SMC cards	3.9%
Include pregnant women	3.9%
Increase number of days each month	3.4%
Deliver in the mines, to reach those staying in mining areas	1.7%
Improve pay and conditions of health workers	1.7%
Increase number of drug distributors	1.7%
Provide information in good time	1.7%
Improve health provision generally	1.1%
Include all prefectures in Guinea	1.1%
Provide a second opportunity to get SMC	0.6%
Build a school	0.6%
Improve training for drug distributors	0.6%
Bring other medicines for children	0.6%
Ensure enough registers	0.6%
Cover transport costs or drug distributors	0.6%
Provide financial assistance	0.6%
Central point rather than door to door	0.6%
	100.0%

Time taken to receive SMC

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 (Table 33). About 50% of households reported that they waited less than one hour for the CHW to visit, 24% more than an hour, but about a quarter could not say how long they waited (Table 34).

Table 33: Household member who waited with the child for SMC

Who waited with the child	% of households
Mother	94.3%
Father	1.0%
Aunt	0.3%
Cousin	0.2%
Grandmother	3.8%
Grandfather	0.1%
Other	0.2%

Table 34: Amount of time spent waiting for SMC

Time spent waiting for the CHW	% of households
Less than 1 hour	50.1%
1-2 hours	13.8%
Up to half a day	6.4%
A full day	1.8%
More than 1 day	1.2%
Don't know	26.8%

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 2.9. Overall, 81% of children received SMC at cycle 1, 79% at cycle 2, 78% at cycle 3 and 49% at cycle 4. Overall, 41% received four treatments. 58% received four treatments in GF areas.

Cycle 4 was not implemented in PMI areas. However, there appeared to be some limited SMC distribution in some PMI areas, some children had cycle 4 treatment dates for 2019 marked on the SMC cards and in registers.

Coverage was similar from month to month. As in previous years, coverage was poor in Siguiri (average monthly coverage 44%), and as this has the largest target population, this brings down the overall national figures of SMC coverage.

Overall, 14.5% of children did not receive any SMC treatments, slightly less than in 2018 and 2017 (21%). Most of the children who did not receive any SMC are in Siguiri where 48% of children did not receive SMC.

SMC coverage in each year since 2015 is compared in Table 37.

Table 35: SMC coverage among children eligible for four treatments, by area (with 95%CI)

Area	Mean treatments per child	Mean coverage	Cycle 1	Cycle 2	Cycle 3	Cycle 4
Dinguiraye, Gaoual, Koubia, Koundara, Mali, Tougue	3.0	73.8%	95.4%	95.1%	93.4%	11.1%
Labe, Lelouma	2.9	73.5%	98.3%	97.8%	96.8%	1.1%
Dabola, Kankan, Kouroussa	3.3	83.7%	85.9%	85.0%	81.5%	82.4%
Siguiri, Mandiana	2.2	54.2%	58.2%	52.0%	55.4%	51.3%
TOTAL	2.9	71.5%	81.0%	78.6%	77.9%	48.6%

Table 36: Coverage in each cycle, by prefecture

Prefecture	C1	C2	C3	C4
Dabola	93.0%	99.3%	99.3%	93.7%
Dinguiraye	100.0%	100.0%	100.0%	28.9%
Gaoual	92.3%	88.7%	81.9%	0.0%
Kankan	83.3%	79.8%	78.3%	78.5%
Koubia	100.0%	100.0%	91.7%	8.3%
Koundara	82.4%	79.9%	79.9%	0.0%
Kouroussa	89.1%	91.1%	81.8%	86.7%
Labe	98.6%	97.3%	96.1%	0.0%
Lelouma	96.9%	100.0%	100.0%	6.1%
Mali	94.5%	98.8%	98.8%	0.0%
Mandiana	87.1%	83.6%	83.4%	82.5%
Siguiri	48.8%	41.6%	46.3%	41.1%
Tougue	100.0%	100.0%	100.0%	2.4%

Table 37: Comparison of coverage with 2015 and 2016: mean number of treatments per child in each year

Prefecture	2015	2016	2017	2018	2019
Dinguiraye	3.25	3.65	3.99	3.82	3.29
Gaoual	2.46	3.29	3.10	3.31	2.63
Koubia	3.26	3.52	3.54	3.36	3.00
Koundara	3.16	2.75	2.49	3.41	2.42
Labé			3.04	3.33	2.92
Lelouma			3.83	3.25	3.03
Mali	3.20	3.40	2.97	3.80	2.92
Mandiana		3.46	3.49	3.85	3.37
Siguiri		3.48	2.12	1.43	1.78
Tougé	3.50	3.89	3.79	3.58	3.02
Dabola				3.30	3.85
Kouroussa				3.67	3.49
Kankan				3.29	3.20
TOTAL	3.15	3.46	2.93	2.90	2.90

Table 38: Number of SMC treatments: percentage of children who received SMC 0,1,2,3,or 4 times

Number of treatments	TOTAL	Dinguiraye, Gaoual, Koubia, Koundara, Mali, Tougue	Labe, Lelouma	Siguiri, Mandiana	Dabola, Kankan, Kouroussa
0	**14.5%** (8.8%,22.8%)	3.9% (1.4%,10.6%)	0.6% (0.1%,5.1%)	36.2% (23.2%,51.7%)	7.1% (2.7%,17.2%)
1	**3.7%** (2.0%,6.8%)	0.8% (0.3%,2.4%)	0.5% (0.1%,3.9%)	6.0% (2.8%,12.7%)	4.5% (1.6%,11.9%)
2	**4.4%** (2.9%,6.7%)	2.9% (1.2%,7.0%)	4.2% (1.0%,16.1%)	3.8% (1.6%,8.9%)	5.9% (3.3%,10.4%)
3	**35.9%** (25.3%,48.1%)	81.3% (55.7%,93.7%)	93.6% (79.3%,98.2%)	12.4% (7.8%,19.0%)	11.6% (7.1%,18.3%)
4	**41.4%** (31.7%,51.8%)	11.1% (1.7%,47.5%)	1.1% (0.1%,8.4%)	41.5% (31.5%,52.4%)	70.9% (58.6%,80.8%)
At least 1	**85.5%** (77.2%,91.2%)	96.1% (89.4%,98.6%)	99.4% (94.9%,99.9%)	63.8% (48.3%,76.8%)	92.9% (82.8%,97.3%)

