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**Coverage and quality of seasonal
malaria chemoprevention
supported by Malaria Consortium
in 2022:**

Results from Burkina Faso, Chad,
Mozambique, Nigeria, South
Sudan, Togo and Uganda

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Established in 2003, Malaria Consortium is one of the world's leading non-profit organisations specialising in the prevention, control and treatment of malaria and other communicable diseases among vulnerable populations. Our mission is to improve lives in Africa and Asia through sustainable, evidence-based programmes that combat targeted diseases and promote child and maternal health.

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Acronyms and abbreviations

ACCESS-SMC	Achieving Catalytic Expansion of Seasonal Malaria Chemoprevention in the Sahel
AQ	amodiaquine
COVID-19	Coronavirus disease (2019)
CI	confidence interval
CISM	Centro de Investigação em Saúde de Manhiça
DHS	Demographic and Health Surveys
DOT	directly observed therapy.
EoC	end-of-cycle
EoR	end-of-round
GF	Global Fund to Fight AIDS, Tuberculosis and Malaria
IPC	infection prevention and control
KOICA	Korea International Cooperation Agency
LGA	local government area
LQAS	lot quality assurance sampling
M&E	monitoring and evaluation
PMI	President's Malaria Initiative
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

The Sahel region of sub-Saharan Africa experiences the highest burden of malaria illness and deaths during the rainy season. Seasonal malaria chemoprevention (SMC) is an intervention intended to provide prophylactic protection against malaria to at-risk populations during this period of high transmission. Since 2012, the World Health Organization (WHO) has recommended a monthly course of SMC medicines: involving the administration of a single dose of sulfadoxine-pyrimethamine (SP) in combination with three daily doses of amodiaquine (AQ) to eligible children over consecutive monthly cycles during the high malaria transmission season. Accumulated evidence from randomized control trials and SMC implementation at scale has shown SMC to be safe, feasible, effective, and cost-effective in the target population of eligible children.

SMC is typically delivered door-to-door over a period of four days by trained community distributors during each month for four monthly cycles (or five cycles in some cases) during the rainy season. The first dose of SP and AQ ('day 1 SPAQ') is given as a directly observed therapy (DOT) under the supervision of the community distributors. The community distributors leave the remaining two tablets of AQ in the blister pack with the child's primary caregivers to administer daily over the following two days ('day 2 AQ' and 'day 3 AQ'), while providing caregivers with information on AQ administration and how to respond in the event of adverse reactions to SPAQ. To be fully effective at providing sufficient protection from malaria infection, children should receive the full three-day course of SPAQ during each monthly SMC cycle.

Malaria Consortium is committed to rigorously monitoring and evaluating the performance of its SMC program. It is not only important to demonstrate program coverage by evaluating performance against coverage targets, but also to determine the proportion of children who 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 as follows:

- To outline methods employed by Malaria Consortium for monitoring coverage of its philanthropically funded SMC program and quality of SMC delivery in 2022.
- To provide a summary of program coverage estimates and degree of adherence to the program's implementation standards in 2022.

- To provide recommendations on potential adaptations and further improvement to SMC coverage estimation, household surveys and monitoring and evaluation activities for the coming 2023 campaign.

Malaria Consortium's SMC program in 2022

In 2022, Malaria Consortium, through full or partial philanthropic funding, supported SMC delivery in seven countries, namely: Burkina Faso, Chad, Mozambique, Nigeria, South Sudan, Togo, and Uganda, targeting about 15 million children aged 3–59 months.

In Burkina Faso, SMC was delivered in 29 districts across six regions in Burkina Faso during 2022, targeting 2,107,982 eligible children per monthly cycle. In Chad, SMC was implemented in 27 districts across four regions in Chad, targeting 1,200,706 eligible children. In Mozambique, SMC was scaled up from two districts in Nampula province during the 2020/21 round to four districts in the 2022 campaign, targeting 114,276 eligible children in each cycle. In Nigeria, SMC was delivered in nine states in Nigeria in 2022 (an increase from seven states in 2021), with a total target population of 10,719,882 eligible children. In South Sudan, SMC was implemented in one country (Aweil South) in the Northern Bahr El Ghazal region in 2022 as part of SMC implementation research in new geographies, targeting a total of 18,514 eligible children. In Togo, SMC was implemented in 19 districts in Togo during the 2022 round, targeting a population of 501,696 eligible children. In Uganda, SMC was scaled up from two districts in the Karamoja region during the 2021 round to eight districts in 2022, targeting a population of 234,912 eligible children during the 2022 campaign.

Methods

Administrative coverage was estimated based on routine monitoring forms referred to as SMC tally sheets, as was the case in Burkina Faso, Nigeria, Togo, South Sudan and Uganda. Where data from tally sheets were not available, administrative coverage was estimated using SPAQ stock reconciliation data, as in Chad and Mozambique. In addition to administrative coverage estimates, SMC program coverage was assessed using two types of household coverage surveys, as were conducted in all countries except South Sudan. Both types of household surveys are described in brief below:

- End-of-cycle (EoC) surveys employing the lot quality assurance sampling (LQAS) methodology were typically conducted following all but the final SMC cycle, to enable implementing teams to identify areas of low coverage and other issues in SMC delivery. That way, EoC surveys

enabled SMC program teams to rapidly take corrective actions to improve SMC delivery in subsequent cycles. Surveys were typically completed within two weeks of the completion of the SMC cycle.

