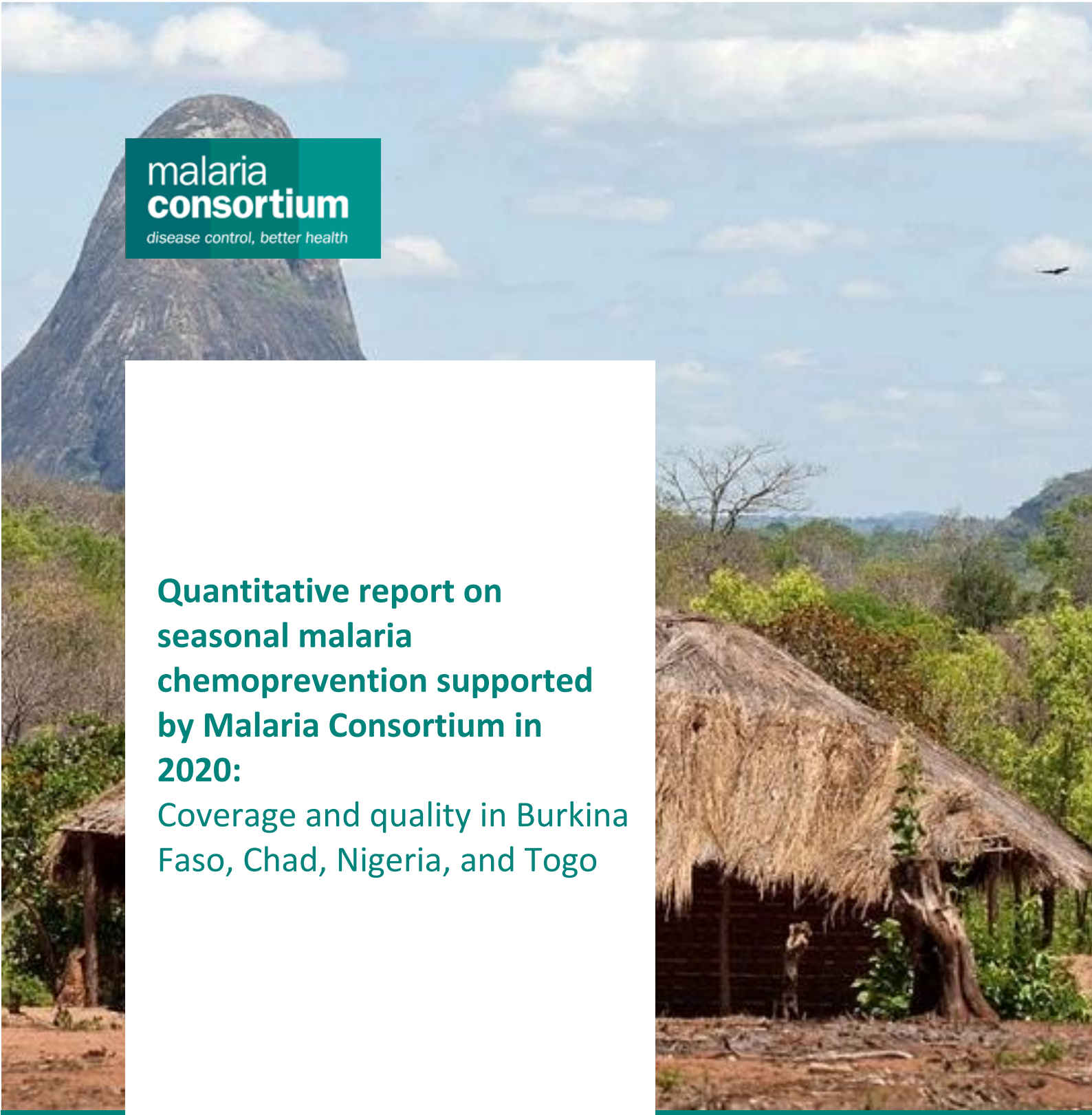

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Quantitative report on seasonal malaria chemoprevention supported by Malaria Consortium in 2020:

Coverage and quality in Burkina Faso, Chad, Nigeria, and Togo

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Contents

Acronyms and abbreviations

ACCESS-SMC	Achieving Catalytic Expansion of Seasonal Malaria Chemoprevention in the Sahel
AQ	amodiaquine
COVID-19	coronavirus disease
CI	confidence interval
DOT	directly observed treatment
EoC	end-of-cycle
EoR	end-of-round
IPC	infection prevention and control
LGA	local government area
LQAS	lot quality assurance sampling
M&E	monitoring and evaluation
RDT	rapid diagnostic test
SA	supervision area
SP	sulfadoxine-pyrimethamine
SPAQ	sulfadoxine-pyrimethamine and amodiaquine
SMC	seasonal malaria chemoprevention
WHO	World Health Organization
UNICEF	United Nations International Children's Emergency Fund

Executive summary

Background

Most malaria illness and deaths in the Sahel and sub-Sahel regions of sub-Saharan Africa occur during the rainy season. Seasonal malaria chemoprevention (SMC) is an intervention intended to provide chemoprophylactic protection against malaria to at-risk populations during this period of high transmission. The World Health Organization (WHO) currently recommends a single dose of sulfadoxine-pyrimethamine (SP) in combination with three daily doses of amodiaquine (AQ) to children over consecutive monthly cycles during the rainy season. The objective of SMC is to maintain therapeutic antimalarial drug concentrations in the blood throughout the period of greatest risk. Evidence from randomized control trials and accumulated evidence from SMC implementation in the field at scale has shown it to be safe, feasible, effective, and cost-effective in children under five.

SMC is typically delivered door-to-door by trained community distributors over a period of four days each month for four monthly SMC cycles during the rainy season (and, in some cases, five cycles). The first dose of SP and AQ (day 1 SPAQ) is given under the supervision of the community distributors; this is referred to as directly observed treatment (DOT). The community distributors give the remaining two tablets of AQ in the blister pack to the child's caregivers to administer daily over the following two days (day 2 AQ and day 3 AQ), and provide information on AQ administration and how to respond in the event of adverse drug reactions. To be fully effective at providing sufficient protection from malaria infection, children should receive the full three-day course of SPAQ during each of the four monthly SMC cycles. It is, therefore, important not only to demonstrate program coverage to evaluate performance against coverage targets, but also to determine the proportion of children who have received a full course of SPAQ in each monthly cycle to assess the degree to which target populations are protected against malaria transmission.

The primary objectives of this report are to:

- outline methods employed by Malaria Consortium for monitoring coverage of its SMC program and quality of SMC delivery in 2020
- provide a summary of program coverage, and degree of adherence to the program's protocols in 2020
- give an overview of next steps in terms of changes expected to be implemented in 2021.

Malaria Consortium's seasonal malaria chemoprevention program in 2020

In 2020, Malaria Consortium supported SMC in Burkina Faso, Chad, Nigeria, and Togo, covering a target population of 12,568,449 children 3–59 months.

Target populations of eligible children were 1,624,300 in Burkina Faso and 964,894 in Chad, where SMC was entirely supported by philanthropic funding. In northern Nigeria, the target population in 2020 was 9,087,532, of which 3,692,553 were in areas supported by philanthropic funding.

We made a range of adaptations to delivery of the SMC program and its associated monitoring activities in the context of the coronavirus disease (COVID-19) pandemic.

Methods

In addition to estimating administrative coverage in Burkina Faso, Chad, and Nigeria based on routine monitoring forms — referred to as SMC tally sheets — and SPAQ stock reconciliation data, we also assessed program coverage in all four countries using two types of household coverage surveys:

- End-of-cycle (EoC) surveys employing the lot quality assurance sampling (LQAS) methodology following cycles one, two, and three (where possible) to enable implementing teams to identify areas of low coverage and other issues in SMC delivery, and to rapidly take corrective actions to improve SMC delivery in subsequent cycles. Surveys were completed within two weeks of the completion of the SMC cycle.
- Comprehensive end-of-round (EoR) surveys (which took place within eight weeks of completion of cycle four) to assess SMC performance across all four monthly cycles.

EoC surveys were carried out after cycles one, two, and three in Nigeria, cycle three in Burkina Faso, and cycles two and three in Chad. Reasons for cancellation of surveys in other cycles included COVID-19 restrictions in Chad and a combination of COVID-19 restrictions, insecurity, and a theft-related incident in Burkina Faso. An EoR survey was also conducted following cycle four in all three countries, as well as in Togo, ahead of Malaria Consortium's initiative to intensify the implementation support it provides to the country's SMC program from 2021. These surveys assessed coverage of Malaria Consortium's SMC program in terms of proportions of households with eligible children visited by a community distributor, eligible children who received SMC per cycle, and eligible children who received SPAQ in all four cycles. We also investigated the proportions of children who received SMC and for whom DOT was observed, and who received two doses of AQ from caregivers over the two days following visits by community distributors. The analyses also considered the proportion of ineligible children 5–10 years who had received SMC, and the proportion who received day 1 SPAQ by sources other than home visits by community distributors.

Results

Administrative coverage

Administrative coverage was consistently high across all three countries in 2020, and comparable with that in 2019 and 2018. Data on doses of SPAQ administered by community distributors show that averages of 12,861,281 and 12,930,251 doses were provided in each cycle across Burkina Faso, Chad, and Nigeria combined, based on data from SMC tally sheets and stock reconciliation data, respectively. This corresponds to an average administrative coverage of children 3–59 months across cycles 1–4 and all three countries of 103.8 percent based on data from SMC tally sheets, and 104.4 percent based on stock reconciliation data.

The results of our analyses — based on coverage survey data — showed that the program achieved a high coverage across all cycles and countries, despite adaptations to SPAQ delivery made in response to COVID-19 infection prevention procedures. Coverage was typically over 90 percent, both in terms of eligible children receiving SPAQ from a community distributor, and the proportion of those receiving doses of AQ from their caregivers in the days following visits by community distributors. A summary of coverage survey results by country can be found below:

Burkina Faso

- Coverage of eligible children was high, with 97.8–98.7 percent of eligible children 3–59 months receiving day 1 SPAQ from community distributors during home visits, based on the cycle three EoC survey and cycle four EoR survey, respectively.
- Among those children who received day 1 SPAQ, 97.6 and 99.3 percent received both day 2 and day 3 AQ from caregivers in cycles three and four based on the EoC and EoR surveys, respectively.
- Community distributors observed DOT for over 90 percent of all SPAQ doses administered across the EoC and EoR survey.
- The results of the EoR survey show that 96.9 percent of eligible children received day 1 SPAQ during each of the four monthly cycles.

Chad

- Coverage in terms of provision of day 1 SPAQ by a community distributor exceeded 94 percent across the three SMC cycles in which surveys were conducted; of these children, over 94 percent received both day 2 and day 3 AQ in all cycles.
- Adherence to DOT was observed for 71.9 percent of all children who received day 1 SPAQ in cycle four, based on the EoR survey; this proportion was over 80 percent in cycles two and three, according to EoC surveys.
- The EoR survey showed that that 81.9 percent of eligible children received SPAQ in all four cycles during 2020.

Nigeria

- Results of EoR surveys show that, across the seven states where Malaria Consortium supported SMC, 85.4 percent of eligible children received day 1 SPAQ from a community distributor in cycle four. Coverage varied between states, ranging from 81.6 percent in Kano (where SMC was introduced in 2020) to 92.3 percent in Jigawa (where SMC has been delivered since 2016).
- Among those children who received day 1 SPAQ, the proportion who received both day 2 and day 3 AQ exceeded 90 percent across all states in the EoR survey and all EoC surveys.
- The EoR survey results showed that, in cycle four, adherence to DOT among community distributors was 68.3 percent across all seven states; this may have been lower than in 2019 (when it exceeded 80 percent in all states) due to concerns of COVID-19 transmission.
- EoR survey data show that coverage of day 1 SPAQ, administration of both day 2 and day 3 AQ by caregivers, and adherence to DOT by distributors, were lowest in Kano and Sokoto. While SMC was newly introduced in Kano in 2020, anecdotal caregiver reports in 2019 suggest that community distributors in Sokoto did not systematically visit compounds door-to-door in some areas in this state (and this may continue to be the case).

Togo

- During cycle four, 95.5 percent of eligible children received day 1 SPAQ from a community distributor.
- Among those children who received day 1 SPAQ, 97.1 percent received both day 2 and day 3 AQ in cycle four.

- Community distributors observed DOT in 78.8 percent of SPAQ doses administered in cycle four.
- The results show that 64.9 percent of eligible children received day 1 SPAQ during each of the four monthly cycles.