Table 39: Number of SMC treatments: percentage of children who received SMC 0,1,2,3,or 4 times, by prefecture

Prefecture	0	1	2	3	4	At least 1
Dabola	0.0%	0.7%	0.0%	12.6%	86.7%	100.0%
Dinguiraye	0.0%	0.0%	0.0%	71.1%	28.9%	100.0%
Gaoual	7.7%	2.5%	8.9%	80.8%	0.0%	92.3%
Kankan	10.7%	6.6%	5.4%	6.8%	70.5%	89.3%
Koubia	0.0%	0.0%	8.3%	83.3%	8.3%	100.0%
Koundara	17.6%	2.6%	0.0%	79.9%	0.0%	82.4%
Kouroussa	1.6%	1.3%	9.4%	21.9%	65.8%	98.4%
Labe	0.7%	0.6%	4.4%	94.2%	0.0%	99.3%
Lelouma	0.0%	0.0%	3.1%	90.8%	6.1%	100.0%
Mali	1.2%	0.0%	4.3%	94.5%	0.0%	98.8%
Mandiana	0.0%	5.8%	10.7%	24.8%	58.8%	100.0%
Siguiri	48.1%	6.1%	1.6%	8.3%	35.9%	51.9%
Tougue	0.0%	0.0%	0.0%	97.6%	2.4%	100.0%

Equitability of SMC coverage

The proportion that received no SMC was lower in the poorest two wealth rankings and increased in the higher rankings (test for trend, P=0.002). There was no evidence that the coverage of four treatments was associated with wealth ranking (test for trend, P=0.584). SMC coverage was similar in boys and girls.

Table 40: SMC treatment by wealth ranking

SES	Mean number of SMC treatments (95%CI)	% that received four SMC treatments	% that received at least one SMC treatment	% that received no SMC
Lowest	2.9 (2.7,3.2)	28.0% (15.5%,45.1%)	92.3% (84.1%,96.5%)	7.7% (3.5%,15.9%)
Low	3.3 (3.0,3.5)	56.9% (40.6%,71.8%)	93.6% (87.4%,96.8%)	6.4% (3.2%,12.6%)
Middle	2.7 (2.4,3.1)	31.4% (18.4%,48.2%)	84.6% (69.8%,92.8%)	15.4% (7.2%,30.2%)
High	2.6 (2.2,3.1)	37.6% (25.9%,50.9%)	79.6% (62.5%,90.1%)	20.4% (9.9%,37.5%)
Highest	2.7 (2.4,3.1)	47.1% (35.6%,59.0%)	80.5% (70.1%,87.9%)	19.5% (12.1%,29.9%)

Table 41: SMC treatment by gender

Gender	Mean number of SMC treatments	% that received four SMC treatments	% that received at least one SMC treatment	% that received no SMC
Boys	2.8 (2.6,3.1)	39.4% (29.5%,50.2%)	85.2% (76.1%,91.2%)	14.8% (8.8%,23.9%)
Girls	2.9 (2.6,3.1)	43.4% (33.5%,53.9%)	85.9% (77.8%,91.3%)	14.1% (8.7%,22.2%)

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.

244 children 6years and above were surveyed. 13.9% (95%CI 7.1%,25.6%) received an SMC card. 13.0% received SMC at least once, 10.9% received SMC in cycle 1, 9.6% in cycle 2, 10.2% in cycle 3 and 1.8% in cycle 4. The mean number of treatments was 0.32.

It appears that treatment of older children has been reduced in 2018 (Table 25). In 2017, 53.8% of this group received an SMC card and about 40% received SMC at each cycle. In 2018, only 17.5% received a card and about 15% received SMC at each cycle. In 2019, 14% received a card and about 10% received SMC each cycle (except the fourth).

Table 42: Treatment of children above the age limit for SMC (aged 6-7 years at the survey)

		Treated at cycle:					
Year	**Mean number of treatments**	**1**	**2**	**3**	**4**	**Given an SMC card**	**Number surveyed**
2017	1.68	42.8%	43.9%	43.5%	38.2%	53.8%	189
2018	0.63	16.3%	16.5%	15.3%	14.9%	17.5%	327
2019	0.32	10.9%	9.6%	10.2%	1.8%	13.9%	244

Comparison of administrative and survey estimates of SMC coverage

Administrative estimates of coverage (the number treated as a percentage of the estimated target population), tend to over-estimate the percentage of eligible children who received SMC, partly because estimates of the target population often under-estimate the actual number, and partly because administrative data on the number of doses administered, include doses given to children outside the recommended age range. In surveys, interviewers check the age of each respondent and we limit estimates of coverage to children known to be aged at least 3 months and less than 60 months at the time of the first SMC cycle 1, (children eligible for 4 treatments), or to children aged less than 60 months at cycle 1 and aged at least 3 months at cycle 2, 3 or 4 (eligible for SMC at that cycle). In our survey reports we generally limit analyses to the group of children eligible for 4 cycles, apart from analyses of adherence, which include children who were eligible at cycle 4.