- Comprehensive end-of-round (EoR) surveys took place within eight weeks of completion of the final monthly cycle. EoR surveys were designed to be representative at the country level (in addition to being representative at the state level in Nigeria), to assess program performance across all monthly cycles in which SMC was delivered.

Results

Administrative coverage

There were consistently high levels of administrative coverage across all seven countries during the SMC 2022 campaign. The high coverage levels seen were comparable with those of previous years spanning 2020–2021. Administrative coverage was estimated based on SMC tally sheets in Burkina Faso, Nigeria, Togo, South Sudan and Uganda, and based on stock reconciliation data in Chad and Mozambique, where tally sheet data were not available in 2022. Based on combined estimates from both data sources, an average (mean) of 14,976,794 courses of SPAQ were distributed by community distributors in each monthly cycle across all seven countries supported by Malaria Consortium in 2022. Based on the target population of 14,897,968 eligible children, this represents an administrative coverage estimate of approximately 100 percent globally. Administrative coverage was higher than 90 percent in all seven countries.

End-of-cycle and end-of-round surveys

Coverage estimates from our household surveys showed that the program achieved high levels of coverage across all cycles and in all implementing countries. Coverage was above 90 percent for most indicators across cycles, countries and survey types. Coverage results from surveys for key indicators by country are highlighted in the table below and discussed in detail with other program indicators later in the report:

Table 0: Summary of 2022 SMC coverage results (with 95% CI) from EoC and EoR surveys by country and cycle

Country	Cycle no.	Target population	Day 1 SPAQ	Day 1 DOT	Adherence to day 2 and 3 AQ	Receipt of SMC in all cycles	
Burkina Faso	cycle 1	2,107,982	100	95.7 (95.0-96.4)	98.0 (97.5-98.4)	*77.4 (72.3-81.8)	#64.6 (58.1-70.6)
	cycle 2		96.1 (95.3-96.7)	92.7 (91.9-93.7)	98.4 (97.9-98.8)		
	cycle 3		96.8 (96.1-97.3)	92.8 (92.0-93.5)	98.1 (97.6-98.5)		
	cycle 4		96.4 (95.7-96.9)	94.6 (93.8-95.3)	98.1 (97.6-98.5)		
	cycle 5		95.4 (93.9-96.5)	83.7 (79.3-87.3)	98.9 (97.3-99.5)		
Chad	cycle 1	1,200,706	95.3 (94.6-96.0)	91.2 (90.3-92.2)	95.9 (95.2-96.6)	79.8 (78.4-81.1)	
	cycle 2		95.4 (94.7-96.1)	91.7 (90.7-92.6)	95.9 (95.2-96.5)		
	cycle 3						
	cycle 4		94.2 (93.4-95.0)	83.3 (82.1-84.6)	96.7 (96.1-97.3)		
Mozambique	cycle 1	114,276	89.9 (88.0-91.8)	91.9 (90.1-93.8)	90.8 (88.8-92.7)	60.0 (57.2-62.9)	
	cycle 2						
	cycle 3		92.2 (90.5-93.9)	94.1 (92.5-95.6)	93.4 (91.7-95.0)		
	cycle 4		80.7 (78.5-82.8)	97.8 (97.0-98.7)	98.0 (97.2-98.9)		
Nigeria	cycle 1	10,719,882	94.2 (93.5-94.8)	87.7 (86.7-88.7)	97.1 (96.9-97.4)	*89.9 (87.4-91.9)	#80.7 (77.3-83.7)
	cycle 2		95.7 (95.2-96.2)	89.4 (88.3-90.3)	97.5 (97.3-97.8)		
	cycle 3		94.1 (93.5-94.6)	86.6 (85.6-87.6)	97.2 (96.9-97.5)		
	cycle 4		93.3 (92.5-94.0)	86.2 (84.8-87.5)	97.1 (96.7-97.4)		
	cycle 5		93.9 (92.4-95.0)	89.1 (87.5-90.4)	97.8 (97.3-98.2)		
South Sudan	cycle 1	18,514					
	cycle 2		91.5 (83.8-95.8)	98.3 (96.6-99.2)	88.2 (77.2-94.3)		
	cycle 3						
	cycle 4		93.8 (83.3-97.5)	96.2 (92.6-98.1)	99.2 (97.3-99.8)		
	cycle 5						
Togo	cycle 1	501,696	99.5 (98.7-99.8)	92.3 (88.9-94.8)	82.8 (72.2-89.9)	81.2 (79.5-82.8)	
	cycle 2		99.7 (99.1-99.9)	97.8 (96.2-98.7)	96.2 (92.4-98.1)		
	cycle 3		99.9 (99.6-99.9)	97.7 (96.5-98.6)	92.8 (83.6-97.0)		
	cycle 4		97.3 (96.5-97.9)	89.7 (88.3-91.0)	98.3 (97.6-98.8)		
Uganda	cycle 1	234,912	94.2 (93.0-95.5)	96.9 (96.0-97.9)	98.8 (98.2-99.4)	71.6 (68.5-74.7)	
	cycle 2		97.8 (96.4-99.2)	96.0 (94.1-97.9)	93.3 (90.8-95.7)		
	cycle 3		90.7 (88.8-92.6)	97.9 (96.9-98.9)	98.2 (97.3-99.1)		
	cycle 4						
	cycle 5		94.0 (92.4-95.6)	99.5 (99.0-100)	99.7 (99.4-100)		