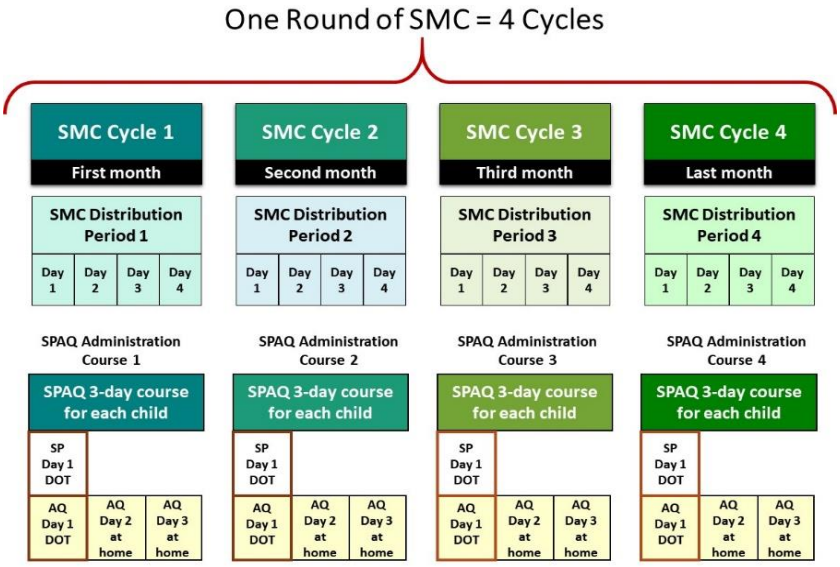
1. Introduction

Across the Sahel regions of sub-Saharan Africa, the majority of malaria cases and deaths occur during a three- to five-month window corresponding to the rainy season. Seasonal malaria chemoprevention (SMC) is an intervention recommended by the WHO to provide prophylactic protection to children 3–59 months against *Plasmodium falciparum* malaria during the period of highest risk of malaria transmission, through intermittent administration of monthly courses of sulfadoxine-pyrimethamine (SP) and amodiaquine (AQ), or SPAQ. SMC has been shown to be safe, feasible, effective, and cost-effective for the prevention of malaria cases in targeted populations.[1,2]

Policy recommendations provided by WHO classify areas eligible for SMC as those in which over 60 percent of clinical malaria cases occur within a four-month period, the clinical attack rate of malaria is greater than 0.1 attack per transmission season in the target age group, and resistance to SPAQ has not developed such that its protective efficacy remains above 90 percent.[1,3] According to the 2019 World Malaria Report,[4] data from 2018 show that 31 million children under five were living in areas of highly seasonal malaria transmission that were eligible for SMC administration. Of these, 19 million children in 12 Sahelian African countries (62 percent) were reached by SMC programs.

SMC is typically delivered in yearly rounds of four cycles during the peak of the rainy season — approximately July to October — with distribution periods approximately 28 days apart. Volunteer community distributors — who, in most settings receive a stipend — distribute SPAQ through door-to-door campaigns during a SPAQ distribution period of three to four days per cycle (**Figure 1**). Salaried, facility-based health workers coordinate and supervise the volunteers. Distribution teams typically comprise a pair of community distributors, who are each assigned a supervisor whose role is to ensure that activities are carried out in compliance with agreed procedures.

Figure 1: Illustration of schedule for an annual round of SMC



Each monthly SPAQ course consists of one single dispersible tablet of SP and three daily dispersible tablets of AQ. There are two doses of SPAQ: a lower dose for children 3–<12 months, and a higher dose for children 12–59 months.

A dose of day 1 SPAQ is administered by or under the supervision of community distributors to ensure that the tablets are correctly dispersed in water and that the child fully ingests all of the

dispersed tablets without spitting them out or vomiting. This is referred to as DOT. Children who vomit or spit out most of the drug within 30 minutes should be given one replacement dose of SP and AQ by distributors. The caregiver administers the remaining two doses of day 2 and day 3 AQ once every 24 hours over the following two days. Community distributors leave a blister pack containing the two remaining tablets with caregivers and provide instructions on how to administer and record the dose on the SMC child record card. If a child vomits or spits out the second or third dose of AQ, caregivers are encouraged to visit the nearest health facility or contact the community distributor by mobile phone to receive a replacement dose.

According to WHO guidelines,[1,2] SPAQ should not be administered to children if they: have an acute febrile illness and test positive for malaria; are severely ill; are unable to take oral medication; are receiving co-trimoxazole prophylaxis; have taken a single dose of either SP or AQ, or any sulfa-containing drug during the past four weeks; or have a known allergy to either SP or AQ, or a known allergy to sulfa drugs such as co-trimoxazole. SMC with SPAQ should not be administered to children outside the eligible age range of 3–59 months. For older children, the formulations specified above are unlikely to provide sufficient antimalarial drug concentrations in the blood to provide protection throughout the 28-day period of each cycle and are, therefore, likely to contribute to the development of drug-resistant *Plasmodium falciparum* malaria. In addition, use of doses by children outside the targeted age range poses challenges for quantification of drug needs for campaigns and procurement. However, caregivers do not always know their children's ages, civil registration and identification systems are underdeveloped, and the high prevalence of widespread malnutrition and stunting in areas with a high malaria attack rate often complicate accurate determination of children's ages. Community distributors receive training on methods to determine a child's age; however, administration of SPAQ to children outside the eligible age range is still reported to be common. Furthermore, community distributors may come under pressure from caregivers to administer SPAQ to older children because SMC is seen as an effective protection from malaria.

Community distributors are instructed to refer children with fever to the nearest health facility, where they should be tested for malaria using a rapid diagnostic test (RDT). If the test result is negative, the health facility worker should give the children SP and the first dose of AQ, giving the remaining two doses of AQ to the caregiver to administer over the following two days. If the test result is positive, children should be treated for malaria as per national treatment guidelines.

1.1. Malaria Consortium's seasonal malaria chemoprevention program in 2020

Malaria Consortium has been involved in implementation of SMC in Sahelian countries since 2013, with a major scale-up from 2015 through the Unitaid-funded Achieving Catalytic Expansion of Seasonal Malaria Chemoprevention in the Sahel (ACCESS-SMC) project. Since 2018, Malaria Consortium has continued to support SMC implementation with philanthropic funding, as well as funding from the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), and UK aid from the UK government. We also supported a research project exploring the feasibility, acceptability, and impact of SMC in Mozambique. However, this project is ongoing and data from Mozambique are not included in this report.

The total target population covered by SMC programs supported by Malaria Consortium in 2020 (excluding Mozambique) was 12,568,449, of which 7,085,932 (56 percent) were in areas where SMC was funded or co-funded using philanthropic donations. This represents an increase of 203 percent

since 2019, when the target population was 6,178,750, and an increase of 319 percent since 2018, when the total target population was 3,936,723.[5] This was due both to the expansion of the program to new Nigerian states — Bauchi, Kano and Kebbi, with 75 local government areas (LGAs) combined — and additional LGAs in existing states (13 LGAs in Yobe and 26 in Katsina), and to population growth in areas already covered in 2019. This total also includes the region of Savanes in Togo, where SMC delivery was co-funded by Malaria Consortium and the United Nations International Children's Emergency Fund (UNICEF), and the target population of eligible children was 183,301. We also delivered SMC in the Togolese regions of Centrale and Kara with funding from the Global Fund to target populations of 133,832 and 159,415, respectively (for a total of 476,548 across the country, including Savanes). In all regions, SMC delivery was co-funded by UNICEF and philanthropic funding. More information about achievements and challenges in areas where Malaria Consortium used philanthropic funding to support implementation of SMC can be found in our 2020 SMC philanthropy report.[6]

Countries and regions covered by Malaria Consortium's SMC program in 2020 and estimated target populations are shown in **Table 1**, alongside primary funders of SMC delivery in each Nigerian state.

Table 1: Malaria Consortium's SMC program in 2020 by numbers of children targeted for SMC delivery and funder

Country	Areas covered	Number of children targeted in 2020 (mean per cycle)
Burkina Faso	23 health districts in nine regions: Cascades, Centre, Hauts Bassins, Nord, Centre Nord, Centre Ouest, Centre Sud, Centre Est, and Plateau Central[PF]	1,624,300
Chad	20 health districts in four regions: Chari Baguirmi, Hadjer Lamis, Mayo Kebbi Est, and N'Djamena[PF]	964,894
Nigeria	176 LGAs in seven states: 10 LGAs in Bauchi,[PF] 27 LGAs in Jigawa,[PF/UK] 44 LGAs in Kano,[GF] 34 LGAs in Katsina,[GF] 21 LGAs in Kebbi,[PF] 23 LGAs in Sokoto,[PF] and 17 LGAs in Yobe[GF]	9,795,954 (of which 3,906,184 were in Malaria Consortium-supported states/LGAs with philanthropic funding, and 407,273 in nine LGAs in Jigawa with co-funding from UK aid and philanthropic funding)
Togo	Seven health districts in one of the country's three SMC eligible regions (Savanes)[UNICEF]	183,301
Program (total)		**12,568,449**
Program (supported with philanthropic funding/co-funding)		**7,085,932**

GF: Global Fund to Fight AIDS, Tuberculosis and Malaria; PF: philanthropic funding; UK: UK aid; UNICEF: United Nations International Children's Emergency Fund.

1.1.1 Seasonal malaria chemoprevention and COVID-19

In line with WHO's recommendation to continue delivery of malaria services during the COVID-19 pandemic,[7,8] SMC campaigns in Burkina Faso, Chad, Nigeria, and Togo went ahead in 2020 as originally planned, with minimal disruptions.

To minimize the risk of COVID-19 transmission due to delivery of SMC, a number of adaptations were made to all SMC intervention components, including monitoring and evaluation (M&E). Malaria Consortium led the development of operational guidance for adapted implementation of SMC during COVID-19, which was endorsed by WHO and published by the Roll Back Malaria Partnership to End Malaria.[9] We also developed more concrete internal guidance and infection prevention and control (IPC) standards that would apply to areas where Malaria Consortium supports SMC implementation. Lessons from implementing SMC during the COVID-19 pandemic in 2020 will be published in an upcoming learning paper.

While SMC campaigns in the countries supported by Malaria Consortium generally proceeded without substantial delays, M&E activities were scaled back in some instances.

1.2. Objectives of this report

This report summarizes data on coverage and quality of SMC implementation in areas supported by Malaria Consortium's SMC program in 2020, including administrative data, stock reconciliation data, EoC surveys, and EoR surveys. Its objectives are to:

- outline methods employed by Malaria Consortium for monitoring coverage and quality of SMC delivery in 2020
- provide a summary of program coverage, and degree of adherence to the program's protocols in 2020
- give an overview of next steps in terms of changes expected to be implemented in 2021
- draw comparisons, where appropriate, with findings from 2019[5]
- discuss methodological improvements compared with 2019, and the strengths and limitations of the different data sources employed.

Coverage results are presented from all areas where Malaria Consortium implemented SMC in 2020, regardless of funding source. The report will also highlight improvements to the program's monitoring activities, in addition to changes to Malaria Consortium's SMC program since 2019 in response to the COVID-19 pandemic and considerations for interpreting the results presented.

2. Methods

For maximum protective effect, children should receive a full three-day course of SPAQ during all monthly cycles in a seasonal round of SMC. At the population level, SMC should provide maximum coverage to extend protection as widely as possible among the eligible population in targeted areas.

In general, coverage can be defined as the number of people reached by services offered by a program as a proportion of the eligible target population. In the context of SMC, coverage can therefore be defined as the proportion of children that the SMC campaign reached in each monthly cycle during the transmission season. Coverage can be measured using program data and representative surveys specifically designed for this purpose.

SPAQ coverage, meanwhile, can be defined in different ways. As receiving the first dose of SP and AQ alone is insufficient to provide full protection for the full duration of the high transmission season, coverage indicators should take into account adherence to all relevant components of SPAQ administration, including proportions of households visited by community distributors, caregivers' administration of day 2 and day 3 AQ, and whether children received SPAQ in all monthly cycles. We also considered, where possible, the proportion of ineligible children (60–119 months) who received day 1 SPAQ by monthly cycle and investigated the proportion of eligible children who received SPAQ by means other than its distribution by SMC community distributors during home visits. (This included both potentially legitimate sources of SPAQ, such as distribution at health facilities and distribution at makeshift fixed distributions points, and illegitimate sources of SPAQ, such as through private purchase.) We measured all the above indicators using data from multiple sources — during 2020, these included administrative program data, stock reconciliation data, and data provided by independent coverage surveys commissioned by Malaria Consortium. Surveys also considered the quality of SMC delivery in terms of receipt of SPAQ by eligible children outside of home visits by community distributors.

Surveys took the form of EoC surveys following cycles one to three (where possible), and commissioned EoR surveys following cycle four. All surveys were administered using data forms in SurveyCTO (version 2.70) — an electronic data collection platform for smartphones — and data were uploaded to a remote server after each day of data collection. The data collection software was changed from Magpi in 2019, both to reduce costs and to allow greater flexibility in the design of questionnaire forms (for example, in allowing integration of question randomization and additional skip logic options). Generic questionnaires for both types of survey were initially developed in English for Nigeria and translated into French for use in Burkina Faso, Chad, and Togo. Malaria Consortium staff in each country then made minor adaptations to the questionnaires according to the specific context, for example by changing terminology used to reflect differences in local administrative units, local usage of French, or program terminology. Informed consent was sought from all survey participants in accordance with Malaria Consortium's policy on ethical research, and caregivers and heads of household were read a description of the survey, its purpose, and the types of questions it contained.

2.1. Administrative and stock reconciliation data

SMC tally sheets

Administrative data were obtained through routine monitoring forms, referred to as SMC tally sheets, which community distributors use to record numbers of SPAQ doses administered each day, the number of children re-dosed with SPAQ because of vomiting, and the number of blister packs wasted due to spills or contamination. Supervisors and facility in-charges then compiled information on a daily basis from all the collected SMC tally sheets into daily summary forms, and then transferred all data from the daily summary forms to SMC EoC reports. Information was then aggregated by dedicated M&E staff at district and/or LGA level, to allow calculations of the number of children who received SMC in each country (and by state in the case of Nigeria) by cycle. These data were not available for Togo in 2020. Tally sheet data were used to give estimates of SMC program coverage in each country and Nigerian state, defined as the proportion of eligible children 3–59 months who had received day 1 SPAQ from community distributors. To calculate administrative coverage, the total number of SPAQ courses administered in a given cycle (including both doses given during home visits by community distributors and those given after referral of

eligible children to health facilities) was divided by the estimated target population of children 3–<12 months, 12–59 months, and 3–59 months (i.e. for each formulation of SPAQ, and overall) in the relevant implementation area based on data provided by national or state authorities. Administrative coverage was expressed as a percentage of the estimated target population, both overall and disaggregated by age group.