Table 43: Administrative data over-estimate coverage:

Cycle	Target	Treated	Administrative estimate	Survey estimate
1	818502	819485	100.1%	81.0%
2	818502	859412	105.0%	78.6%
3	818502	854000	104.3%	77.9%
4	818502	453467	55.4%	48.6%
TOTAL	3274008	2986364	91.2%	71.5%

Figure 6: Administrative and survey estimates of the coverage of four treatments

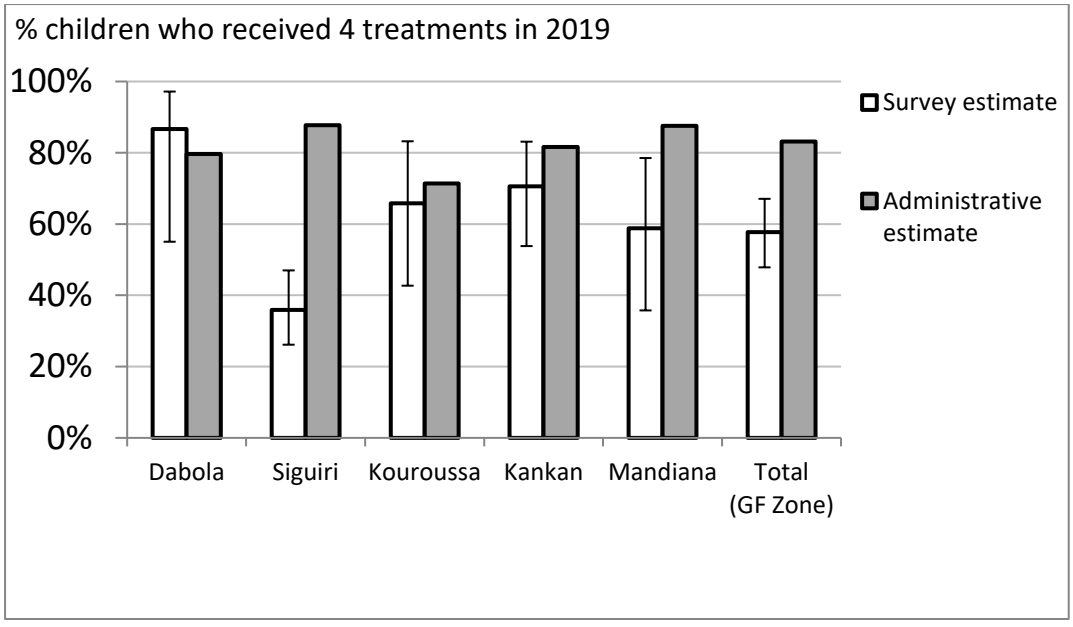
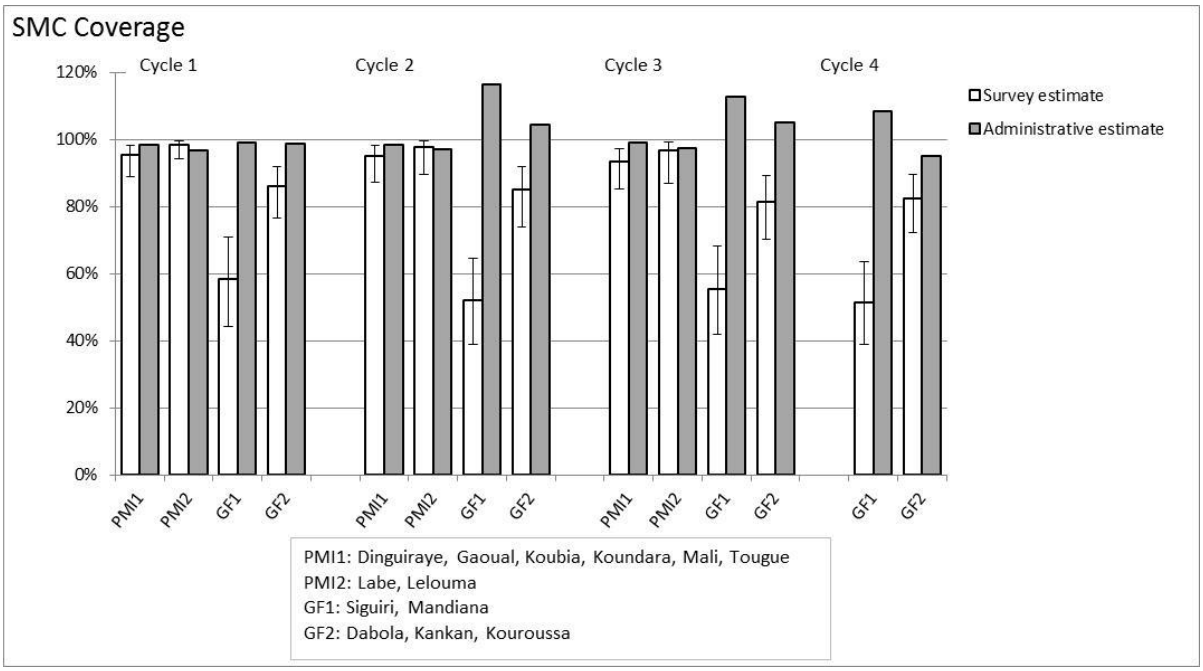


Figure 7: Administrative and survey estimates of the coverage per cycle



Bednet use by children

Bednet use the night before the survey was recorded in the survey for children receiving SMC. 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).

In the survey after the 2017 SMC campaign, 43.6% of children in the survey (children eligible to receive SMC) were reported to have slept under a bednet the night before the survey.

In the 2018 survey, 30.2% of children slept under a net the night before the survey. The survey was conducted after the main malaria season and bednet use may be lower at this time than in the main season but nevertheless bednet use was surprisingly low. There were notable variations with very low use of nets in some prefectures.