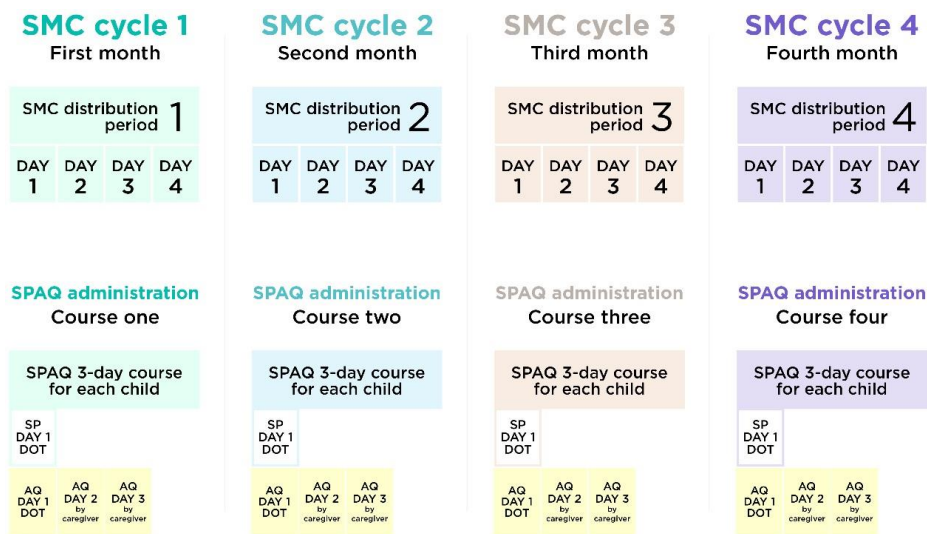
*Areas that received four SMC cycles; #areas that received five SMC cycles

1. Introduction

The Sahel region of sub-Saharan Africa experiences the highest burden of malaria illness and deaths during the rainy season.^[1, 2] Seasonal malaria chemoprevention (SMC) is an intervention intended to provide prophylactic protection to children against *Plasmodium falciparum* malaria during this period of high transmission.^[2] The objective is to maintain therapeutic antimalarial drug concentrations in the blood throughout the period of highest risk of malaria transmission through intermittent administration of monthly courses of sulfadoxine-pyrimethamine (SP) and amodiaquine (AQ), or 'SPAQ'.^[1, 2] Since 2012, the World Health Organization (WHO) has recommended a monthly course of SMC medicines: involving the administration of a single dose of sulfadoxine-pyrimethamine (SP) in combination with three daily doses of amodiaquine (AQ) to eligible children over consecutive monthly cycles during the high malaria transmission season. In 2022, the WHO published consolidated malaria guidelines, including updated guidelines on SMC. The updated WHO guidelines generally provide greater flexibility to malaria-endemic countries to adapt chemoprevention strategies based on the local epidemiology and context. For SMC, they no longer define geographic restrictions.^[3] Accumulated evidence from randomized control trials and SMC implementation at scale has shown SMC to be safe, feasible, effective, and cost-effective in the target population of children in both low and high resistance settings.^[1, 4, 5]

SMC is typically delivered in yearly rounds of four monthly cycles during the peak of the rainy season: approximately July to October in the Sahel and December to March in countries in the Southern Hemisphere like Mozambique, with distribution periods approximately 28 days apart. In some areas, such as in Burkina Faso, Nigeria, South Sudan and Uganda, SMC is now delivered in an additional (fifth) monthly cycle. SPAQ is distributed through door-to-door campaigns by trained volunteer community distributors, who in most settings receive stipends. Distribution occurs over a period of three to four days per cycle (**Figure 1**). 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. Supervisors are usually salaried facility-based health workers, who themselves receive training.

Figure 1: Illustration of schedule for an annual round of SMC delivery in areas with four cycles



Each monthly course of SPAQ comprises one single dispersible tablet of SP and three daily dispersible tablets of AQ. There are two dosing schedules of SPAQ: a lower dose for children three to <12 months, and a higher dose for children 12–59 months. On the first day, a dose of SP and the first dose of AQ ('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 directly observed therapy (DOT). Children who vomit or spit out most of the medicine within 30 minutes should be given one replacement dose of SP and AQ by distributors. Community distributors leave a blister pack with the two remaining tablets with caregivers and provide instructions on how to administer the remaining two doses of AQ once per day (every 24 hours) over the following two days ('day 2 AQ' and 'day 3 AQ'). 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. Community distributors also provide information to caregiver on how to record the administered doses on the SMC child record card.

Community distributors are given training on methods to determine a child's age to ensure that only age-eligible children receive SMC medicines during monthly campaigns. However, administration of SPAQ to children outside the eligible age range is reported to be common. Accurate age determination is often challenging, as caregivers do not always know their children's ages; civil registration and identification systems are often underdeveloped; and malnutrition and stunting are prevalent in areas with high malaria attack rate. 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.^[4] For children older than 59 months (5 years), the age-based 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.^[6] Moreover, use of doses by children outside the targeted age range poses challenges for accurate quantification of SPAQ needs for campaigns and procurement.