Stock reconciliation data

Numbers of SPAQ blister packs used over all four monthly cycles by country were also calculated using stock reconciliation data, by subtracting SPAQ blisters returned, and doses wasted or lost from those distributed to the health district level in advance of SMC campaigns. Numbers of doses per country and state were then divided by four to give per cycle means. Both methods disaggregated calculations of doses administered by age range (i.e. 3–<12 months and 12–59 months).

SMC child record cards

Although coverage can also be calculated on the basis of SMC child record cards, which are given to caregivers by community distributors the first time they administer SPAQ to a child each season, their retention by caregivers has been consistently low across most areas where SMC is delivered, and information recorded by caregivers on day 2 and day 3 AQ doses administered to children at home after distributor visits may be inconsistent. SMC child record cards were not employed to measure coverage for the purposes of this report.

2.2. End-of-cycle surveys

EoC surveys are routinely conducted after all but the last annual SMC cycle, so that data from each can be collected and processed before the next cycle to identify issues within smaller discrete local areas, and changes or improvements to SMC delivery can be suggested. However, some EoC surveys did not go ahead as planned during 2020 in the context of the COVID-19 pandemic. In Burkina Faso, a combination of COVID-19 restrictions, insecurity, and a theft-related incident meant that planned EoC surveys following cycles one and two did not go ahead; an EoC survey took place after cycle three. In Chad, the EoC survey following cycle one was cancelled due to COVID-19 restrictions; EoC surveys were conducted after cycles two and three. In Nigeria, surveys took place following every cycle of SMC (i.e. three EoC surveys following cycles one, two, and three). All EoC surveys were conducted by independent parties. In Burkina Faso and Nigeria, various independent consultants performed the EoC surveys; while in Chad, EoC surveys were carried out by the external consultancy Cible RH. Malaria Consortium was unable to support EoC LQAS surveys in Togo during 2020.

IPC procedures were applied to data collectors based on the IPC adaptations for SMC delivery.[9] These adaptations included the use of face masks or coverings by data collectors and supervisors while at work, regular temperature checks for fever, instructions not to enter compounds or come into close physical contact with their residents and to maintain physical distancing, protocols for safe disposal of masks, and hand washing using soap or an alcohol-based hand sanitizer. Surveys were also adapted to collect data on COVID-19-specific indicators (described later in this report).

A number of key improvements were made to SMC surveys in 2020. We improved the representativeness of all EoC surveys using random selection based on self-weighting samples with clusters selected, with probability proportional to their population size. Randomization of children for sampling within compounds was automatically performed using SurveyCTO to reduce selection

bias introduced by data collectors. Definition of eligibility for SMC was improved with additional screening questions.

2.2.1. Rationale and design

EoC surveys employed the LQAS method, which has been recommended by WHO for monitoring health interventions as it provides a simple, rapid method to assess performance at the sub-project level.[10] In the context of public health programs such as SMC, LQAS subdivides program implementation areas into smaller functional areas (e.g. wards or health facility catchment areas) referred to as supervision areas (SAs). The LQAS method requires a relatively small sample per SA to allow for a hypothesis test of whether a predetermined standard for a particular indicator (e.g. percentage coverage) has been met in a given SA. Although this limits interpretation of findings at the SA level, the smaller sample size allows for surveys to be rapidly completed to inform actions for program improvements (i.e. between monthly SMC cycles).[11]

We defined decision criteria and targets for 16 indicators, based on a consultative process involving Malaria Consortium staff at headquarters and country offices (**Table 2**). Decision criteria are defined as a proportion of units (i.e. compounds) per SA below which action is considered necessary to improve program delivery. Targets, meanwhile, are defined as the proportion of units per SA in which a standard is met, such that no further improvement is considered necessary.

Based on results from previous surveys, program requirements, and maximum alpha and beta errors of 10 percent, a lot size of 25 compounds per SA was found to be the minimum such that the sample was sufficient to run hypothesis tests for each of the indicators to determine whether required standards had been met. Finally, decision rules were calculated based on the lot size, decision criteria, and targets. These decision rules defined a threshold number of compounds out of 25 that were required to meet a standard for each SA; if the compounds meeting a standard fell below the decision rule, this indicated that actions were necessary before the next SMC cycle to address issues related to that standard. For example, if fewer than 22 caregivers in an SA reported administering day 2 and day 3 AQ to their eligible children, this issue was reported to community distributors' supervisors. Supervisors then considered further actions to increase caregiver adherence, such as improved distributor training or community sensitization campaigns before the next SMC cycle.

LQAS can also provide a representative summary of coverage at the state or national level, and interpretation of these findings is similar to that of conventional cluster surveys on the assumption that SAs are selected through random sampling, and that they are of approximately equal population size to ensure a representative sample. This report shows the results of EoC surveys aggregated across SAs to give country-level (or state-level, in the case of Nigeria) summaries of key indicators not limited to coverage of eligible children.

Together, modifications to the LQAS methodology and implementation in EoC surveys in 2020 have led to major improvements in three key aspects since 2019. First, surveys were adapted to assess multiple indicators and, using hypothesis tests, to identify specific issues that can be acted upon to drive improvements in SMC delivery at the local level. Second, lot sizes were adapted to facilitate hypothesis tests based on realistic targets and decision criteria that were informed by consensus from Malaria Consortium's country teams and surveys in previous years.[5] Third, EoC surveys, where conducted, were completed within two weeks of the preceding cycle, giving an additional two weeks before the succeeding cycle to process data, perform hypothesis tests, identify and prioritize issues

at the SA level, communicate results to stakeholders at the local level, and engage with them to take actions to improve SMC delivery before the start of the succeeding cycle.

2.2.2. Aims, objectives and indicators

EoC surveys had two aims. The first was to determine whether SAs had met each of the 16 targets below, including achieving acceptable SMC coverage, achieving high use of SMC record cards, disseminating information to ensure caregivers have knowledge of SMC, and ensuring community distributors' adherence to protocols to minimize the risk of COVID-19 transmission (**Table 2**).

The second aim was to provide country- and state-level summaries of key indicators. EoCs were intended to meet the following objectives in support of this aim:

- assess program coverage in terms of compounds/households visited
- assess coverage of eligible children in terms of day 1 SPAQ administered, and full three-day course of SPAQ received during cycle four
- assess adherence to the SMC protocol, including adaptations in response to COVID-19
- provide timely insights on implementation issues requiring adaptations in subsequent cycles
- assess coverage of ineligible children 60–119 months.

The key summary indicators assessed for the purposes of this report were:

1) compounds/households with eligible children visited by a community distributor
2) day 1 SPAQ provided to eligible children by a community distributor*
3) children who received a full three-day course of SPAQ (including both day 2 and day 3 AQ) (among eligible children who received day 1 SPAQ)
4) SPAQ administered with community distributors observing DOT (among eligible children who received day 1 SPAQ).

*For the purposes of measuring coverage of children with SPAQ on day 1, children who had fever or were very sick at the time of the distributor's visit, had an allergy to SMC medicines (as reported by caregivers), or who were not eligible for any other reason (including, but not limited to: age, currently being treated for malaria, or taking other medicines containing SP or AQ, or unable to swallow), were excluded from the analytic sample.

Table 2: List of key indicators assessed by end-of-cycle surveys, by unit of analysis, denominator, and lot quality assurance sampling specifications including decision criteria for action, targets, errors, and decision rules for action

Indicator with targets	Unit of analysis	Denominator	Decision criterion (percent)	Target (percent)	α error	β error	Selected lot size	Decision rule (below is failure)
Households with eligible children visited	Household	Households with eligible children	80	100	<0.0001	0.0982	25	23
SPAQ administered to eligible child (day 1)	Child	Households with eligible children	80	100	<0.0001	0.0982	25	23
Eligible child received three-day complete course of SPAQ (incl. day 2 and day 3 AQ)	Child	Eligible children given SPAQ (day 1)	75	95	0.0341	0.0962	25	22
SPAQ administration observed by a community distributor (day 1)	Child	Eligible children given SPAQ (day 1)	75	95	0.0341	0.0962	25	22
SMC child record card retention	Child	Eligible children given SPAQ (day 1)	80	100	<0.0001	0.0982	25	23
All SPAQ doses received marked on card	Child	Eligible children given SPAQ (day 1)	80	100	<0.0001	0.0982	25	23
Caregiver accepted SMC administration (not refused)	Child	Compounds reached	90	100	<0.0001	0.0718	25	25
SMC awareness (heard of SMC)	Caregiver	Households with eligible children	80	100	<0.0001	0.0982	25	23
SMC knowledge (purpose of SMC)	Caregiver	Households with eligible children	80	100	<0.0001	0.0982	25	23
SMC knowledge (age eligibility for SMC)	Caregiver	Households with eligible children	70	90	0.098	0.0905	25	21
SMC knowledge (importance of age eligibility for SMC)	Caregiver	Households with eligible children	70	90	0.098	0.0905	25	21
SMC knowledge (importance of administering AQ on day 2 and day 3)	Caregiver	Households with eligible children	70	90	0.098	0.0905	25	21
SMC knowledge (what to do in case of an adverse event)	Caregiver	Households with eligible children	70	90	0.098	0.0905	25	21
Confidence in SMC efficacy	Caregiver	Households with eligible children	75	95	0.0341	0.0962	25	22
Caregiver reported distributor wore mask	Caregiver	Compounds reached	80	100	<0.0001	0.0982	25	23
Information on COVID-19 prevention received	Caregiver	Compounds reached	80	100	<0.0001	0.0982	25	23

2.2.3. Sampling methods

Selection of SAs was based on health facility catchment areas and is described below in greater detail for each country. Within each SA, a lot of 25 compounds (with at least one child 3–59 months) was randomly selected, and methods for random selection within SAs varied between countries. Compounds in which residents refused or were unable to participate, or without a child under five years, were resampled. Interviews were conducted in local languages using questionnaires provided by Malaria Consortium, with data collectors translating from the French or English questionnaire on the spot and assigning responses to predefined answer categories in SurveyCTO.

In each compound, after obtaining consent from residents for participation in the survey, a roster of all children 3–119 months was made in SurveyCTO, and their first name, age, and sex recorded. One child 3–59 months was automatically selected at random from the roster by SurveyCTO. All questions relating to coverage related to that child, and all other questions to that child's primary caregiver. An additional child 60–119 months was also randomly selected, if present, to allow for estimation of summary statistics for the proportion of overage ineligible children who received day 1 SPAQ in each country and Nigerian state.

Burkina Faso (cycle three)

In Burkina Faso, the EoC survey targeted a sample of 78 health facility catchment areas as SAs in the 23 health districts where Malaria Consortium implemented SMC in 2020 (**Table 3**). Health facilities were selected using random sampling, and the probability of selection was proportional to the population of each health district. In each health facility's catchment area, villages were assigned to three categories according to their distance from the health facility. A total of 19 compounds[†] per health center catchment area were then randomly selected from each of the three strata.

Although the sample of 19 compounds for each SA was below the target of 25, this was still sufficient to allow hypothesis tests for the following indicators: households with eligible children visited, SPAQ administered to eligible child (day 1), SMC child record card retention, all SPAQ doses received marked on card, SMC awareness (heard of SMC), SMC knowledge (purpose of SMC), caregiver reported distributor wore mask, and information on COVID-19 prevention received by the selected eligible child's caregiver.

[†]This lot size was selected as a result of an error and reflected the practice in previous years.

Table 3: Sampling frame for 2020 end-of-cycle surveys (cycle 3 only), Burkina Faso

Region	Health district	Number of health facilities	Target number of compounds surveyed
Cascades	Mangodara	3	57
Centre	Baskuy	2	38
	Bogodogo	4	76
	Boulmiougou	4	76
	Nongremassom	1	19
	Signonguin	2	38
Hauts Bassins	Dafra	2	38
	Lena	2	38
Nord	Gourcy	4	76
	Seguenega	3	57
	Yako	6	114
Centre Nord	Kaya	4	76
	Kongoussi	4	76
Centre Ouest	Koudougou	6	114
	Leo	4	76
	Nanoro	3	57
	Reo	2	38
	Sapouy	3	57
Centre Sud	Manga	4	76
	Pô	3	57
Centre Est	Tenkodogo	3	57
Plateau Central	Bousse	3	57
	Ziniaré	6	114
Burkina Faso (total)	**n=23**	**78**	**1,482**

Chad (cycles two and three)

In Chad, EoC surveys were carried out after cycles two and three. All health districts across the four regions in which Malaria Consortium supports SMC delivery were divided into SAs of approximately equal population size, each covering the catchment areas of an average of three health centers. Within each SA, nine settlements (e.g. villages or urban wards in the case of N'Djamena) were randomly selected, from which three to four compounds were randomly sampled (by enumerating all compounds per cluster, assigning them numbers, and then randomly selecting a number) to give a total number of compounds sampled per SA of 25 (**Table 4**). This process covered the catchment areas of all health facilities in which SMC was delivered during 2020 and resulted in a target sample size of 2,625 compounds across 317 health facility catchments.