In this 2019 survey, 86% (95%CI 79%,90%) of children slept under an LLIN the night before the survey. 97% of the nets the children were using were less than 8 months old according to caregivers.

Table 44: Percentage of children 3-59months who slept under a LLIN the night before the survey

Area	% slept under a LLIN last night (95%CI)
Dinguiraye, Gaoual, Koubia, Koundara, Mali, Tougue	87.1% (78.8%,92.4%)
Labe, Lelouma	92.3% (88.4%,95.0%)
Siguiri, Mandiana	75.9% (56.9%,88.3%)
Dabola, Kankan, Kouroussa	90.7% (86.4%,93.8%)
TOTAL	85.7% (79.2%,90.4%)

Table 45: Bednet (LLIN) use by prefecture

Prefecture	% children 3-59 months who slept under a LLIN the night before the survey	Number of children surveyed
Dabola	87.2%	104
Dinguiraye	79.9%	138
Gaoual	93.5%	78
Kankan	93.9%	448
Koubia	100.0%	12
Koundara	95.5%	43
Kouroussa	84.9%	294
Labe	90.6%	106
Lelouma	100.0%	30
Mali	86.9%	80
Mandiana	90.9%	186
Siguiri	71.1%	336
Tougue	84.7%	38

Bednet use by all household members

A total of 5,051 household members were surveyed in 1038 households. A total of 4,906 slept in the household the night before the survey. Household size (slept in the household the night before) ranged from 1 to 13. (Note that the survey was limited to households that had at least one child under 7 years of age and aged at least 3 months).

Table 46: Age distribution of those surveyed for bednet use

Age group	Number surveyed	%
0-4yrs	2,083	41.2%
5-9yrs	648	12.8%
10-14yrs	176	3.5%
15-19	155	3.1%
20-24	248	4.9%
25-29	386	7.6%
30-34	315	6.2%
35-39	364	7.2%
≥40yrs	553	11.0%
Age missing	123	2.4%
TOTAL	5,051	100.0%

(4,906/5,051 slept in the household the night before the survey)

Table 47: Household size: Number of households, by household size, in each wealth ranking. The largest households are in the highest wealth ranking.

	Wealth ranking					
Number slept in the household the night before the survey	**Lowest**	**Low**	**Middle**	**High**	**Highest**	**Total**
1	0	0	1	2	0	3
2	12	5	13	6	2	38
3	53	49	42	34	26	204
4	56	81	62	66	73	338
5	46	40	46	46	36	214
6	16	21	19	20	24	100
7	8	8	10	12	17	55
8	2	10	3	9	10	34
9	0	5	4	5	6	20
10	0	0	6	4	8	18
11	0	0	1	1	4	6
12	0	1	1	2	2	6
13	0	1	0	1	0	2
Total	193	221	208	208	208	1038
Mean household size	4.2	4.6	4.6	4.9	5.3	4.7

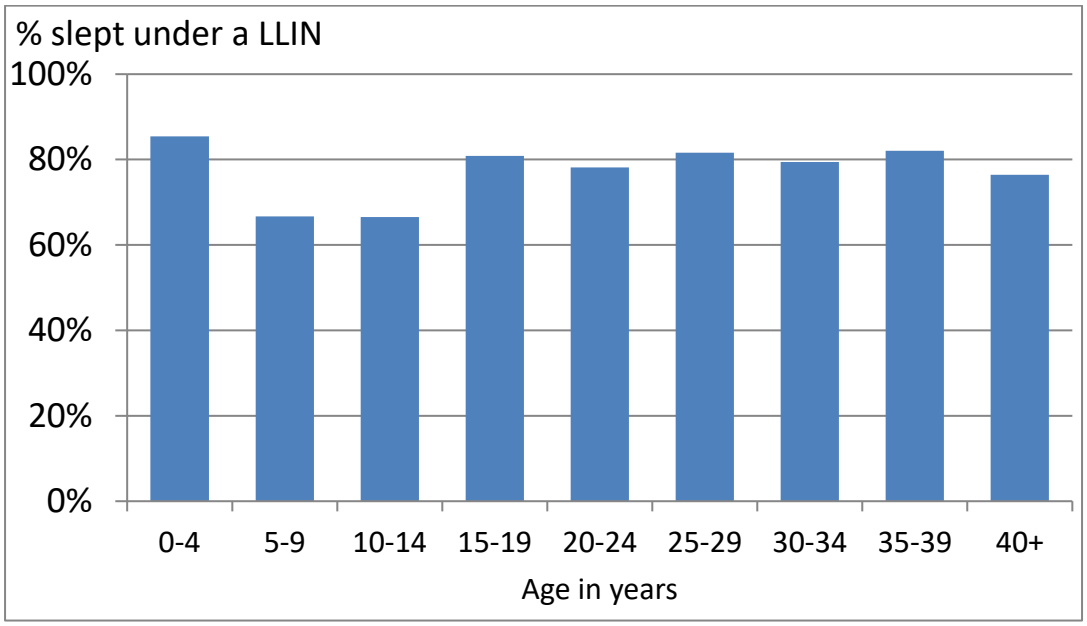
(1038 households consented and included members who slept in the household the night before the survey)

Overall, 79.7% used a LLIN the night before the survey, compared to 28.7% in the 2018 survey. There was a notable dip in bednet use in children 5-14 years of age. This is of concern as children stop receiving SMC when they are 5 years old (if they are more than 59 months old at the time of cycle 1). It is therefore especially important that these children use an LLIN.