In addition to determining children's age-eligibility, community distributors receive training on how to assess children for known contra-indications to SPAQ. According to WHO guidance, SPAQ should not be administered to children with an acute febrile illness who: 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 sulfonamide-containing medicine during the past four weeks; or have a known allergy to either SP or AQ, or a known allergy to sulfonamide-containing medicines such as co-trimoxazole. SMC with SPAQ should not be administered to children outside the eligible age range of 3–59 months.^[3] 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, children should be given SP and the first dose of AQ by the health facility worker, giving the remaining two doses of AQ to the caregiver for administration over the following two days. If the test result is positive, they should be treated for malaria as per national treatment guidelines.

1.1. Malaria Consortium's SMC program in 2022

Since 2013, Malaria Consortium has been involved in implementation of SMC, with a major scale-up from 2015 through the Unitaid-funded Achieving Catalytic Expansion of Seasonal Malaria Chemoprevention in the Sahel (ACCESS-SMC) project. Based on micro-planning estimates, a total of 14,897,968 age-eligible children were targeted by SMC programs supported by Malaria Consortium in 2022 in Burkina Faso, Chad, Mozambique¹, Nigeria, South Sudan, Togo, and Uganda. These were funded or co-funded using philanthropic donations. For a detailed account of how Malaria

¹ Note that the 2022 SMC philanthropy report provides 2022 target population figures for Mozambique for the high transmission season that started in 2022, i.e., the 2022/23 season. In contrast, this report includes target population figures for Mozambique for the high transmission season for which coverage figures are available, i.e., the 2021/22 season. The total 2022 target population figures for Malaria Consortium's philanthropic SMC programme reported here therefore differs from the one provided in the 2022 philanthropy report.

Consortium used philanthropic funding for SMC in 2022, refer to our 2022 SMC Philanthropy Report.^[7]

SMC was delivered in four monthly cycles in all areas receiving SMC in Chad, Mozambique, and Togo during 2022, while five cycles were delivered in all areas receiving SMC in South Sudan. Five cycles were delivered in some areas with longer high-transmission seasons in Burkina Faso and Nigeria. As in the previous round in 2021, a fifth cycle was delivered in Burkina Faso in the Cascades and Hauts Bassins regions (except the district of Dande); and in Pô district of the Centre-Sud region in Burkina Faso. In Nigeria, the states of Kogi, Nasarawa, and Plateau received five cycles, while the states of Borno, Kebbi, Oyo, Sokoto and the Federal Capital Territory Abuja received four cycles. In Bauchi state, nine LGAs received four cycles, while 11 LGAs received five. In Uganda, five cycles were delivered in the districts of Amudat, Kotido, Moroto, Nabilatuk and Nakapiripirit. In three districts (Abim, Karenga and Napak), four cycles were delivered due to delays in finalizing funding arrangements. In practice, in countries where the number of cycles varies between states or districts, all areas implementing five cycles start the SMC round earlier than areas implementing four cycles. Therefore, for the purposes of this report, this additional cycle is referred to as ‘cycle 1,’ while the first cycle of the SMC round in areas implementing four cycles is referred to as ‘cycle 2’. Consequently, the final cycle in all areas is referred to as ‘cycle 5’.

Countries and sub-national regions/states covered by Malaria Consortium’s philanthropically funded SMC program in 2022, dates of SMC rounds, and estimated target populations are shown in **Table 1**.

Table 1: Malaria Consortium’s SMC program in 2022 by number of children targeted for SMC delivery and funder

Country	Dates of SMC round	Areas covered and funder	Number of children targeted (mean per cycle)
Burkina Faso	June–October 2022	29 health districts in seven regions: Cascades, ^{PF} Centre, ^{PF} Centre Nord, ^{UNICEF/PF} Centre Sud, ^{PF} Hauts Bassins, ^{PF} Nord, ^{PF} and Plateau Central ^{PF}	2,107,982 (cycles 2–5), of which 106,295 were jointly supported by UNICEF
Chad	July–October 2022	27 health districts in six regions: Barh el Gazel, ^{PF} Batha, ^{PF} Chari Baguirmi, ^{PF}	1,200,706

		Hadjer Lamis, ^{PF} Mayo Kebbi Est, ^{PF} and N'Djamena ^{PF}	
Mozambique	January 2022– April 2022	Four districts (Lalaua, Malema, Mecubúri and Muecate) in one region: Nampula ^{PF}	114,276
Nigeria	June–October 2022	154 local government areas (LGAs) in nine states: Bauchi, ^{KOICA/PF} Borno, ^{PF} FCT, ^{PF} Kebbi, ^{PF} Kogi, ^{PF} Nasarawa, ^{PF} Oyo, ^{PF} Plateau, ^{PF} and Sokoto ^{PF}	10,719,882 (cycles 2–5), of which around 282,938 were co-funded by KOICA in two LGAs
South Sudan	July–November 2022	One county (Aweil South) in one region: Northern Bahr El Ghazal ^{PF}	18,514
Togo	July–October 2022	19 health districts in three SMC-eligible regions: Savanes, ^{UNICEF/PF} Kara, ^{GF/PF} Centrale ^{GF/PF}	501,696
Uganda	May–September 2022	Eight districts (Abim, ^{GF/PF} Amudat, ^{PF} Karenga, ^{GF/PF} Kotido, ^{PF} Moroto, ^{PF} Nabilatuk, ^{PF} Nakapiripirit, ^{GF/PF} and Napak ^{GF/PF}) in one region: Karamoja	234,912 (cycles 2-5), of which around 86,143 were jointly supported by GF in four districts
		Programme (total)	14,897,968

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

The total number of 14,897,968 children targeted for SMC delivery in 2022 represents an increase of 22.2 percent from the 12,191,005 children targeted in 2020/21.^[8] This increase was driven by the scale up of SMC delivery in Mozambique (from two districts in 2020/2021 to four districts in 2022), Nigeria (from 129 LGAs in 2021 to 154 in 2022), Uganda (from two districts in 2021 to eight districts in 2022), and South Sudan where SMC was introduced in 2022 through an implementation research study in Aweil South County in the country's Northern Bahr El Ghazal region.