Table 4: Sampling frame for 2020 end-of-cycle surveys, Chad

Region	Health district	Number of health facilities	Number of supervision areas	Target number of compounds surveyed
Chari Baguirmi	Ba-Illi	9	3	75
	Bousso	11	4	100
	Dourbali	16	5	125
	Kouno	4	1	25
	Mandelia	20	7	175
	Massenya	16	5	125
Hadjer Lamis	Bokoro	24	8	200
	Gama	9	3	75
	Karal	10	3	75
	Mani	13	4	100
	Massaguet	21	7	175
	Massakory	17	6	150
Mayo Kebbi Est	Bongor	34	11	275
	Guelendeng	11	4	100
	Moulkou	10	3	75
N'Djamena	N'Djamena Est	20	7	175
	N'Djamena Centre	17	6	150
	N'Djamena Nord	16	5	125
	N'Djamena Sud	25	8	200
	Toukra	14	5	125
Chad (total)	**n=20**	**317**	**105**	**2,625**

Nigeria (cycles one, two, and three)

In Nigeria, between 10 and 20 health facilities were randomly selected from each LGA in proportion to the LGA's population size. The catchment areas of these facilities were considered SAs for the purposes of the EoC surveys. Three settlements (i.e. villages) were randomly selected from the catchment area of each of these three health facilities, and eight or nine compounds were sampled from each to give a total of 25 compounds sampled per health facility catchment area. This approach resulted in a target sample size of 40,500 households per cycle across the seven Nigerian states where Malaria Consortium supported SMC delivery in 2020 (**Table 5**). The sample could also be considered a representative, self-weighted sample on the assumption that health facility catchment areas were of similar population size. One notable feature of this method was that not all health facilities were sampled in each cycle (doing so was not possible due to the large numbers of health facilities in each state), and catchment areas that were surveyed varied between each EoC survey.

Table 5: Sampling frame for 2020 end-of-cycle surveys, Nigeria (cycle one example)

Region	Number of LGAs implementing SMC	Number of health facility catchment areas sampled	Number of households surveyed per cycle
Bauchi	10	163	4,075
Jigawa	27	280	7,000
Kano	44	468	11,700
Katsina	34	338	8,450
Kebbi	21	223	5,575
Sokoto	23	221	5,525
Yobe	17	150	3,750
Nigeria (total)	**155**	1,620	40,500

2.3. End-of-round surveys

EoR surveys were conducted following cycle four in all countries where Malaria Consortium supported SMC implementation during 2020. This included in Togo, where philanthropic funding was used to conduct an EoR survey covering all three regions where SMC was implemented, including those not otherwise supported by Malaria Consortium.

All EoR surveys were conducted independently by local research firms selected by Malaria Consortium through a competitive bidding process:

- Burkina Faso: Institut de Sciences & Techniques
- Chad: Cible RH
- Nigeria: Hanovia Limited
- Togo: CERA Group

Only households with at least one child 3–59 months were eligible for inclusion in EoR surveys. Relevant questions for coverage indicators related to one randomly selected eligible child 3–59 months per household, and one randomly selected child 60–119 months (when present) to ascertain coverage among ineligible children. Villages that were inaccessible or compounds in which residents refused or were unable to participate — or without a child aged under five years — were resampled. Interviews were conducted in local languages using questionnaires provided by Malaria Consortium, with data collectors translating from the French or English questionnaire on the spot and assigning responses to predefined answer categories in SurveyCTO. Conduct of surveys was adapted to minimize the risk of COVID-19 transmission in the same manner as EoC surveys.

IPC procedures to minimize potential transmission of COVID-19 were applied to data collectors based on the IPC adaptations for SMC delivery.[9]

2.3.1. Aims, objectives and indicators

The EoR surveys aimed to assess SPAQ coverage, defined as the proportion of eligible children that received SPAQ during the four monthly cycles of the 2020 SMC campaign.

The surveys were designed to assess:

- program coverage in terms of compounds/households visited
- coverage of eligible children in terms of day 1 SPAQ administered, and full three-day course of SPAQ received during cycle four
- adherence to program protocols, in terms of the proportion of day 1 SPAQ administered by community distributors adhering to DOT in cycle
- SPAQ coverage in terms of children who received day 1 SPAQ during all four monthly cycles.

The key summary indicators assessed were:

1) compounds/households with eligible children visited by a community distributor
2) day 1 SPAQ administered by community distributors to eligible children 3–59 months[‡]
3) children who received a full three-day course of SPAQ (including both day 2 and day 3 AQ, among children who had received day 1 SPAQ)
4) day 1 SPAQ administered with community distributors observing DOT (among children who had received day 1 SPAQ)
5) number of day 1 SPAQ doses received per child over the course of the SMC round
6) coverage of ineligible children 60–119 months (as day 1 SPAQ administered by community distributors).

Several other indicators relating to the full ingestion of dispersed SPAQ, general malaria prevention, and caregivers' knowledge of SMC were investigated. Full results can be found in detailed EoR survey reports summarizing findings from each country. Only key coverage indicators are presented for the purposes of this report. Unless otherwise specified, estimates of coverage indicators were based on self-reported information provided by caregivers. Results presented here may differ from those shown in reports, as manual adjustments to denominators were made to ensure removal of all ineligible children from the analytic samples.

New variables were also included in the EoR surveys to facilitate further analyses to better understand how Malaria Consortium's SMC program works and its effectiveness in achieving coverage, and to provide an estimate of its efficacy in terms of reducing incidence of fever and visits to health facilities among eligible children in areas targeted for SMC. In addition, surveys may also be used to identify variables that may influence key outcomes such as: whether children receive day 1 SPAQ, whether caregivers adhere to administration of AQ on day 2 and day 3, and children's health outcomes.

[‡]For the purposes of measuring coverage of children with SPAQ on day 1, children who had fever or were very sick at the time of the distributor's visit, had an allergy to SMC medicines (as reported by caregivers), or who were not eligible for any other reason (including but not limited to age, currently being treated for malaria, or taking other medicines containing SP or AQ, or were not able to swallow), were excluded from the analytic sample.

These new variables included:

- other malaria control interventions received by the household, including presence and use of (any type of) mosquito nets, and indoor residual spray
- fever within the past month (eligible child), clinic visits, positive RDT test
- literacy of children's caregivers and heads-of-household (based on self-reported ability to read a simple short statement written in any language on a topic related to everyday life)
- employment status of children's caregivers and heads-of-household
- level of education of children's caregivers and heads-of-household
- knowledge, attitudes and practices related to COVID-19
- spitting or vomiting of day 1 SPAQ by eligible children who received SMC, and re-dosing
- level of caregiver satisfaction with community distributor visits and reasons for dissatisfaction
- household place or origin and history of migration within the previous year
- household socioeconomic position (based on the Simple Poverty Scorecard® Poverty Assessment Tool).[12–15]

2.3.2. Sampling methods

EoR surveys employed multistage random samples of households in areas covered by Malaria Consortium's SMC program, and they were intended to achieve a representative sample of the target population at the state or country level, as appropriate to the country setting. Sampling protocols aimed to achieve a self-weighted sample with sampling units selected with probability proportional to size. Only at the last stage of sampling (i.e. at the compound level) was a constant number of eligible children (one child per household) selected. In all three EoR surveys, only one child was sampled for both questions related to coverage and adherence to the SMC guidelines. This method was statistically efficient, due to the likely high within-household correlation of coverage status among eligible children. Sample sizes were intended to allow indicators to be estimated to a high degree of accuracy (designed to be a maximum of five percent for most indicators across individual Nigerian states, and a maximum of three percent by country). Sampling protocols differed by country due to country-specific reporting requirements, differences in administrative areas, and logistics.

Burkina Faso

In Burkina Faso, the EoR survey was based on a stratified random sample of settlements (villages and urban wards), with constant numbers of compounds sampled within each sample unit. Separate random samples of settlements were taken for urban strata, represented by the regions of Centre and Hauts Bassins (corresponding to Ouagadougou and Bobo-Dioulasso), and rural strata comprising all other areas. Settlements were selected with a probability proportional to their population size. In urban areas, a total of 22 compounds was randomly selected from each settlement, while in rural areas a total of five was randomly sampled. The survey design entailed sampling a total of 1,100 (54 percent) compounds located in urban areas and a total of 950 (46 percent) in rural areas, proportional to the ratio of urban to rural residents across the health districts surveyed (**Table 6**). Based on the sampling frame, the survey was designed to reach nearly 30 percent of all settlements in Burkina Faso. The survey took place in early November 2020.

Table 6: Sampling frame for 2020 end-of-round surveys, Burkina Faso

Region	Health district	Number of clusters (settlements) sampled	Target number of compounds surveyed
Cascades	Mangodara	8	40
Centre	Baskuy	10	110
	Bogodogo	11	242
	Boulmiougou	13	286
	Nongremassom	3	66
	Signonguin	8	176
Hauts Bassins	Dafra	5	110
	Lena	5	110
Nord	Gourcy	11	55
	Seguenega	10	50
	Yako	19	95
Centre Nord	Kaya	13	65
	Kongoussi	12	60
Centre Ouest	Koudougou	18	90
	Leo	14	70
	Nanoro	7	35
	Reo	6	30
	Sapouy	10	50
Centre Sud	Manga	14	70
	Pô	9	45
Centre Est	Tenkodogo	10	50
Plateau Central	Bousse	20	100
	Ziniaré	9	45
Burkina Faso (total)	**n=23**	**279**	**2,050**

Chad

In Chad, each district was classified as either urban or rural, and sampling was carried out independently within those two strata as in 2019. Initially, 72 health facility catchment areas were randomly selected from a total of 233 across the four regions where Malaria Consortium supported SMC implementation, with probability of selection proportional to the size of the catchment area populations. Next, five villages (or wards in urban areas) within health facility catchment areas were randomly selected with the aid of comprehensive village lists. Due to differences in the numbers of health facilities per district and their population size between urban and rural areas, the team aimed to survey nine randomly selected compounds per ward in N'Djamena (urban) and four in villages outside the capital (rural), based on numbering of each compound and random number selection. The target sample size was 2,450 compounds (**Table 7**). Villages or wards were resampled if they were determined to be inaccessible. The survey took place in mid-November 2020 and achieved a sample of 2,458 compounds.

Table 7: Sampling frame for 2020 end-of-round surveys, Chad

Region	Health district	Number of health facilities covered	Number of clusters (settlements) sampled	Target number of compounds surveyed
Chari Baguirmi	Ba-Illi	3	15	80
	Bousso	8	40	160
	Dourbali	9	45	180
	Mandelia	5	25	100
	Massenya	3	15	60
	Kouno	2	10	40
Hadjer Lamis	Bokoro	3	15	60
	Gama	3	15	60
	Karal	2	10	40
	Mani	6	29	116
	Massaguet	4	20	80
	Massakory	4	20	80
Mayo Kebbi Est	Bongor	4	20	80
	Guelendeng	5	26	104
	Moulkou	3	15	60
N'Djamena	N'Djamena Est	5	25	225
	N'Djamena Centre	6	30	270
	N'Djamena Nord	5	25	225
	N'Djamena Sud	7	35	315
	Toukra	3	15	135
Chad (total)	**n=20**	**90**	**450**	**2,450**

Nigeria

In Nigeria, target sample sizes were specified in advance for each state, with 990 compounds from 66 clusters considered appropriate for estimating coverage at state level to within an accuracy of five percent (**Table 8**). Within states, LGAs were randomly selected from amongst the LGAs currently covered by the program in each state — except for Katsina and Yobe states, where all SMC implementing LGAs were selected to achieve the targeted sample size (due to the small number of LGAs covered by SMC delivery in these states). Within LGAs, health facilities were then sampled at random. Communities were randomly sampled from each health facility catchment area, and clusters of 15 households were randomly selected from each community. These sampling methods are explained in greater detail by the national protocol that Malaria Consortium produced in partnership with the Nigerian National Malaria Elimination Programme.[16] Surveys were designed to be representative within states. EoR surveys took place between 30th November and 7th December 2020.

Table 8: Sampling frame for 2020 end-of-round surveys, Nigeria

Region	Number of LGAs implementing SMC	Number of LGAs sampled	Number of clusters sampled	Target number of compounds surveyed
Bauchi	10	10	66	990
Jigawa	27	23	66	990
Kano	44	35	66	990
Katsina	34	21	66	990
Kebbi	23	21	66	990
Sokoto	17	17	66	990
Yobe	10	10	66	990
Nigeria (total)	**155**	**137**	**594**	**8,910**

Togo

The EoR survey in Togo was based on a simple random sample of clusters (comprising both villages and urban districts, referred to as localities) in the three northernmost regions of the country where SMC was delivered in 2020 (Centrale, Kara, and Savanes). Malaria Consortium designed a randomizer, into which data on localities and their populations (provided by the country's national malaria control program) were entered. The randomizer selected 201 localities with probability proportional to their population size (**Table 9**). A total of 10 compounds were randomly sampled in each locality. One locality in the region of Savanes was sampled on 11th December as part of training for data collectors and supervisors, and the remaining 200 localities were sampled between 12th and 21st December 2020.

Table 9: Sampling frame for 2020 end-of-round surveys, Togo

Region	Health district	Number of clusters (localities) sampled	Target number of compounds surveyed
Centrale	Blitta	11	110
	Mô	3	30
	Sotouboua	10	100
	Tchamba	13	130
	Tchaoudjo	17	170
Kara	Assoli	5	50
	Bassar	10	100
	Binah	6	60
	Dankpen	10	100
	Doufelgou	9	90
	Keran	12	120
	Kozah	19	190
Savanes	Cinkasse	6	60
	Kpendjal	7	70
	Kpendjal-Ouest	9	90
	Oti	8	80
	Oti-Sud	10	100
	Tandjoare	10	100
	Tone	26	260
Togo (total)	**n=19**	**201**	**2,010**

2.4. Data analysis

Malaria Consortium staff processed and analyzed data from both EoC and EoR surveys using STATA version 16. Coverage and related indicators were calculated using the proportion command, with 95 percent confidence intervals calculated using a logit transform.

All indicators were expressed as percentages at the country level, or state level in the case of Nigeria. Population size weights were applied using the svy: command as appropriate for estimates of coverage indicators for Nigeria as a whole, to give weighted averages across the seven states. No weightings were used for Burkina Faso, Chad, or Togo — or within Nigerian states — as samples were designed to be self-weighting with clusters selected with a probability proportional to population size. Confidence intervals were otherwise calculated under the assumption that data represented a simple random sample.