Table 48: Bednet use by age group (% that used a net, the night before the survey)

Age group	Any net	LLIN	Intact net	Net <2years old
0-4	85.4%	85.4%	84.0%	83.8%
5-9	66.7%	66.7%	64.1%	65.6%
10-14	65.9%	66.6%	61.5%	63.5%
15-19	80.0%	80.9%	77.3%	77.3%
20-24	78.2%	78.2%	74.8%	76.2%
25-29	81.5%	81.6%	80.4%	80.0%
30-34	79.4%	79.4%	77.5%	77.0%
35-39	82.2%	82.1%	80.8%	80.1%
40+	76.1%	76.4%	73.1%	74.5%
TOTAL	79.6% (71.7%,85.7%)	79.7% (71.8%,85.8%)	77.7% (70.0%,83.8%)	77.9% (70.1%,84.2%)

Figure 7: Bednet use by age group showing lower use by the 5-15 year age group



Net use was lower in Siguiri/Mandiana than in other areas. Net use was slightly lower among males than females (difference 6.0% (2.6%,9.4%, P=0.001)), and was higher in the lower wealth rankings (test for trend P=0.094).

Table 49: LLIN use by area

	% slept under a LLIN the night before the survey (95%CI)
AreA:	
Dinguiraye, Gaoual, Koubia, Koundara, Mali, Tougue	88.0% (81.7%,92.3%)
Labe, Lelouma	89.0% (75.7%,95.5%)
Siguiri, Mandiana	66.9% (49.6%,80.6%)
Dabola, Kankan, Kouroussa	85.8% (81.8%,89.0%)
Gender:	
Male	76.6% (67.9%,83.5%)
Female	82.4% (74.9%,88.0%)
Wealth ranking:	
Lowest	87.9% (81.8%,92.1%)
Low	80.0% (72.0%,86.2%)
Middle	79.1% (63.7%,89.1%)
High	76.7% (63.5%,86.2%)
Highest	77.3% (63.2%,87.1%)

Of 1038 households surveyed, 89.8% had at least one LLIN and 36.8% had one LLIN for every 2 persons. This compares with 39.7% had at least one LLIN and 13.1% had one LLIN for every 2 persons in the household, in 2018.

Table 50: Access to a bednet: % of households with at least one net, and % of households with at least one net for every two people who slept in the household the night before the survey

		% households (95% CI)
At least one net per household	2019	89.8% (84.7%,94.8%)
	2018	39.7% (29.8%,49.5%)
At least one net for every two persons	2019	36.8% (30.6%,42.9%)
	2018	13.1% (7.5%,18.7%)

Access to a LLIN, the percentage of the population who could sleep under a LLIN if there were two people per net, was 25.4% in 2018. This has increased to 68.2% in the current survey.

Table 51: Access to a LLIN. Percentage of the population who slept in the household the night before the survey, 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. of nets (LLIN) in the household									
Number who slept in the household the night before the survey	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**No. of households**	**% who could sleep under a net if 2/net**
1	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1	100.0%
2	15.7%	77.0%	7.8%	0.0%	0.0%	0.0%	0.0%	0.0%	38	84.3%
3	5.8%	62.7%	27.1%	4.3%	0.3%	0.0%	0.0%	0.0%	204	73.4%
4	8.2%	29.1%	57.0%	4.5%	1.2%	0.0%	0.0%	0.0%	338	77.2%
5	10.2%	10.3%	62.9%	15.8%	0.5%	0.5%	0.0%	0.0%	214	71.1%
6	10.2%	14.2%	49.4%	23.6%	2.6%	0.0%	0.0%	0.0%	100	63.9%
7	7.9%	6.7%	28.8%	43.8%	12.8%	0.0%	0.0%	0.0%	55	68.7%
8+	24.7%	4.5%	16.1%	27.4%	18.7%	5.3%	2.6%	0.7%	86	51.1%
Total	10.3%	28.4%	44.1%	13.0%	3.3%	0.6%	0.3%	0.1%	1,038	68.2%

Annex A: Sampling methods

The primary outcomes to be assessed in the survey were the percentage of eligible children who received SMC in each cycle and the percentage of children who received SMC four times. Children aged 5-7 years were included in the survey to determine the extent of SMC treatment above the age limit. It was also planned to ask about adherence to SMC doses, and reasons for missed treatments, and (for all household members) the use of long-lasting insecticide-treated bednets (LLINs).

To achieve reasonable geographical coverage of survey clusters, and to be able to estimate the percentage of children who received SMC in each cycle with a margin of error of +/- 6%, it was estimated that 66 clusters of about 20 children per cluster would be required. Clusters were selected with probability proportional to population size (PPS), so that more clusters would be chosen in prefectures with larger population. 66 clusters selected with PPS resulted in the following allocation of clusters by prefecture:

Dabola 3, Kankan 15, Kouroussa 8
2017 prefectures: Dinguiraye, 4; Mandiana, 5; Siguiri, 11; Gaoual, 3; Koubia, 1; Koundara, 2; Labe, 5; Lelouma, 2; Mali, 5; Tougue, 2
TOTAL: 66

Sample size calculation

The margin of error on the survey estimates of SMC coverage, depends on the level of coverage, the number of children surveyed, the number of clusters, and the design effect. Children within the same cluster tend to be similar in terms of the number of SMC treatments they received, the design effect measures the effect of this on the precision of survey estimates of coverage. For a given total sample size, one obtains better precision by having more clusters and fewer children per cluster, but logistic constraints limit the number of clusters, due to travel time and cost, and also because to ensure sampling is not biased, care is needed in each cluster to map where the dwellings are, divide the map into segments, and then to ensure all dwellings in the selected segment are visited.