Of the total number children targeted per cycle for SMC delivery with support from philanthropic funding in 2022, 106,295 children were targeted in two districts in the Centre Nord region of Burkina Faso with co-funding from the United Nations International Children’s Emergency Fund (UNICEF). A population of 282,938 children targeted with support from the Korea International Cooperation Agency (KOICA) in two LGAs in the state of Bauchi in Nigeria in 2022. A population of 308,075 children in Centrale and Kara regions of Togo were targeted for SMC delivery with co-funding from the Global Fund, while the rest were co-funded with support from UNICEF. In Uganda, a population of 86,143 children were targeted with support from the Global Fund in four districts in the region of Karamoja.

1.1.1 SMC and COVID-19

To adapt SMC implementation to minimize potential for transmission of COVID-19, Malaria Consortium developed operational guidance in 2020.^[9] The program continued to adhere to this guidance during SMC delivery in 2022.

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 2022, including administrative data, stock reconciliation data, end-of-cycle (EoC) surveys, and end-of-round (EoR) surveys. Its objectives are to:

- Outline methods employed by Malaria Consortium for monitoring coverage of its philanthropically funded SMC program and quality of SMC delivery in 2022.
- Provide a summary of program coverage and degree of adherence to the program’s protocols in the period under review.
- Provide recommendations on potential adaptations to approaches for SMC coverage surveys and monitoring and evaluation activities for the 2023 campaign.

Coverage results are presented from all areas where Malaria Consortium implemented SMC in 2022 with full or partial philanthropic funding.

2. Methods

To realize the maximum protective effect of SMC, 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.

Program 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 therefore refers to the proportion of children who were reached by the SMC campaign in each monthly cycle during the transmission season. Coverage can be measured using program data and representative surveys specifically designed for this purpose.

SMC coverage can be defined in different ways. Given that receiving the first dose of SP and AQ alone is insufficient to provide full protection for the full duration of the high transmission season, it is therefore necessary that SMC coverage indicators consider adherence to all relevant components of SPAQ administration, including proportions of households visited by distributors, administration of day 2 and day 3 AQ by caregivers, 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 (including both potentially legitimate sources of SPAQ, such as distribution at health facilities and distribution at makeshift fixed distribution points, and illegitimate sources of SPAQ, such as through private purchase). All the above indicators were measured using data from multiple sources during 2022, including administrative program data, stock reconciliation data, and data from household coverage surveys.

2.1. Administrative and stock reconciliation data

Administrative coverage was estimated using two methods, as described below. Preference was given for the tally sheet method when relevant data were available from tally sheets completed by SMC community distributors and compiled by supervisors and facility in-charged. The stock reconciliation method was employed where data from SMC tally sheets were not available. In Burkina Faso, Nigeria, Togo, South Sudan and Uganda, the tally sheet method was employed, while the stock reconciliation method was used in Chad and Mozambique (where the tally sheet data were unavailable in 2022).

SMC tally sheets

Administrative coverage data were obtained through routine monitoring forms, referred to as SMC tally sheets, which are used by community distributors to record numbers of SPAQ doses administered each day, the number of children re-dosed with SPAQ due to vomiting, and the number of blister packets wasted due to spills or contamination. Supervisors and facility in-charges then compiled information daily from all the collected SMC tally sheets onto daily summary forms, and then for all the daily summary forms onto SMC EoC reports. Information was then aggregated by dedicated monitoring and evaluation 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. 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 by 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 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. Administrative coverage was expressed as a percentage of the estimated target population, both overall and disaggregated by age group (i.e., 3–<12 months and 12–59 months).

There were notable improvements made to the SMC tally sheet and administrative coverage estimation processes, including the digitalization of the process in Nigeria with observable improvements in process efficiency, data accuracy and timeliness of reporting.

Stock reconciliation data

Where data from SMC tally sheets were not available, administrative coverage data were obtained through the stock reconciliation method. Numbers of SPAQ blister packs used over all four or five monthly cycles (depending on the number of cycles) by country were calculated using stock reconciliation data, by subtracting SPAQ blisters returned and doses wasted or lost from doses 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

While SMC coverage can also be calculated using home-based SMC child record cards, which are given to caregivers by community distributors the first time they administer SPAQ to a child each season, the retention of these cards by caregivers remains low across most areas. Moreover, information recorded by caregivers on day 2 and day 3 AQ doses administered to children at home after distributor visits may be inconsistent. As in the previous reporting periods, SMC child record cards were not employed to measure program coverage for the purposes of this report.