3. Results

3.1. Administrative coverage and stock reconciliation data

Malaria Consortium's 2020 SMC campaign aimed to reach 12,385,137 children per monthly cycle across Burkina Faso, Chad, and Nigeria. Estimates of administrative coverage by cycle using data from SMC tally sheets, and mean coverage across all four cycles by age group based on data from SMC tally sheets and stock reconciliation data, are shown for Burkina Faso, Chad, and Nigeria in **Table 10**, and by Nigerian states in **Table 11**. Based on data from SMC tally sheets, the mean number of doses that community distributors provided to children 3–59 months across the three countries was 12,861,281 across all four cycles, corresponding to administrative coverage of 103.8 percent. Total numbers of blister packs provided, and corresponding mean administrative coverage estimates based on data from SMC tally sheets were: 1,735,895 (106.9 percent) for Burkina Faso; 1,011,506 (104.8 percent) for Chad; and 10,222,778 (104.4 percent) for Nigeria in the states where SMC implementation took place with support from Malaria Consortium during 2020. **Table 10 and Table 11** also show estimates of administrative coverage and numbers of SPAQ blister packs used during 2020, using the stock reconciliation method as an average percentage coverage across the four cycles. Based on stock reconciliation data, 12,930,251 blister packs were used across the three countries, corresponding to a coverage of 104.4 percent. With some exceptions, administrative coverage exceeded 100 percent in all Nigerian states across the four cycles.

SMC tally sheet and stock reconciliation data — and, therefore, estimates of administrative coverage — were not available for Togo in 2020 because, due to COVID-19, Malaria Consortium did not provide operational support to the country's malaria program to the extent initially planned before the pandemic. See the Philanthropy report 2020 for details.[6]

Table 10: Administrative coverage by country, cycle, and age group (tally sheet and stock reconciliation methods)

Country	Age group*	Target population	Tally sheet										Stock reconciliation	
			Cycle one		Cycle two		Cycle three		Cycle four		Mean		Mean (cycles 1–4)	
			Doses	Coverage (percent)	Doses	Coverage (percent)	Doses	Coverage (percent)	Doses	Coverage (percent)	Doses	Coverage (percent)	Doses	Coverage (percent)
Burkina Faso	3–<12 months	**299,593**	249,568	83.3	253,773	84.7	271,239	90.5	278,890	93.1	263,368	87.9	268,978	89.8
	12–59 months	**1,324,707**	1,314,397	99.2	1,352,356	102.1	1,422,891	107.4	1,457,005	110.0	1,386,662	104.7	1,411,053	106.5
	3–59 months	**1,624,300**	1,563,965	96.3	1,650,646	101.6	1,694,130	104.3	1,735,895	106.9	1,661,159	102.3	1,680,031	103.4
Chad	3–<12 months	**213,990**	201,055	94.0	207,415	96.9	206,437	96.5	201,980	94.4	204,222	95.4	208,293	97.3
	12–59 months	**750,893**	780,036	103.9	804,803	107.2	812,769	108.2	809,454	107.8	801,766	106.8	806,749	107.4
	3–59 months	**964,883**	981,161	101.7	1,012,301	104.9	1,019,265	105.6	1,011,506	104.8	1,006,058	104.3	1,015,042	105.2
Nigeria	3–<12 months	**1,856,076**	1,966,614	106.0	2,043,383	110.1	2,048,216	110.4	1,941,801	104.6	2,000,005	107.8	1,987,298	107.1
	12–59 months	**7,939,879**	7,969,943	100.4	8,289,438	104.4	8,235,880	103.7	8,280,977	104.3	8,194,061	103.2	8,247,880	103.9
	3–59 months	**9,795,954**	9,936,557	101.4	10,332,821	105.5	10,284,096	105.0	10,222,778	104.4	10,194,064	104.1	10,235,178	104.5
Total	3–<12 months	**2,369,659**	2,417,237	102.0	2,504,571	105.7	2,525,892	106.6	2,422,671	102.2	2,467,595	104.1	2,464,569	104.0
	12–59 months	**10,015,479**	10,064,376	100.5	10,446,597	104.3	10,471,540	104.6	10,547,436	105.3	10,382,489	103.7	10,465,682	104.5
	3–59 months	**12,385,137**	12,481,683	100.8	12,995,768	104.9	12,997,491	104.9	12,970,179	104.7	12,861,281	103.8	12,930,251	104.4

*The dose for children 3–<12 months is SP 250 mg/12.5 mg and AQ 76.5 mg. For children 12–59 months, the dosage is SP 500/25mg and AQ 153mg.

Table 11: Administrative coverage by Nigerian state, cycle, and age group (tally sheet and stock reconciliation methods)

Country and state		Age group*	Target population	Tally sheet										Stock reconciliation	
				Cycle one		Cycle two		Cycle three		Cycle four		Mean		Mean (Cycles 1–4)	
				Doses	Coverage (percent)	Doses	Coverage (percent)	Doses	Coverage (percent)	Doses	Coverage (percent)	Doses (percent)	Coverage (percent)	Doses	Coverage (percent)
Nigeria	Bauchi	3–<12 months	**131,571**	133,436	101.4	145,565	110.6	153,016	116.3	156,665	119.1	147,171	111.9	150,179	114.1
		12–59 months	**562,833**	534,278	94.9	567,105	100.8	585,006	103.9	595,365	105.8	570,439	101.4	575,376	102.2
		3–59 months	**694,404**	667,714	96.2	712,670	102.6	738,022	106.3	752,030	108.3	717,609	103.3	725,555	104.5
	Jigawa	3–<12 months	**251,689**	268,508	106.7	273,214	108.6	276,804	110.0	280,301	111.4	274,707	109.1	281,116	111.7
		12–59 months	**1,076,669**	1,126,930	104.7	1,135,357	105.5	1,143,065	106.2	1,146,410	106.5	1,137,941	105.7	1,148,676	106.7
		3–59 months	**1,328,357**	1,395,438	105.0	1,408,571	106.0	1,419,869	106.9	1,426,711	107.4	1,412,647	106.3	1,429,793	107.6
	Kano	3–<12 months	**549,451**	594,259	108.2	616,499	112.2	614,065	111.8	501,104	91.2	581,482	105.8	588,083	107.0
		12–59 months	**2,350,428**	2,395,399	101.9	2,563,607	109.1	2,523,028	107.3	2,539,844	108.1	2,505,470	106.6	2,526,358	107.5
		3–59 months	**2,899,879**	2,989,658	103.1	3,180,106	109.7	3,137,093	108.2	3,040,948	104.9	3,086,951	106.5	3,114,441	107.4
	Katsina	3–<12 months	**355,038**	378,471	106.6	381,214	107.4	383,153	107.9	381,214	107.4	381,013	107.3	343,822	96.8
		12–59 months	**1,518,772**	1,495,280	98.5	1,500,279	98.8	1,498,952	98.7	1,500,279	98.8	1,498,698	98.7	1,506,097	99.2
		3–59 months	**1,873,810**	1,873,751	100.0	1,881,493	100.4	1,882,105	100.4	1,881,493	100.4	1,879,711	100.3	1,849,919	98.7
	Kebbi	3–<12 months	**216,812**	221,598	102.2	229,993	106.1	231,609	106.8	234,453	108.1	229,413	105.8	234,322	108.1
		12–59 months	**927,472**	888,684	95.8	909,070	98.0	911,435	98.3	915,364	98.7	906,138	97.7	913,484	98.5
		3–59 months	**1,144,284**	1,110,282	97.0	1,139,063	99.5	1,143,044	99.9	1,149,817	100.5	1,135,552	99.2	1,147,806	100.3
	Sokoto	3–<12 months	**217,211**	228,107	105.0	232,530	107.1	233,481	107.5	234,697	108.1	232,204	106.9	235,032	108.2
		12–59 months	**929,180**	936,401	100.8	949,466	102.2	950,751	102.3	953,882	102.7	947,625	102.0	952,066	102.5
		3–59 months	**1,146,391**	1,164,508	101.6	1,181,996	103.1	1,184,232	103.3	1,188,579	103.7	1,179,829	102.9	1,187,097	103.6
	Yobe	3–<12 months	**134,304**	142,235	105.9	164,368	122.4	156,088	116.2	153,367	114.2	154,015	114.7	154,744	115.2
		12–59 months	**574,525**	592,971	103.2	664,554	115.7	623,643	108.5	629,833	109.6	627,750	109.3	625,824	108.9
		3–59 months	**708,829**	735,206	103.7	828,922	116.9	779,731	110.0	783,200	110.5	781,765	110.3	780,567	110.1

*The dose for children aged three to <12 months is SP 250 mg/12.5 mg and AQ 76.5 mg. For children aged 12 to 59 months, the dosage is SP 500/25mg and AQ 153mg.

3.2. Coverage surveys

This section presents results of EoC and EoR surveys in Burkina Faso, Chad, Nigeria, and Togo.

3.2.1. Households with eligible children visited by a community distributor

According to EoC survey results, the percentage of compounds or households visited by community distributors during the first three monthly cycles was over 90 percent in Burkina Faso, Chad, and Togo (**Table 12**). Proportions are shown with 95 percent confidence intervals (CI) and sample sizes. Estimates of the proportion of households visited by a community distributor in Burkina Faso and Chad were consistent across surveys.

In Nigeria, the weighted average proportion of households visited by community distributors across the seven states surveyed was found to be 83.7 percent (95 percent CI: 82.8–84.6). Proportions varied across individual states and by survey (**Table 13**). Estimates of proportions of households visited using data from EoR surveys were lower than those based on EoC surveys.

Our results for 2020 are similar to those from 2019,[5] when 99.8 percent (95 percent CI: 99.7–99.9), 99.9 percent (95 percent CI: 99.7–100.0), and 89.4 percent (95 percent CI: 83.4–93.4) of compounds with eligible children were visited in Burkina Faso, Chad, and Nigeria, respectively.[§]

Table 12: Proportions of households with eligible children visited by a community distributor by country and survey

Data source	Number of households sampled	Number of households covered	Percent coverage (95 percent CI)
Burkina Faso			
EoC: cycle three	1,557	1,499	96.3 (95.2–97.1)
EoR: cycle four	2,177	2,171	99.7 (99.4–99.9)
Chad			
EoC: cycle two	2,640	2,429	92.0 (91.0–93.0)
EoC: cycle three	2,453	2,316	93.8 (92.8–94.7)
EoR: cycle four	2,458	2,375	96.6 (95.8–97.3)
Nigeria (total, weighted proportion)			
EoR: cycle four	7,914	6,625	83.7 (82.8–84.6)
Togo			
EoR: cycle four	2,032	1,962	96.6 (95.7–97.3)

[§]Results of EoC and EoR surveys may not be directly comparable between 2019 and 2020. Estimates of coverage and other indicator summaries for Burkina Faso are based on an average across 22 health districts, excluding Mangodara. Results for Nigeria in 2019 are based on weighted averages from across five states (Jigawa, Katsina, Sokoto, Yobe, and Zamfara), which do not correspond to states surveyed in 2020. In addition, results within Nigerian states may also not be comparable due to differences in LGAs targeted for SMC delivery. Finally, no data are available for Togo in 2019.

Table 13: Proportions of households with eligible children visited by a community distributor by Nigerian state and survey

Data source	Number of households sampled	Number of households covered	Percent coverage (95 percent CI)
Bauchi			
EoC: cycle one	4,070	3,606	88.6 (87.6–89.5)
EoC: cycle two	4,113	3,773	91.7 (93.4–94.4)
EoC: cycle three	4,128	3,895	94.4 (93.6–95.0)
EoR: cycle four	998	886	88.8 (86.7–90.6)
Jigawa			
EoC: cycle one	6,986	6,582	94.2 (93.6–94.7)
EoC: cycle two	7,010	6,733	96.0 (95.6–96.4)
EoC: cycle three	7,097	6,939	97.8 (97.4–98.1)
EoR: cycle four	1,003	905	90.2 (88.2–91.9)
Kano			
EoC: cycle one	11,656	10,959	94.0 (93.6–94.4)
EoC: cycle two	11,115	10,668	96.0 (95.6–96.3)
EoC: cycle three	12,128	11,744	96.8 (96.5–97.1)
EoR: cycle four	1,099	889	80.9 (78.5–83.1)
Katsina			
EoC: cycle one	8,592	7,787	90.6 (90.0–91.2)
EoC: cycle two	8,032	7,489	93.2 (92.7–93.9)
EoC: cycle three	8,277	7,775	93.9 (93.4–94.4)
EoR: cycle four	1,208	1,038	85.9 (83.8–87.8)
Kebbi			
EoC: cycle one	5,589	4,624	82.7 (81.7–83.7)
EoC: cycle two	5,578	4,967	89.0 (88.2–89.8)
EoC: cycle three	5,674	5,190	91.5 (90.7–92.1)
EoR: cycle four	1,187	1,038	87.4 (85.5–89.2)
Sokoto			
EoC: cycle one	5,615	4,992	88.9 (88.1–89.7)
EoC: cycle two	5,878	5,472	93.1 (92.4–93.7)
EoC: cycle three	5,918	5,628	95.1 (94.5–95.6)
EoR: cycle four	1,195	950	79.5 (77.1–81.7)
Yobe			
EoC: cycle one	3,771	3,530	93.6 (92.8–94.3)
EoC: cycle two	4,052	4,052	94.5 (93.7–95.2)
EoC: cycle three	4,209	3,924	93.2 (92.4–93.9)
EoR: cycle four	1,224	919	75.0 (72.6–77.4)

3.2.2. Day 1 SPAQ provided to eligible children 3–59 months

EoC and EoR surveys showed high coverage in terms of day 1 SPAQ provided by community distributors across all surveys in Burkina Faso, Chad, and Togo, with coverage exceeding 95 percent in all EoR surveys in these countries (**Table 14**). Weighted average coverage across the seven Nigerian states included in the EoR survey was 85.4 percent (95 percent CI: 84.4–86.3). Despite the challenges associated with SMC delivery in the context of the COVID-19 pandemic, day 1 SPAQ coverage among eligible children in the 2020 EoR survey was similar to that in 2019, when coverage in Burkina Faso, Chad, and Nigeria was 96.9 percent (95 percent CI: 96.4–97.4), 98.5 percent (95 percent CI: 98.0–98.9), and 85.1 percent (95 percent CI: 78.6–89.9), respectively. There was variation in coverage between Nigerian states (**Table 15**), with coverage of day 1 SPAQ highest in Jigawa and lowest in Sokoto (as in 2019).