If the coverage is 80%, the margin of error is expected to be +/- 100x{1.96x√(Deff)x√[0.8x(1-0.8)/(bxC)]} where C is the number of clusters, b the mean number of children surveyed in each cluster, and Deff is the design effect. The design effect itself depends on the average number of children surveyed in each cluster (b), and the 'rate of homogeneity' which is a measure of the degree of similarity among children in a cluster: Deff=1+(b-1)roh . From earlier surveys, the roh value for the percentage of children who received four treatments was 0.3 and for the coverage per cycle between 0.41 and 0.54. If we include b=10 children in each cluster, the design effect for the percentage receiving 4 treatments is 1+(10-1)x0.3=3.7. If we have 66 clusters, the margin of error on a coverage of 80% will be: 1.96x√[3.7)x(0.8x(1-0.8)/(10x66)]=+/-5.9%. If there are 20 children per cluster, the design effect increases to Deff=1+(20-1)x0.3=6.7, but the margin of error is little changed: 1.96x√[6.7)x(0.8x(1-0.8)/(20x66)]=+/-5.6%.

It was therefore planned that segments should be chosen to include about 10-15 eligible children and as before should also include children age 5-7yrs to be able to determine the extent of treatment of older children. Clusters with 20 children aged 3 months to 7 years would include about 15 children 3-59 months and 5 children 5-7yrs. This would give a total sample size of about 66x20=1320.

Compact segment sampling was to be used as before but with segments chosen to include about 10-15 eligible children. The expected precision in the 10 districts that had SMC in 2017 would be about +/-9% and the precision in the 3 new prefectures would be about +/-12%, and for overall coverage about +/-6%.

Survey methods

The survey was conducted in the prefectures of Gaoual, Koundara, Mali, Lelouma, Labe, Koubia, Tougué, Dinguiraye, Siguiri and Mandiana, Dabola, Kouroussa and Kankan, which implemented SMC in 208 and 2019. Ten of these prefectures were surveyed in 2017, Gaoual, Koundara, Mali, Lelouma, Labe, Koubia, Tougué, Dinguiraye, Siguiri and Mandiana. The estimated total population size of these 10 prefectures was 2,570,789 based on the 2014 census. In 2017, 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. The same sampling interval was used to select communities in Dabola, Kouroussa and Kankan in 2018. The total population of thee three prefectures from the 2014 census was 1,689,605, and interval of 64269.725 gives a sample of 26 settlements. Thus a total of 66 settlements were surveyed in 2018. The same settlements, and the same segments within the settlements, were surveyed in 2019.

The segmentation process that was used in 2017 and 2018 was as follows. 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 4 in October, (hence at least 6 months at the time of the survey, conducted the following January) 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 1320 children was required, i.e. 1320/66=20 children on average from each settlement. Each settlement was therefore divided into $S=\max(1,\text{floor}(N_i x 0.2/20))$ 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 visited and every child who was aged at least 3 months at the last cycle and was less than 7 years at the time of the survey, 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 20 if the population data were accurate. There were 17 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 (20) had been reached. In the final dwelling, all children eligible for the survey were included so the final sample size could exceed 20.

The sampling probability is $pi=66x(N_i/N_T)xf_i\ xR_i$, for individuals in settlement I, where N_i is the population of village i from the 2014 census and N_T is the total population of the 13 prefectures and R_i is the response rate in cluster i. For the settlements that were segmented, $f_i= (1/S_i)$, where S_i is the number of segments. For the settlements which were too large to segment, $f_i=(a_i/A_i)$, where a_i is the sampled area in settlement i, and A_i is the total area of the settlement. This is a rough and ready way to estimate sampling probabilities, where it can be assumed population density is approximately uniform. It is sensitive to the

way the sampled polygon is defined. To calculate sampled areas for the 17 large settlements, we plotted the GPS locations of the surveyed dwellings onto aerial photos of the settlements in Google Earth, and defined a polygon that was midway between the convex hull of the sampled coordinates and the next adjacent dwellings outside the sampled area, in the photograph. The convex hull itself would underestimate the sampled area. Response rates were averaged over each prefecture. Because it was not possible to inspect sleeping places in some households, there are different response rates for SMC-related questions and for the bednet questions, and hence different weightings.