2.2. Household surveys

Household surveys took the form of EoC surveys following cycles 1–4 (depending on the number of cycles delivered) and commissioned independent EoR surveys after the final cycle (following cycle 4 or 5, depending on number delivered in a given area). All surveys were administered using data forms in SurveyCTO (version 2.80), an electronic data collection platform for smartphones, and data were uploaded to a remote server after each day of data collection. Generic questionnaires for both types of survey were initially developed in English for Nigeria; adapted for use in Uganda and South Sudan; translated into French for use in Burkina Faso, Chad, and Togo; and into Portuguese in the case of Mozambique.

Survey questionnaires were based on those used in 2021 in all cases. Questionnaires were, however, adapted by Malaria Consortium staff in each country 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. In some cases, survey questionnaires were also adapted to capture additional variables to answer specific research questions or obtain additional contextual information on SMC campaigns. Informed consent was received 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.

End of cycle surveys

EoC surveys are routinely conducted after all but the last 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 to suggest changes or improvements to SMC delivery.

In Burkina Faso and Nigeria, EoC surveys were carried out following all but final monthly SMC cycles during 2022 (i.e., three EoC surveys following cycles 2, 3, and 4 in areas with four cycles and cycles 1, 2, 3, and 4 in areas with five cycles). Similarly, EoC surveys were conducted after all but the final

cycles in all districts in Togo. EoC Surveys followed cycles 1 and 2 in Chad; and cycles 2 and 3 in Mozambique. In Uganda, EoC surveys were conducted after cycle 1 in five districts (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk) districts, after cycle 2 in two districts (Amudat and Nakapiripirit) and after cycle 3 in three districts (Moroto, Kotido and Nabilatuk). In South Sudan, EoC surveys were conducted following cycles 2 and 4.

EoC surveys were conducted by Malaria Consortium staff in all countries, with the exception of Mozambique. Data collectors were employed directly by Malaria Consortium as independent contractors. They were typically selected through an open process based on certain criteria such as data collection competences and being able to speak the local language. Individuals involved in SMC delivery, including community distributors and district-level supervisors were considered ineligible to work as data collectors. In Mozambique, EoC surveys carried out by the research institution Centro de Investigação em Saúde de Manhiça (CISM).

The SMC program continued to adhere to Malaria Consortium's COVID-19 infection prevention and control (IPC) guidance during SMC delivery in 2022.^[9] Based on this guidance, SMC implementation was adapted to minimize potential for transmission of COVID-19. These adaptations included 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).

2.2.1. Rationale and design

EoC surveys employed the lot quality assurance sampling (LQAS) method, which has been recommended by the malaria community for monitoring health interventions as it provides a simple, rapid method to assess performance at the sub-project level.^[10] LQAS is an efficient sampling method that enables rapid monitoring of a program against pre-determined targets, while facilitating timely generation of local evidence to aid decision-making for program improvement. In the context of public health programs such as SMC, LQAS subdivides program implementation areas into smaller functional areas (such as health facility catchment areas) referred to as 'supervision areas' (SAs).^[11] 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]

Malaria Consortium's SMC M&E framework defines decision criteria and targets for 16 indicators (**Table 2**). The framework was developed based on a consultative process involving Malaria Consortium staff at global and country offices.^[12] Decision criteria are defined as proportions of units (i.e. compounds) per SA below which action is considered necessary to improve program delivery. Targets, on the other hand, are defined as proportions 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.^[13] 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 a lot size of 25, which were required to have met a standard for each SA. Hence, if the number of compounds meeting a standard fell below the decision rule for an indicator in a given SA, this indicated that actions were necessary to improve program performance related to that indicator in that particular SA before the next SMC cycle. For example, given a decision rule of 22; if fewer than 22 out of 25 caregivers in an SA reported administering day 2 and day 3 AQ to their eligible children, this issue was flagged and reported for further actions to be considered to increase adherence to the full three-day course of SMC. Such remedial actions could include improved distributor training or community sensitization on the importance of day 2 and day 3 AQ doses before the next SMC cycle.

Through the aggregation of results across multiple SAs, LQAS can also provide a representative summary of coverage at higher administrative levels, such as state or national level. As such, the 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 presents the EoC results aggregated across SAs to give country-level (or state-level, in the case of Nigeria) summaries of key SMC indicators.

Since 2019, modifications have been made to the LQAS methodology and survey implementation to improve the EoC surveys. In addition to the adaptations made in the previous years for surveys to assess multiple indicators and facilitate hypothesis tests based on realistic targets and decision criteria, efforts were made to harmonize the conduct surveys across countries in 2022, including the consistent sampling of households using of a lot size of 25. Moreover, efforts were made to conduct

EoC surveys in a timelier manner during 2022. In all cases, EoC surveys were completed within two weeks of the preceding cycle. This provided a two-week window before the next cycle to process and analyse data, identify program improvement needs, 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. Moreover, the timely implementation of EoC surveys also helped to minimize the risk of recall bias in the estimation of program coverage.

2.2.2. Aims, objectives, and indicators

As in previous years, EoC surveys had two aims, the first of which was to determine whether SAs had met each of the 16 indicator targets (see **Table 2**).

The second aim was to provide summaries of key indicators at above-SA levels, including country and state levels. To meet this aim, EoC surveys were intended to achieve the following specific objectives:

- To assess program coverage in terms of compounds/households visited
- To assess coverage of eligible children in terms of day 1 SPAQ administered, and full three-day course of SPAQ received during cycle 4
- To assess adherence to the SMC protocol, including adaptations in response to COVID-19
- To provide timely insights on implementation issues requiring adaptations in subsequent cycles
- To assess coverage of ineligible children 60–119 months.