Table 14: Proportions of eligible children (3–59 months) who received day 1 SPAQ by country and survey

Data source	Number of children sampled	Number of children covered	Percent coverage (95 percent CI)
Burkina Faso			
EoC: cycle three	1,526	1,492	97.8 (96.9–98.4)
EoR: cycle four	2,164	2,136	98.7 (98.1–99.1)
Chad			
EoC: cycle two	2,608	2,457	94.2 (93.2–95.0)
EoC: cycle three	2,433	2,302	94.6 (93.6–95.4)
EoR: cycle four	2,442	2,370	97.1 (96.3–97.7)
Nigeria (total, weighted proportion)			
EoR: cycle four	7,889	6,791	85.4 (84.4–86.3)
Togo			
EoR: cycle four	2,028	1,936	96.9 (95.5–98.4)

Table 15: Proportions of eligible children (3–59 months) who received day 1 SPAQ by Nigerian state and survey

Data source	Number of children sampled	Number of children covered	Percent coverage (95 percent CI)
Bauchi			
EoC: cycle one	4,010	3,578	89.2 (88.2–90.1)
EoC: cycle two	4,061	3,699	91.1 (90.2–91.9)
EoC: cycle three	4,087	3,786	92.7 (91.7–93.3)
EoR: cycle four	997	858	86.1 (83.8–88.1)
Jigawa			
EoC: cycle one	6,913	6,617	95.7 (95.2–96.2)
EoC: cycle two	6,955	6,750	97.1 (96.6–97.4)
EoC: cycle three	7.032	6,880	97.8 (97.4–98.2)
EoR: cycle four	1,000	923	92.3 (90.5–93.8)
Kano			
EoC: cycle one	11,595	11,175	96.4 (96.0–96.7)
EoC: cycle two	11,072	10,768	97.2 (96.9–97.5)
EoC: cycle three	12,096	12,096	96.7 (96.4–97.0)
EoR: cycle four	1,095	893	81.6 (79.1–83.7)
Katsina			
EoC: cycle one	8,510	7,933	93.2 (92.7–93.7)
EoC: cycle two	7,971	7,531	94.5 (94.0–95.0)
EoC: cycle three	8,230	8,230	94.6 (94.1–95.0)
EoR: cycle four	1,202	1,028	85.5 (83.4–87.4)
Kebbi			
EoC: cycle one	5,511	4,837	87.8 (86.9–88.6)
EoC: cycle two	5,506	5,053	91.8 (91.0–92.5)
EoC: cycle three	5,612	5,612	92.6 (91.9–93.3)
EoR: cycle four	1,181	1,064	90.1 (88.3–92.5)
Sokoto			
EoC: cycle one	5,600	5,155	92.1 (91.3–92.7)
EoC: cycle two	5,843	5,507	94.2 (93.6–94.8)
EoC: cycle three	5,872	5,872	95.5 (95.0–96.0)
EoR: cycle four	1,194	997	83.5 (82.9–84.2)
Yobe			
EoC: cycle one	3,755	3,603	96.0 (95.3–96.5)
EoC: cycle two	4,250	4,069	95.7 (95.1–96.3)
EoC: cycle three	4,204	4,204	93.5 (92.7–94.2)
EoR: cycle four	1,220	1,028	84.3 (82.1–86.2)

3.2.3. Proportion of eligible children who received a full three-day course of SPAQ

Both types of surveys found that high proportions of children received AQ doses on both day 2 and day 3 from their caregivers (**Table 16 and Table 17**). Adherence across all four countries was around 95 percent in each monthly SMC cycle, based on estimates from EoC and EoR surveys. Adherence was found to be lowest in Chad and Nigeria (particularly in the state of Kebbi, where SMC was introduced for the first time in 2020) and highest in Burkina Faso (>97.5 percent in both surveys). Although not directly comparable,[**] the results from 2020 show that adherence to day 2 and day 3 AQ administration, as reported by caregivers, was similar or marginally lower than the proportion of day 3 AQ in 2019.

Among caregivers of the 276 children sampled in the EoR survey across all four countries in 2020 who did not receive AQ on day 3, the most common reasons for non-adherence included "the caregiver forgot to administer day 3 AQ" (n=47, 17.0 percent), "concern over adverse effects of AQ administration" (n=44, 15.9 percent), "the child was sick" (n=43, 15.6 percent), and "the child vomited all of the day 3 AQ dose" (n=39, 14.1 percent). In 2019, the most common reason for non-adherence to day 3 AQ was that "the caregiver did not know it was necessary to administer AQ on day 2 and day 3," which represented 36.3 percent of responses to that question. In 2020, across the four countries, only 29 children — of which 27 were in Nigeria and one each was in Chad and Togo — did not receive day 3 AQ for this reason. This suggests not only that caregiver knowledge of the need for administration of AQ on day 2 and day 3 may have improved, but also that future efforts to improve adherence should confront caregivers' concerns about possible adverse effects of AQ administration.

Table 16: Proportions of eligible children (3–59 months) who received a full three-day course of SPAQ among those who received day 1 SPAQ, by country and survey

Data source	Number of children sampled	Number of children received full course	Percent received full course (95 percent CI)
Burkina Faso			
EoC: cycle three	1,492	1,456	97.6 (96.8–98.3)
EoR: cycle four	2,131	2,117	99.3 (98.8–99.6)
Chad			
EoC: cycle two	2,457	2,312	94.1 (93.1–95.0)
EoC: cycle three	2,302	2,169	94.2 (93.2–95.1)
EoR: cycle four	2,291	2,159	94.2 (93.2–95.1)
Nigeria (total, weighted proportion)			
EoR: cycle four	6,279	5,951	94.4 (93.2–95.1)
Togo			
EoR: cycle four	1,853	1,805	97.1 (96.6–98.0)

[**]In 2018 and 2019, adherence was measured in terms of administration of day 2 AQ and day 3 AQ as two separate outcomes. In 2020, the outcome variable for adherence was defined according to whether a given child had taken both of these AQ doses.

Table 17: Proportions of eligible children (3–59 months) who received a full three-day course of SPAQ among those who received day 1 SPAQ, by Nigerian state and survey

Data source	Number of households sampled	Number of children received full course	Percent received full course (95 percent CI)
Bauchi			
EoC: cycle one	3,578	3,492	97.6 (97.0–98.1)
EoC: cycle two	3,699	3,599	97.3 (96.7–97.8)
EoC: cycle three	3,876	3,691	97.5 (96.9–97.9)
EoR: cycle four	836	807	95.4 (93.3–96.5)
Jigawa			
EoC: cycle one	6,617	6,524	98.6 (98.2–98.9)
EoC: cycle two	6,750	6,676	98.9 (98.6–99.1)
EoC: cycle three	6,880	6,823	99.2 (98.9–99.3)
EoR: cycle four	865	829	95.8 (94.2–97.0)
Kano			
EoC: cycle one	11,175	10,901	97.5 (97.2–97.8)
EoC: cycle two	10,678	10,621	98.6 (98.4–98.8)
EoC: cycle three	11,697	11,577	99.0 (98.8–99.1)
EoR: cycle four	832	774	94.6 (93.0–97.1)
Katsina			
EoC: cycle one	7,933	7,727	97.4 (97.0–97.7)
EoC: cycle two	7,531	7,354	97.6 (97.2–97.5)
EoC: cycle three	7,783	7,561	97.1 (96.8–97.5)
EoR: cycle four	979	940	96.0 (94.6–97.1)
Kebbi			
EoC: cycle one	4,837	4,616	95.4 (94.8–96.0)
EoC: cycle two	5,053	4,841	95.8 (95.2–96.3)
EoC: cycle three	5,199	4,945	95.1 (94.5–95.7)
EoR: cycle four	990	931	94.0 (92.3–95.4)
Sokoto			
EoC: cycle one	5,155	4,974	96.5 (96.0–97.0)
EoC: cycle two	5,507	5,336	96.9 (96.4–97.3)
EoC: cycle three	5,609	5,463	97.3 (96.9–97.8)
EoR: cycle four	916	840	91.7 (89.7–93.3)
Yobe			
EoC: cycle one	3,603	3,577	99.3 (98.9–99.5)
EoC: cycle two	4,069	3,999	98.3 (97.8–98.6)
EoC: cycle three	3,931	3,829	97.4 (96.9–97.9)
EoR: cycle four	861	830	96.4 (94.9–97.5)

3.2.4. SPAQ administration directly supervised by community distributors adhering to DOT

The EoC survey consistently showed high levels of adherence to DOT by community distributors who administered day 1 SPAQ to eligible children. While community distributors' adherence to DOT in Burkina Faso was particularly high in 2020 in the EoR survey, it should be noted that adherence according to 2020 cycle EoR surveys in both Burkina Faso (90.3 percent, 95 percent CI: 88.9–91.4) and Chad (71.9 percent, 95 percent CI: 70.0–73.7) was lower than that in 2019, when the proportions of children who had received SPAQ from distributors adhering to DOT was 98.6 percent (95 percent CI: 98.2–98.9) and 82.8 percent (95 percent CI: 81.3–84.2), respectively (**Table 18**). Meanwhile, as in 2019, EoR surveys typically showed lower adherence rates than EoC surveys.

Distributor adherence was 68.3 percent (95 percent CI: 67.0–69.6) as a weighted average across the seven Nigerian states surveyed after cycle four. While this was higher than in the 2019 EoR survey (65.2 percent, 95 percent CI: 53.9–75.0), the difference was not significant (as evidenced by overlapping 95 percent CIs). Adherence varied widely between Nigerian states (**Table 19**) and between cycles within states.

Table 18: Proportions of eligible children (3–59 months) who received day 1 SPAQ from community distributors adhering to DOT among those who received Day 1 SPAQ from community distributors during home visits, by country and survey

Data source	Number of children sampled	Number administered SMC by DOT	Percent administered SMC by DOT (95 percent CI)
Burkina Faso			
EoC: cycle three	1,492	1,392	93.3 (91.9–94.5)
EoR: cycle four	2,144	1,935	90.3 (88.9–91.4)
Chad			
EoC: cycle two	2,388	2,002	83.9 (82.3–85.3)
EoC: cycle three	2,274	1,856	81.6 (80.0–83.2)
EoR: cycle four	2,317	1,665	71.9 (70.0–73.7)
Nigeria (total, weighted proportion)			
EoR: cycle four	6,382	4,400	68.3 (67.0–69.6)
Togo			
EoR: cycle four	1,873	1,475	78.8 (76.8–80.5)

Table 19: Proportions of eligible children (3–59 months) who received day 1 SPAQ from community distributors adhering to DOT among those who received day 1 SPAQ from community distributors during home visits, by Nigerian state and survey

Data source	Number of children sampled	Number administered SMC by DOT	Percent administered SMC by DOT (95 percent CI)
Bauchi			
EoC: cycle one*	3,380	2,214	65.5 (63.9–67.1)
EoC: cycle two	3,576	2,715	75.9 (74.4–77.3)
EoC: cycle three	3,726	2,921	78.4 (77.0–79.7)
EoR: cycle four	846	528	62.4 (59.1–65.6)
Jigawa			
EoC: cycle one*	6,444	2,574	39.9 (38.8–41.1)
EoC: cycle two	6,637	5,495	82.8 (81.9–83.7)
EoC: cycle three	6,842	5,761	84.2 (83.3–85.0)
EoR: cycle four	879	633	72.0 (69.0–74.9)
Kano			
EoC: cycle one	10,774	8,817	81.8 (81.1–82.6)
EoC: cycle two	10,520	9,010	85.6 (85.0–86.3)
EoC: cycle three	11,576	9,793	84.6 (83.9–85.2)
EoR: cycle four	849	537	63.3 (60.0–66.4)
Katsina			
EoC: cycle one*	7,628	5,993	78.6 (77.6–79.5)
EoC: cycle two	7,333	5,375	73.3 (72.3–74.3)
EoC: cycle three	7,659	5,349	69.8 (68.9–70.9)
EoR: cycle four	994	720	72.4 (69.6–75.1)
Kebbi			
EoC: cycle one	4,472	4,019	89.8 (89.0–90.7)
EoC: cycle two	4,844	4,326	89.3 (88.4–90.1)
EoC: cycle three	5,058	4,528	89.5 (88.6–90.3)
EoR: cycle four	1,005	775	77.1 (74.4–79.6)
Sokoto			
EoC: cycle one*	4,931	3,128	63.4 (62.1–64.8)
EoC: cycle two	5,932	4,892	90.7 (89.9–91.4)
EoC: cycle three	5,539	4,888	88.2 (87.4–89.1)
EoR: cycle four	930	607	65.3 (62.1–68.2)
Yobe			
EoC: cycle one*	3,480	2,759	79.3 (77.9–80.6)
EoC: cycle two	4,025	3,839	95.3 (94.7–96.0)
EoC: cycle three	3,893	3,706	95.2 (94.5–95.8)
EoR: cycle four	879	600	68.3 (65.1–71.2)

*Question phrasing differed between cycles in some states (marked). In cycle one EoC surveys in these states, the relevant question was phrased “Please indicate whether it was the community distributor who administered the SMC medicines.” For all other cycles and states, the question was phrased “Please indicate whether the community distributor directly supervised administration of the SMC medicines during the visit.” Due to IPC measures for SMC delivery in 2020 in response to the COVID-19 pandemic, community distributors were instructed not to administer day 1 SPAQ themselves to children, but instead guide caregivers to do so.