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

Prefecture	Sousprefecture	District /quartier	Village /Secteur	Population	Cluster number	Segments	Area/m²	Sampled area/m2	Sampling probability	Response Rate* (SMC)	Response Rate* (nets)	Weights (SMC)	Weights (nets)
MANDIANA	Balandougouba	Sidikila II	Sidikila II Centre	3616	1	36			0.00156	0.981	0.972	654.8	661.4
MANDIANA	Dialakoro	Samory Touré	Samory TOURE	3794	2	37			0.00159	0.981	0.972	641.4	647.9
MANDIANA	Kinieran	Mbalia	Mbalia Centre	12710	3		1081830	89681	0.01632	0.981	0.972	62.4	63.1
MANDIANA	Koundian	Koundian I	Namafouada	131	4	1			0.00203	0.981	0.972	502.1	507.1
MANDIANA	Morodou	Samakofara	Samakofara Centre	1199	5	11			0.00169	0.981	0.972	603.4	609.5
GAOUAL	Foulamory	Tabadian	Nyor Nyor	668	6	7			0.00148	0.934	0.983	723.9	688.3
GAOUAL	Koumbia	Dara Bowé	Dara Bowé Centre	1315	7	13			0.00157	0.934	0.983	682.9	649.3
GAOUAL	Malanta	Kounsi	Peguéty	247	8	2			0.00191	0.934	0.983	559.4	531.9
KOUNDARA	Guingan	Kifaya	Angona	87	9	1			0.00135	0.950	1.000	781.0	742.0
KOUNDARA	Sambailo	Sambailo Centre	Thiuopoutel	497	10	5			0.00154	0.950	1.000	683.6	649.4
DINGUIRAYE	Banora	Boubèrè	Boubèrè Centre	793	11	8			0.00154	1.000	0.917	651.2	710.4
DINGUIRAYE	Diatifere	Mamoudouya I	Bandianya	531	12	5			0.00165	1.000	0.917	607.8	663.1
DINGUIRAYE	Dinguiraye-centre	Tinkisso	Souloukoufalan	257	13	3			0.00126	1.000	0.917	753.5	822.0
DINGUIRAYE	Selouma	Selouma Centre	Sakabari	557	14	6			0.00137	1.000	0.917	695.3	758.6
SIGUIRI	Doko	Kouremalé	Kouremalé Centre	8784	15		2195906	8576	0.00053	0.989	0.803	1903.4	2341.9
SIGUIRI	Franwalia	Franwalia Centre	Franwalia Centre	5807	16		995165	6300	0.00047	0.989	0.803	1776.2	2185.4
SIGUIRI	Kintinian	Balato III	Balato Centre III	6354	17		1259773	8171	0.00064	0.989	0.803	1584.4	1949.4
SIGUIRI	Kintinian	Fatoya	Fatoya Centre	11449	18		1713351	7131	0.00074	0.989	0.803	1370.3	1686.0
SIGUIRI	Malea	Maléah Centre	Maléah Centre	2245	19	22			0.00158	0.989	0.803	639.9	787.3
SIGUIRI	Niagassola	Kignekourou	Faraboloni	436	20	4			0.00157	0.989	0.803	599.1	737.1
SIGUIRI	Norassoba	NanenTraoré	Nanen Traoré Centre	4362	21		1365449	29993	0.00148	0.989	0.803	681.5	838.5
SIGUIRI	Siguiri-centre	Dankakoura	Dankakoura Centre	1734	22	17			0.00153	0.989	0.803	640.2	787.7
SIGUIRI	Siguiri-centre	Saourou	Saourou Centre	4372	23		384840	7614	0.00134	0.989	0.803	754.9	928.8
SIGUIRI	Siguiri-centre	Sougoula	Sougoula Centre	2362	24	21			0.00174	0.989	0.803	580.5	714.3

SIGUIRI	Siguirini	Talabé	Talabé Centre	648	25	6			0.0016	0.989	0.803	604.6	743.9
KOUBIA	Matakaou	Matakaou Centre	Dougouwoulen	334	26	3			0.00129	0.643	1.000	901.9	579.8
MALI	Donghol Sigon	Dougaya	Dioma Roundé	413	27	4			0.0016	0.985	0.969	634.8	645.0
MALI	Fougou	Kansaghel	Laami	121	28	1			0.00187	0.985	0.969	541.7	550.4
MALI	Madina Wora	Pellissaré	Donghol Doubhi	131	29	1			0.00203	0.985	0.969	500.3	508.4
MALI	Salambande	Koya	Koya Centre	139	30	1			0.00215	0.985	0.969	471.5	479.1
MALI	Yembereng	Sinthiourou	Diaguitarè	113	31	1			0.00175	0.985	0.969	580.0	589.4
TOUGUE	Konah	Bourouwal	Kounsen	234	32	2			0.00136	0.784	0.931	703.9	592.6
TOUGUE	Tougue centre	Tougué I	Dioloki	285	33	2			0.00155	0.784	0.931	578.0	486.5
LABE	Garambe	Garambé Centre	Bassanya II	644	34	6			0.00123	0.843	0.886	713.1	679.0
LABE	Labé centre	Daka II	Secteur II	7182	35		802786	42257	0.00432	0.843	0.886	202.5	192.8
LABE	Labé centre	Madina	Dianyabhè Mosquée	1525	36	15			0.00084	0.843	0.886	752.8	716.9
LABE	Noussy	Kassangui	Dow Kougue	16	37	1			0.00025	0.843	0.886	4783.7	4555.0
LABE	Tountouroun	Tounny	Gadha Thiolliwel	174	38	1			0.00236	0.843	0.886	439.9	418.9
LELOUMA	Lafou	Bombi Bourou	Yalaya	103	39	1			0.00117	0.800	1.000	783.4	626.7
LELOUMA	Sagale	Bamikountou	Gnekori	85	40	1			0.00119	0.800	1.000	949.3	759.4
DABOLA	Banko	Dalado	Daffela	192	41	1			0.00297	1.000	0.930	336.2	361.4
DABOLA	Dabola-centre	Foundeng II	Foula	1524	42	15			0.00157	1.000	0.930	635.3	683.0
DABOLA	Kindoye	Kindoye II	Fissanya	146	43	1			0.00218	1.000	0.930	442.1	475.3
KANKAN	Balandougou	Koba	Koba Centre	2044	44	20			0.00158	1.000	0.955	631.6	661.4
KANKAN	Bate-nafadji	Djelibakoro	Total	9282	45		1132450	6873	0.00087	1.000	0.955	1145.9	1199.9
KANKAN	Boula	Kalafilila	Total	3045	46	30			0.00157	1.000	0.955	636.0	665.9
KANKAN	Kankan-centre	Aviation	Total	8560	47		3568746	32063	0.00119	1.000	0.955	839.4	878.9
KANKAN	Kankan-centre	Briqueterie	Total	12168	48		2409247	26167	0.00205	1.000	0.955	488.4	511.5
KANKAN	Kankan-centre	Farako I	Total	6511	49		355552	6145	0.00174	1.000	0.955	573.6	600.7
KANKAN	Kankan-centre	Hermakonon II	Total	8824	50		399040	6716	0.0023	1.000	0.955	434.7	455.1
KANKAN	Kankan-centre	Madina	Secteur II	5860	51		1387773	29940	0.00196	1.000	0.955	510.6	534.7
KANKAN	Kankan-centre	Salamaninda	Secteur III	3519	52	35			0.00156	1.000	0.955	642.0	672.3
KANKAN	Kankan-centre	Timbo	Secteur II	846	53	8			0.00164	1.000	0.955	610.4	639.2
KANKAN	Koumban	Koumban I	Koumban I Centre	2080	54	20			0.00161	1.000	0.955	620.7	649.9