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

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

Table 2: List of key indicators assessed by EoC surveys, by unit of analysis, denominator, and LQAS specifications: decision criteria, targets, errors, lot size and decision rules

Indicator with targets	Unit of analysis	Denominator	Decision criterion	Target	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 (inc. day 2 and day 3 AQ)	Child	Eligible children provided SPAQ (day 1)	75%	95%	0.0341	0.0962	25	22
SPAQ administration observed by a community distributor (day 1)	Child	Eligible children provided SPAQ (day 1)	75%	95%	0.0341	0.0962	25	22
SMC child record card retention	Child	Eligible children provided SPAQ (day 1)	80%	100%	<0.0001	0.0982	25	23
All SPAQ doses received marked on card	Child	Eligible children provided 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 two and day three)	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 SPAQ 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
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2.2.3. Sampling methods

Health facility catchment areas were defined as SAs for sampling purposes using LQAS methods in the EoC surveys in all areas, except for Borno state in Nigeria, where wards were used instead. A major improvement to the EoC survey during 2022 was the consistent sampling of children using a lot size of 25 compounds within each SA. In each health facility catchment area, 25 compounds (with at least one child aged 3–59 months) were randomly selected, preferably from a household list, where available. As usual, household lists were updated at the start of the SMC season, or just before the survey, to reflect changes in the populations of target communities. Where it was not possible to use a household list, the traditional ‘spin the pen’ method was used.

In each selected 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 were 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 such older children are present in the household, to allow for estimation of summary statistics for the proportion of overage non-eligible children who received day 1 SPAQ in each country and Nigerian state.

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 English, French, or Portuguese questionnaire to caregivers and assigning responses to predefined answer categories in the SurveyCTO form.

Burkina Faso (cycles 1, 2, 3, and 4)

In 2022, 80 SAs were randomly sampled with probability proportional to population size from the total number of SAs (represented by health facility catchment areas) where SMC was delivered. This random selection of SAs was done with probability proportional to size for every EoC survey. Three settlements were randomly selected from the catchment area of each of these health facility catchment areas (SA), and eight or nine compounds were sampled from each settlement to give a total of 25 compounds sampled per SA. In each SA selected, 25 households were sampled, giving a total sample size of 2,000 households in each EoC survey (**Table 3**). In each selected compound, after

obtaining consent from residents for participation in the survey, one child 3–59 months was selected at random from the roster of all children aged 3-119 months in that compound.

In cycle 1, SAs were selected only from among the 296 health facility catchment areas in 11 districts where five cycles of SMC were delivered. In subsequent cycles, SAs were randomly selected from a list of 859 health facility catchment areas in the 27 districts supported directly by Malaria Consortium. For this reason, coverage estimates from the cycle 1 EoC survey were not comparable with those from other cycles. Due to insecurity making some districts inaccessible during survey periods, such districts were excluded from the EoC sampling frames, as was the case for the districts of Barsalogo, Kongoussi and Mangodara. Where districts were partially accessible due to insecurity or other reasons, accessible SAs within such districts were sampled in surveys.

Table 3: Sampling frame for 2022 end-of-cycle surveys, Burkina Faso (cycle 4 example)

Region	Health district	Number of health facilities	Number of supervision areas	Target number of compounds surveyed
Cascades	Banfora	47	6	150
	Sindou	32	5	125
Centre	Sig-Nonghin	30	3	75
	Bogodogo	39	2	50
	Boumiougou	47	3	75
	Baskuy	16	2	50
Centre Nord	Kongoussi	50	6	150
	Boussouma	33	2	50
Centre Sud	Kombissiri	39	3	75
	Sapone	26	6	150
	Po	32	1	25
	Manga	47	3	75
Hauts-Bassins	Orodara	41	6	150
	Ndorola	22	2	50
	Dande	36	4	100
	Dafra	18	3	75
	Do	32	1	25
	Hounde	41	4	100

	Lena	16	1	25
Plateau Central	Zorgho	68	9	225
	Ziniare	71	4	100
	Bousse	34	4	100
Burkina Faso (Total)	n= 22	817	80	2,000

Chad (cycles 1 and 2)

EoC surveys were carried out after cycles 1 and 2 in Chad in 2022. No EoC survey was conducted following cycle 3 due to staffing issues and limited M&E capacity among Malaria Consortium’s country team at the time. All health districts across the six 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 centres. Each health district was classified as either urban or rural and sampling was carried out independently within those two strata. 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 facility catchment areas in which SMC was delivered during 2022 and resulted in a target sample size of 3,800 compounds across 436 health facility catchments. One child 3–59 months was selected at random from the roster of all children aged 3-119 months in each selected compound and survey questionnaire was administered to the primary caregiver of the selected child.