3.2.5. Receipt of SPAQ by eligible children outside of home visits by community distributors

Caregiver reports of eligible children who received day 1 SPAQ outside home visits by community distributors during EoR surveys were least frequent in Burkina Faso and Chad (<1 percent in both countries), and highest in Nigeria (5.1 percent) (**Table 20**). Across the four countries combined, the most common sources of SPAQ outside of visits by community distributors included personnel at local health facilities (154/467, 33.0 percent) and from community distributors handing out SPAQ at makeshift fixed distribution points (109/467, 23.3 percent); these can both be considered legitimate sources of SPAQ but may represent non-adherence to protocols for SPAQ delivery. Private purchase, however — which is likely to reflect misappropriation and sale of SPAQ originally intended for distribution through the SMC program — only accounted for 5.1 percent (24/467) of SPAQ administration outside of home visits. Other miscellaneous reasons given for receiving SPAQ outside of community distributor visits included receiving SMC medicines at a local leader's residence (n=2).

Table 20: Receipt of SPAQ by eligible children outside of home visits by community distributors by country

Data source	Number of eligible children sampled	Number of eligible children covered	Percent coverage (95 percent CI)
Burkina Faso			
EoR: cycle four	2,177	3	0.1 (0.1–0.2)
Chad			
EoR: cycle four	2,458	2	0.0 (0.0–0.0)
Nigeria (total, weighted proportion)			
EoR: cycle four	7,914	439	5.1 (4.5–5.6)
Togo			
EoR: cycle four	2,009	23	1.1 (0.1–1.8)

3.2.6. Day 1 SPAQ received per child over the course of the SMC round and children who received day 1 SPAQ during all four monthly SMC cycles

The number of cycles in which sampled children received day 1 SPAQ was assessed only through the EoR surveys. **Table 17 and Table 18** show the proportions of eligible children by state and country, by number, of day 1 SPAQ received during the 2020 SMC round. While 96.9 percent of eligible children in Burkina Faso, 81.9 percent in Chad, 60.2 percent across the seven states sampled in Nigeria, and 64.9 percent in Togo received day 1 SPAQ in all four cycles, this proportion varied markedly across Nigerian states (**Table 21**).

All of the eligible children 3–59 months sampled in Burkina Faso, Chad, and Togo were found to have received day 1 SPAQ at least once (in any cycle) from community distributors during 2020, according to caregiver reports. In Nigeria, 6.0 percent were found not to have received any SP and AQ from community distributors at any time during the 2020 SMC round; by state, this proportion was highest in Sokoto (10.4 percent) and Yobe (8.7 percent), and lowest in Jigawa (1.7 percent) (**Table 22**).

Table 21: Proportions of eligible children (3–59 months) who received day 1 SPAQ from community distributors by number of cycles during 2020 (EoR survey), by country

Number of cycles	Number of children sampled	Number of children covered	Percent coverage (95 percent CI)
Burkina Faso			
None	2,155	0	N/A
One		3	0.1 (0.0–0.4)
Two		76	3.5 (2.8–4.4)
Three		92	4.2 (3.5–5.2)
Four		1,947	96.9 (96.4–97.4)
Chad			
None	2,420	0	N/A
One		48	2.0 (1.5–2.6)
Two		115	4.8 (4.0–5.7)
Three		274	11.3 (10.1–12.4)
Four		1,983	81.9 (80.3–83.4)
Nigeria (total, weighted proportion)			
None	7,898	507	6.0 (5.4–6.6)
One		411	5.2 (4.7–5.8)
Two		1,066	13.3 (12.5–14.2)
Three		1,198	15.3 (14.4–16.2)
Four		4,716	60.2 (59.0–61.4)
Togo			
None	1,980	0	N/A
One		56	2.8 (2.2–3.7)
Two		322	16.2 (14.7–17.9)
Three		316	16.0 (14.4–17.6)
Four		1,286	64.9 (62.8–67.0)

Table 22: Proportions of eligible children (3–59 months) who received day 1 SPAQ from community distributors by number of cycles during 2020 (EoR survey), by Nigerian state

Number of cycles	Number of children sampled	Number of children covered	Percent coverage (95 percent CI)
Bauchi			
None	997	72	7.2 (5.8–9.0)
One		63	6.3 (4.9–8.0)
Two		68	6.8 (5.4–8.6)
Three		121	12.1 (10.3–14.3)
Four		673	67.5 (64.5–70.3)
Jigawa			
None	1,001	17	1.7 (1.1–2.7)
One		77	7.7 (6.2–9.5)
Two		82	8.2 (6.6–10.1)
Three		187	18.7 (16.4–20.3)
Four		638	63.7 (60.7–66.7)
Kano			
None	1,098	62	5.6 (4.4–7.2)
One		56	5.1 (3.9–6.6)
Two		164	14.9 (12.9–17.2)
Three		174	15.8 (13.8–18.1)
Four		642	58.5 (55.5–61.4)
Katsina			
None	1,203	80	6.7 (5.4–8.2)
One		38	3.2 (2.3–4.3)
Two		119	9.9 (8.3–11.7)
Three		159	13.2 (11.4–15.3)
Four		807	67.1 (64.4–69.7)
Kebbi			
None	1,182	45	3.8 (2.9–5.1)
One		56	4.7 (3.7–6.1)
Two		270	22.8 (20.5–25.3)
Three		242	20.5 (18.3–22.9)
Four		569	48.1 (45.3–51.0)
Sokoto			
None	1,194	124	10.4 (8.8–12.2)
One		79	6.6 (5.3–8.2)
Two		175	14.7 (12.8–16.8)
Three		110	9.2 (7.7–11.0)
Four		706	59.1 (56.3–61.9)
Yobe			
None	1,223	107	8.7 (7.3–10.5)
One		42	3.4 (2.5–4.6)
Two		188	15.7 (13.5–17.5)
Three		205	16.8 (14.8–19.0)
Four		681	55.7 (52.8–58.4)

3.2.7. SPAQ provided to ineligible children five years and above

Table 23 shows the proportions of ineligible children 60–119 months who received SPAQ, based on data from EoC and EoR surveys in Burkina Faso, Chad, and Nigeria: these were 34.9 percent (95 percent CI: 31.0–39.0) in Burkina Faso, 44.4 percent (95 percent CI: 41.7–47.0) in Chad, a weighted average of 35.0 percent (95 percent CI: 33.3–36.1) across the seven states in Nigeria, and 32.7 percent (95 percent CI: 30.4–35.1) in Togo based on EoR surveys. When compared with results from EoC surveys from 2019,[††] results from 2020 suggest that coverage of ineligible children has fallen in Burkina Faso — where 46.3 percent in cycle two and 56.0 percent in cycle three received day 1 SPAQ in 2019 — and remained unchanged in Chad, where coverage of ineligible children in cycle three was 39.2 percent (95 percent CI: 35.6–42.9) in 2019. No comparison can be made for Nigeria, for which data were unavailable in 2019.

Across Nigerian states (**Table 24**), the highest proportions of ineligible children who received SPAQ were found in Yobe (54.1 percent) and Kebbi (44.4 percent) in cycle four, where the majority or all LGAs had not previously received SMC in previous years. For most cycles, the proportion was lowest in Jigawa.

Table 23: Proportions of ineligible children (60–119 months) who received day 1 SPAQ, by country and survey

Data source	Number of ineligible children sampled	Number of ineligible children covered	Percent coverage (95 percent CI)
Burkina Faso			
EoC: cycle three	926	215	23.2 (20.6–26.1)
EoR: cycle four	541	189	34.9 (31.0–39.0)
Chad			
EoC: cycle two	1,310	538	41.1 (38.4–43.8)
EoC: cycle three	1,122	511	45.5 (42.6–48.5)
EoR: cycle four	1,366	606	44.4 (41.7–47.0)
Nigeria (total, weighted proportion)			
EoR: cycle four	5,801	2,140	35.0 (33.3–36.1)
Togo			
EoR: cycle four	1,556	509	32.7 (30.4–35.1)

[††]Data from 2019 EoR surveys (conducted after cycle four) on SPAQ provided to ineligible children five years and above were not available for comparison.

Table 24: Proportions of ineligible children (60–119 months) who received day 1 SPAQ, by Nigerian state and survey

Data source	Number of ineligible children sampled	Number of ineligible children covered	Percent coverage (95 percent CI)
Bauchi			
EoC: cycle one	2,516	645	25.6 (24.0–27.4)
EoC: cycle two	3,604	802	22.2 (20.9–23.6)
EoC: cycle three	3,600	976	27.1 (25.7–28.6)
EoR: cycle four	784	280	35.7 (32.4–39.1)
Jigawa			
EoC: cycle one	4,283	963	22.9 (21.7–24.6)
EoC: cycle two	5,484	1,255	22.9 (21.8–24.0)
EoC: cycle three	5,498	1,513	27.5 (26.4–28.7)
EoR: cycle four	771	240	31.1 (28.0–34.4)
Kano			
EoC: cycle one	4,992	1,891	37.9 (36.5–39.3)
EoC: cycle two	4,617	1,812	39.0 (37.6–40.4)
EoC: cycle three	4,534	2,017	44.4 (43.0–45.9)
EoR: cycle four	814	264	32.4 (29.3–35.7)
Katsina			
EoC: cycle one	4,361	1,169	26.8 (25.5–28.1)
EoC: cycle two	5,387	1,517	28.2 (27.0–29.4)
EoC: cycle three	6,011	1,785	29.7 (28.6–30.9)
EoR: cycle four	835	252	30.2 (27.2–33.4)
Kebbi			
EoC: cycle one	2,587	751	29.1 (27.3–30.8)
EoC: cycle two	3,116	827	26.5 (25.0–28.1)
EoC: cycle three	3,183	1,024	32.1 (30.6–33.8)
EoR: cycle four	827	367	44.4 (41.0–47.8)
Sokoto			
EoC: cycle one	3,488	783	26.4(24.4–28.7)
EoC: cycle two	4,143	1,079	26.0 (24.7–27.4)
EoC: cycle three	4,206	1,268	30.1 (28.8–31.6)
EoR: cycle four	999	320	32.0 (29.2–35.0)
Yobe			
EoC: cycle one	1,023	418	40.9 (37.9–43.9)
EoC: cycle two	1,569	455	29.0 (26.8–31.3)
EoC: cycle three	1,397	502	35.9 (33.5–38.5)
EoR: cycle four	711	417	54.1 (50.6–57.8)

4. Discussion

The results of the EoC and EoR surveys across the four countries suggest that SMC programs supported by Malaria Consortium were generally effective in ensuring high program coverage and adherence to the SMC protocols. Nevertheless, the results also suggest that there a need to improve the quality of SMC implementation, especially with regard to observing DOT and administering SPAQ to children above 59 months. The work we do under our strategic focus on quality is described in more detail in the 2020 philanthropy report.

Administrative program data show high coverage of SMC across all areas where Malaria Consortium implemented SMC in 2020. The proportion of eligible children receiving day 1 SPAQ from a community distributor was found to exceed 90 percent in Burkina Faso, Chad, and Nigeria using both data from SMC tally sheets and stock reconciliation data. Estimates of mean coverage per cycle using the stock reconciliation method were similar to those based on data from SMC tally sheets. In many instances, administrative coverage estimated using both methods exceeded 100 percent; this is likely a reflection of provision of SMC to ineligible children or inaccuracy in target population estimates (which are often, particularly in the case of Nigeria, based on outdated census population estimates and assumptions on the proportion of the population 3–59 months).

According to household survey data, except for some Nigerian states, coverage in terms of receipt of day 1 SPAQ by eligible children 3–59 months exceeded 90 percent across all countries. This was achieved in Togo despite the country's national malaria control program not having the capacity to train SMC personnel in country in 2020 due to funding constraints, and Malaria Consortium's inability to support the program due to delays and constraints related to COVID-19. Among those children who received day 1 SPAQ, the proportion of those receiving both day 2 and day 3 AQ from their caregivers was consistently over 90 percent in all surveys across all countries and Nigerian states. Adherence to DOT varied widely between countries and Nigerian states; results show adherence of 68.3 percent (weighted average) in cycle four across the seven Nigerian states surveyed, over 70 percent for all surveys in Chad and Togo, and over 90 percent in the two surveys conducted in Burkina Faso. Overall adherence to DOT was lower than in 2019; this may have been attributable to confusion over new protocols for SMC delivery following adaptations in response to COVID-19, or to changes in how training was delivered due to COVID-19.

Together, these outcomes suggest that the program successfully reached a large proportion of its target population of eligible children and was broadly successful in promoting adherence to day 2 and day 3 AQ among caregivers; this implies a large proportion of eligible children were provided effective protection against malaria during the high transmission season in the four countries surveyed. These results also suggest, based on comparison with results from 2019, that coverage was not significantly affected by measures taken in response to the COVID-19 pandemic.

There remain significant areas for improvement in SMC delivery, however. EoR data show that coverage of day 1 SPAQ, administration of both day 2 and day 3 AQ by caregivers, and adherence to DOT by distributors were lowest in Kano, Sokoto, and Yobe. It can be speculated that this was a result of the challenges of providing training to community distributors and administering SMC in the context of COVID-19, introducing new guidelines to prevent its transmission, and the desire of individual community distributors to minimize contact with caregivers and children (leading them to leave behind SPAQ without directly observing administration). It should also be noted there was a discrepancy in results on adherence to DOT in some Nigerian states (Bauchi, Jigawa, Katsina, Sokoto,

and Yobe). This can be attributed to the fact that the question wording in the cycle one EoC survey differed from that in all subsequent surveys. In cycle one EoC surveys in these states, the relevant question was phrased “Please indicate whether it was the SMC distributor who administered the SMC medicines.” For all other cycles and states, the question was phrased “Please indicate whether the SMC distributor directly supervised administration of the SMC medicines during the visit.” This question, when phrased in the former way, may have been misinterpreted by caregivers and data collectors in the context of COVID-19 guidance that caregivers themselves should administer SPAQ.