KANKAN	Missamana	Djimbala	Secteur III	2484	55	24			0.0016	1.000	0.955	623.7	653.1
KANKAN	Moribayah	Moribaya Centre II	Moribaya II Centre	778	56	7			0.00172	1.000	0.955	580.8	608.2
KANKAN	Tinti-Oulen	Gbanankoura	Total	2435	57	24			0.00157	1.000	0.955	636.2	666.2
KANKAN	Tokounou	Sansambaya	Sansambaya Centre	1085	58	10			0.00168	1.000	0.955	594.9	623.0
KOUROUSSA	Balato	Balato Centre	Fodedou	390	59	3			0.00201	0.994	0.938	499.4	529.7
KOUROUSSA	Banfele	Nafadji	Total	4492	60		129739	9799	0.00526	0.994	0.938	191.3	202.9
KOUROUSSA	Cissela	Fadoussaba	Total	10985	61		604702	35272	0.00993	0.994	0.938	101.3	107.5
KOUROUSSA	Cissela	Sonokoro	Total	2578	62	25			0.0016	0.994	0.938	629.5	667.7
KOUROUSSA	Doura	Farakoba	Farakoba Centre	1728	63	17			0.00157	0.994	0.938	638.7	677.4
KOUROUSSA	Kiniero	Missamana	Total	945	64	9			0.00163	0.994	0.938	618.3	655.8
KOUROUSSA	Kouroussa centre	Doula	Kignedouba	324	65	3			0.00167	0.994	0.938	601.1	637.5
KOUROUSSA	Kouroussa centre	Wassabada	Secteur II (Raiko)	9031	66		740557	33152	0.00626	0.994	0.938	160.6	170.3

*Some households did not participate (a respondent could not be found, or they refused); for some which responded, it was not possible to inspect sleeping places; thus there are separate response rates for SMC-related indicator and bednets, and hence different weightings.

Total implied population at time of survey, aged 3-59 months, based on survey weightings: 1,218,748

Total 2014 census population: 4,260,394

Estimated target population: 818,502

Table A2: Standard error, design effect and rate of homogeneity for the main indicators

Indicator	N	Value	s.e.	95%CI	Deff	$Deff_{weight}$	$Deff_{cluster}$	roh	b
Average coverage per cycle	1893	0.715	0.0316	(0.65,0.78)	16.02	1.377	11.63	0.32	34.2
Mean number of treatments per child	1893	2.86	0.1265	(2.61,3.11)	16.02	1.377	11.63	0.32	34.2
Coverage of 4 cycles	1893	0.414	0.0509	(0.32,0.52)	20.20	1.352	14.94	0.42	34.2
Adherence	1688	0.961	0.0101	(0.93,0.98)	4.53	0.988	4.59	0.12	31.3
Reach of SMC programme	1893	0.855	0.0346	(0.77,0.91)	18.25	1.528	11.95	0.33	34.2
Coverage of cycle 1	1893	0.810	0.0357	(0.73,0.87)	15.68	1.422	11.03	0.30	34.2
Coverage of cycle 2	1893	0.786	0.0390	(0.70,0.85)	17.11	1.473	11.62	0.32	34.2
Coverage of cycle 3	1893	0.779	0.0372	(0.70,0.84)	15.21	1.415	10.75	0.29	34.2
Coverage of cycle 4	1893	0.486	0.0550	(0.38,0.59)	22.89	1.455	15.73	0.44	34.2
Treatment of older children (treated at least once)	244	0.325	0.0433	(0.07,0.57)	4.31	2.119	2.04	0.04	24.5
Awareness of SMC dates	1002	0.923	0.0248	(0.86,0.96)	8.67	1.698	5.11	0.23	19.0
LLIN use in children	1881	0.857	0.0266	(0.79,0.90)	11.10	1.563	7.10	0.18	34.1
LLIN use (all ages)	4897	0.796	0.0349	(0.72,0.86)	36.66	1.619	22.65	0.24	91.2
ACCESS to LLIN (population)	4906	0.682	0.0308	(0.62,0.74)	21.47	1.592	13.49	0.14	89.7
ACCESS to LLIN (%HH with an LLIN)	1041	0.898	0.0253	(0.84,0.94)	7.26	2.081	3.49	0.14	18.6
ACCESS to LLIN (% HH with 1 net per 2)	1041	0.368	0.0307	(0.31,0.43)	4.20	1.388	3.03	0.12	18.6
Caregiver knowledge about SMC	1068	7.0	0.2715	(6.5,7.6)	7.82	1.292	6.05	0.24	22.1
Reported CHW adherence to guidelines	1068	7.6	0.1259	(7.3,7.8)	12.23	1.080	11.32	0.62	17.7
SMC directly observed	1125	0.971	0.0128	(0.93,0.99)	6.48	1.253	5.17	0.13	32.1
Interval between cycle 1 and cycle 2	1261	33.6	0.1424	(33.3,33.9)	12.99	1.183	10.99	0.39	26.5
Interval between cycle 2 and cycle 3	1231	31.9	0.1319	(31.6,32.1)	11.15	1.070	10.42	0.38	26.1
Interval between cycle 3 and cycle 4	686	32.9	0.4220	(32.0,33.7)	17.65	1.106	15.97	0.61	25.6
SMC card at survey	1893	0.671	0.0385	(0.59,0.74)	12.72	1.397	9.11	0.24	34.2

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).

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