Although the importance of adhering to the SMC guidelines for age eligibility has been strongly emphasized during training of community distributors, administration to children above the eligible age range continues to be widespread with the highest occurrence in Chad and the Nigerian states of Yobe and Kebbi. Administration to children 60–119 months is likely primarily a reflection of the challenges related to determination of children’s ages. These results should be interpreted with caution, however. Survey questions on day 1 SPAQ coverage of older children were not designed to obtain a representative sample of this age group (due to the fact that all of them lived in compounds with one or more eligible children), and caregivers may have over-reported coverage of children in this age group due to social desirability bias. Eligible children receiving SPAQ outside of home visits by community distributors, meanwhile, was relatively rare and most frequently reported in Nigeria.

Although over 80 percent of eligible children in Burkina Faso and Chad received day 1 SPAQ in all four cycles, only 60.2 percent in Nigeria received day 1 SPAQ in all four cycles, while 6.0 percent of children did not receive day 1 SPAQ in any cycle at all during 2020. This finding may suggest that some areas (i.e. parts of health facility catchments) may have been omitted by SMC campaigns in all four cycles, as it was unlikely that children residing in areas covered by the campaign would have been missed in all four cycles.

4.1. Strengths and limitations

The use of independent coverage surveys allowed for evaluation of the program’s performance and coverage of its target population by data collectors who had no involvement in program implementation. Not only did this serve to reduce bias, it also allowed for external resources to be utilized to ensure that surveys were implemented in a timely manner. Self-weighting sampling designs were employed in Burkina Faso, Chad, and Togo with the number of clusters sampled by district proportional to the size of the target population. This ensured that estimates of program coverage were representative of the populations targeted for SMC administration. While samples for individual Nigerian states were also based on a self-weighting design, summaries of each indicator across all the sampled states in Nigeria as a whole relied on the use of state population size weights. This was because the total sample size for each state was not proportional to that state’s population.

A number of improvements have been made to both EoC and EoR surveys since 2019. First, potential selection bias due to the need for data collectors to randomly select eligible children within compounds was eliminated by entry of all children 119 months and under into a roster and in-built randomization to select one eligible (and one overage ineligible) child using SurveyCTO. In addition, warning messages were applied when only one eligible child was entered into the roster to deter ad hoc randomization by data collectors themselves, and to reduce the attendant risk of selection bias. Furthermore, improvements were made to survey forms using question restrictions and prompts for data collectors to correct inputted information when responses to questions were contradictory. Despite this, a small number of observations in survey data showed inconsistencies in caregivers’

responses: for example, in a few instances, caregivers reported that their children were within the eligible age range of 3–59 months, but subsequently reported that children did not receive day 1 SPAQ because they were over the eligible age range (these children were eliminated from analytic samples as appropriate). Although this is likely to have had only a negligible impact on coverage estimates, questionnaire forms will be adjusted in terms of their question order and skip logic to prevent this reoccurring in future.

EoR surveys in 2020 also included questions on receipt of SPAQ outside home visits by community distributors. The results of these surveys may be of use in informing changes to SMC delivery to make certain that all day 1 SPAQ doses are delivered according to program protocols to ensure the safety of children, adherence to day 2 and day 3 AQ administration, and, by extension, effectiveness of protection provided against malaria. Results based on these questions found that the majority of incidences of children receiving day 1 SPAQ from other sources occurred at local health facilities or makeshift fixed distribution points operated by community distributors. Additional questions have also been added to questionnaire forms since 2019 to facilitate improvements in estimation of coverage indicators by identifying children who were ineligible to receive SMC (e.g. due to having fever at the time of SMC distribution), and thereby ensuring accuracy of denominators when estimating coverage indicators. Another improvement in questionnaires was made regarding determination of children's ages: children under 60 months at the beginning of the SMC round were eligible to receive SPAQ from community distributors in all cycles, even if their age exceeded 60 months later in the SMC round. These children were sampled as eligible for SMC and included in estimates of SMC coverage among eligible children.

Summary: Improvements to Malaria Consortium's SMC monitoring activities since 2019

- All surveys were made representative using random selection based on self-weighting samples with clusters selected with probability proportional to their population size (or, in the case of Nigeria, representative within individual states).
- Randomization of children for sampling within compounds was automatically performed using SurveyCTO to reduce selection bias introduced by data collectors.
- Definition of eligibility for SMC was improved, increasing accuracy of denominators.
- Questions were added on SPAQ received outside of visits by community distributors, in addition to questions on characteristics of children's caregivers and households.

Another area where improvements have been made is the use of monitoring data, particularly that from EoC LQAS surveys. After identification and prioritization of issues at the SA level, this information was used to engage with national and local stakeholders in Burkina Faso, Chad, and Nigeria to improve SMC delivery before subsequent cycles. In Burkina Faso, results of the LQAS surveys and issues identified by SA were presented to program managers from the country's national malaria control program, to be relayed to supervisors at the SA level. In Chad, Malaria Consortium shared results with program managers at the district and health facility levels and suggested specific actions to be taken (including improvements to pre-campaign sensitization and community distributor training). In one SA in N'Djamena where multiple issues were identified, four Malaria Consortium staff participated in briefing community distributors before SMC delivery,

worked with supervisors to develop and strengthen distributor work plans, and oversaw SMC delivery to monitor its quality.

Several limitations should be noted, however. First, target populations used to calculate administrative coverage were estimated on the basis of official population figures, which were often based on outdated national census data and adjusted for projected population growth. At the same time, alongside the fact that the population growth factors employed may have been inaccurate, estimates of population sizes could not adequately reflect population movements, for example due to migration or internal displacement. Administration of SPAQ to ineligible children above the targeted age range is also likely to have led to an overestimation of the proportion of children within the eligible age range who received SPAQ. As a result of the numerous limitations of using administrative data to measure coverage, it is possible (and not uncommon) to achieve coverage of well over 100 percent. At the same time, population size weights used in analyses of EoR data from Nigeria relied on the same estimates of target populations.

The primary limitation of coverage surveys is that they rely on self-reporting, and findings based on survey responses may be subject to recall and social desirability bias. Recall bias is likely to increase along with time between the completion of cycle four SMC distribution and the beginning of EoR surveys. It should be noted, however, that time between the end of cycle four and the EoR surveys was shorter in 2020 than in previous years. For example, in 2020, EoR surveys took place in Chad during November in 2020, while the 2019 EoR survey took place in January 2020. Language and translation present further opportunities for introducing bias, especially as questionnaires were only provided in English and French and relied on data collectors to translate questions when interviewing caregivers. Challenges have also been reported in the use of mobile devices while administering surveys in 2020 and in previous years. While issues such as poor internet connection cannot be remedied in the short to medium term, anecdotal reports from Nigeria suggest that the introduction of SurveyCTO and improvements in questionnaire forms have reduced operating system instability and incidence of crashes (and thereby unintentional loss of data), and improved ease-of-use of the data collection application and questionnaire forms.

Estimates of SMC coverage among ineligible children 60–119 months may not be representative as children from this age group were only sampled from households with eligible children. Results for coverage in this age group may represent an overestimate as overage children in households without eligible children — who were less likely to be administered day 1 SPAQ — were absent from the analytic sample. Malaria Consortium does not consider it feasible to obtain a representative sample of these children in Burkina Faso, Chad, Nigeria, or Togo.

While survey questions used consistent wording and answer choices across all cycles and countries as far as possible, caution should be exercised when making comparisons between results from EoC and EoR surveys within the same country due to difference in sampling methods. In addition, results from different years may not be directly comparable, as areas targeted by SMC and included in surveys changed between years (for example, SMC was newly introduced in the Nigerian states of Kano and Kebbi in 2020, and in new LGAs within existing states such as Yobe).

Finally, we did not consider use of SMC child record cards for estimation of coverage due to the high proportion of eligible children for whom cards were missing; it was found that 59.8 percent of eligible children in Burkina Faso, 69.3 percent in Chad, 71.2 percent in Nigeria, and 40.7 percent in Togo had SMC child record cards, based on EoR survey data. SMC child record cards may not

represent a reliable source of coverage data where retention and completion are poor due to potential for bias in estimates of SMC coverage.

4.2. Recommendations, conclusions, and next steps

Although LQAS surveys have been improved since 2019 and have been better adapted for identifying specific issues in SMC delivery at the health facility level, further consideration will be given during 2021 as to how survey findings can be used to engage with local stakeholders to identify issues, plan actions for improvement with stakeholders, make timely adaptations to program delivery, and follow up to verify whether improvements have been realized. EoC surveys will also be implemented for the first time in Togo in 2021 and used to inform improvements to SMC delivery.

Discussions at the country level will also focus on how reports drafted by contractors may be used more effectively to engage with country- and state-level authorities.

The results of this report point to further potential improvements for Malaria Consortium's SMC M&E activities in 2021 and beyond. First, Malaria Consortium will seek to improve reporting of adverse events and referrals to health facilities in response to day 1 SPAQ administration among children in administrative data. Second, the EoR survey in Nigeria found that 6.0 percent of eligible children in areas targeted for SMC received no day 1 SPAQ at all during 2020; data will be reviewed to identify areas that may have been omitted from SMC campaigns to inform corrective actions (particularly in the states of Sokoto and Yobe). In the medium term, geospatial solutions such as Reveal,[17] which Malaria Consortium is testing in Nigeria, will reduce the likelihood of areas being omitted. Third, given that, based on the results of this report, administration of day 1 SPAQ to children above the eligible age group remains widespread, Malaria Consortium will consider including an indicator for coverage in this age group in EoC LQAS surveys to identify SAs where this is a particular issue, and formulate actions reduce administration to overage children such as improved training on determining children's ages. EoR surveys will also attempt to measure provision of SMC to underage children (i.e. those aged under three months) during cycle four. Given that proportions of children 60–119 months exceeded 35 percent in some settings, attempts will also be made to improve wording of survey questions to rule out the possibility that such high proportions were not a result of social desirability bias. Fourth, while results of EoC and EoR surveys were relatively consistent in Burkina Faso and Chad, this was not the case for some Nigerian states (particularly in the states of Kano, Sokoto, and Yobe), where there were significant differences in estimates for some indicators (e.g. day 1 SPAQ coverage among eligible children) in 2020 and in 2019.[5] Efforts will be made to determine whether these differences represent a trend in coverage during the SMC round, or instead are a result of differences in quality or representativeness of EoC surveys compared with EoR surveys; if the latter, appropriate actions will be taken to ensure the representativeness of EoC surveys in 2021 and beyond. Such actions may include improvements in monitoring the process of selecting survey clusters, and appraisal of training and interview methods used by data collectors.

As part of our strategic focus on evidence, Malaria Consortium is continuing development of a quality framework and has started the implementation of an M&E framework for its SMC program that was delayed due to the COVID-19 pandemic. The quality framework specifies expected standards of SMC delivery and will be used by countries as a benchmark for continued quality improvement. The M&E framework, meanwhile, which is described in greater detail in the 2020 philanthropy report,[6] specifies a range of indicators relating to program inputs, outputs, outcomes,

and impacts, which will align with key program quality standards that are currently in development. The M&E framework and its objectives and features are described in a synopsis recently published by Malaria Consortium.[18] The full framework is expected to be published as an article in a peer-reviewed academic journal by 2022. Issues identified in EoC surveys at the SA level, actions taken in response to these issues between cycles, follow-up report summaries will be systematically recorded as part of the M&E framework. EoC and EoR data will also increasingly drive quality improvement initiatives between annual SMC rounds.

Further efforts will be made to improve the quality and timeliness of stock reconciliation data for estimating administrative coverage. Findings based on this data will be triangulated with those from surveys and administrative data collected using SMC tally sheets.

Malaria Consortium will continue to monitor the status of the COVID-19 pandemic and the evolving security situation across countries and regions reached by its SMC program. We will update contingency plans and protocols for SMC and M&E activities to both prevent disruptions and reduce the risk of COVID-19 transmission. In addition, Malaria Consortium will investigate the impacts of COVID-19, and adaptations in response to COVID-19, on its SMC program and populations in areas targeted for SMC using EoC and EoR surveys and other data. So far, using data from the cycle 1 EoC survey,[19] Malaria Consortium has published a study on caregiver knowledge of COVID-19 prevention behaviors and symptoms, belief in misinformation on COVID-19, and effectiveness of different methods of communication on COVID-19 including community distributors involved in SMC distribution in six of the Nigerian states where SMC is delivered.

Data from EoR surveys — which typically occur one to two months after the completion of cycle four and now include a range of contextual variables — may be used to complement Malaria Consortium's work on evaluating the impact of SMC, which is described in more detail in the 2020 Philanthropy report.[6] For example, survey data could be used to analyze the association between SMC status, fever, and confirmed malaria (based on caregiver reports) in the month after cycle four to evaluate the efficacy of SPAQ in reducing malaria incidence in eligible children. These data may also be used to study the associations between socioeconomic variables and other household characteristics on the one hand, and caregiver refusal of SMC, adherence to day 2 and day 3 AQ administration, and SMC provision to ineligible children on the other.

In 2021, Malaria Consortium will continue to conduct EoC and EoR surveys in Burkina Faso, Chad, Nigeria, and Togo, as well as in our SMC pilot projects in Mozambique and Uganda.

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