Table 4: Sampling frame for 2022 end-of-cycle surveys, Chad

State/Region	LGA/Health district	Number of health facilities	Number of supervision areas	Target number of compounds surveyed
Chari Baguirmi	Ba- Illi	11	4	100
	Bosso	11	4	100
	Doorbali	17	6	150
	Mandela	21	7	175
	Masenya	17	6	150
	Kouno	4	1	25
Hadjer Lamis	Bokoro	26	9	225

	Gama	9	3	75
	Karal	13	4	100
	Mani	14	5	125
	Massaguet	21	7	175
	Massakory	18	6	150
Mayo Kebbi Est	Bongor	25	8	200
	Guelendeng	10	3	75
	Moulkou	8	3	75
	Game	11	4	100
	Katoa	4	1	25
N'Djamena	N'Djamena Centre	17	6	150
	N'Djamena Est	21	7	175
	N'Djamena Nord	17	6	150
	N'Djamena Sud	29	10	250
	Toukra	17	6	150
Barh El Ghazal	Chaddra	18	6	150
	Michemire	13	4	100
	Moussoro	31	10	250
	Salal	14	5	125
Batha	Yao	18	6	150
Chad (total)	n=27	435	145	3625

Mozambique (cycles 1 and 3)

EoC surveys were conducted after cycles 1 and 3 in Mozambique during 2022. It was not feasible to conduct EoC surveys following cycle 2 due to insufficient internal capacity resulting from the additional workload of Phase 2 implementation study activities during 2022. The surveys sampled from all 38 SAs across the four districts (13 in Mecubúri, 11 in Malema, 7 in Lalaua and 7 in Muecate) in which SMC was delivered during 2022. The four districts contained 38 SAs represented by health facility catchment areas. Within each SA, three communities were selected at random and eight or nine households were surveyed in each, giving a total sample of 25 households per SA (**Table 5**). Within each selected household, one child 3–59 months was selected at random from the roster of all children aged 3-119 months in that household.

Table 5: Sampling frame for 2022 end-of-cycle surveys, Mozambique (cycle 1 example)

Region	Health district	Number of supervision areas	Target number of compounds surveyed
Nampula	Mecuburi	13	325
	Malema	11	275
	Muecate	7	175
	Lalaua	7	175
Mozambique (Total)	n= 4	38	950

Nigeria (cycles 1, 2, 3, and 4)

EoC surveys were conducted in all but the final cycles in Nigeria during 2022. 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 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 (**Table 6**). It could also be considered a representative sample that was approximately self-weighted, on the assumption that health facility catchment areas were of similar population size.

Table 6: Sampling frame for 2022 end-of-cycle surveys, Nigeria (cycle 1 example)

Region	Number of health facility catchment areas/wards sampled	Number of households surveyed per cycle
Bauchi	310	7,750
Borno	207	5,175
FCT	54	1,350
Kebbi	226	5,650
Kogi	200	5,000
Nasarawa	139	3,475
Oyo	51	1,275
Plateau	250	6,250
Sokoto	238	5,950
Total	1,675	41,875

Togo (cycles 1, 2, and 3)

The sampling strategy employed was the same as in 2021, though differed in scale. Unlike in 2021 when EoC surveys were implemented only in the Mò district in the Centrale region, surveys were conducted in all three regions where SMC was delivered in Togo during 2022. Survey SAs were represented by health facility catchment areas. The sampling frame included 64 health facility catchment areas (including 192 localities) in 18 districts in cycle 1 (**Table 7**); 64 health facility catchment areas (including 189 localities) in 18 districts in cycle 2; and 68 health facility catchment areas (181 localities) in all 19 districts in Cycle 3. Due to the security situation in Kpendjal district, it was not sampled in Cycles 1 and 2. Three villages were randomly selected from each health facility catchment area, and eight or nine compounds were sampled from each to give a total of 25 compounds sampled per catchment area.

Table 7: Sampling frame for 2022 end-of-cycle surveys, Togo (cycle 1 example)

Region	Health district	Number of health facilities	Number of supervision areas	Target number of compounds surveyed
Savanes	Tône	5	15	132
	Kpendjal	0	0	0
	Cinkasse	3	9	78
	Kpendjal-Ouest	2	6	51
	Oti	1	3	27
	Oti-Sud	3	9	79
	Tandjoare	4	12	103
Kara	Kozah	6	18	155
	Binah	2	6	50
	Assoli	1	3	24
	Bassar	4	12	107
	Dankpen	5	15	132
	Doufelgou	1	3	27
	Keran	4	12	103
Centrale	Tchamba	7	21	177
	Tchaoudjo	9	26	233
	Mô	1	3	24
	Blitta	3	9	77
	Sotouboua	3	9	79
Togo (total)	n= 18	64	191	1,658

Uganda (cycles 1, 2 and 3)

Due to delays in finalizing co-funding arrangements, EoC surveys were not conducted in three districts (Abim, Karenga and Napak) where SMC was introduced during 2022 primarily with support from the Global Fund. In the remaining five districts, which were exclusively or primarily supported with philanthropic funding (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk). EoC surveys were conducted in all five districts after cycle 1, in two districts (Amudat and Nakapiripirit) after cycle 2 and in three districts (Kotido, Moroto and Nabilatuk) after cycle 3. The reasons for missing EoC

surveys or districts were mainly operational, due to the added workload of conducting Phase 2 SMC implementation research studies coinciding with routine SMC delivery. As in 2021, SAs were defined at the level of wards. Three villages were randomly selected from each ward, and eight or nine compounds sampled from each to give a total of 25 compounds sampled per SA. This gave a total target sample size across the three districts of 800 households.

2.3. End-of-round surveys

EoR surveys were conducted following the last cycle in all countries where Malaria Consortium supported SMC implementation during 2022, with the exception of South Sudan where SMC was introduced in the Northern Bahr El Ghazal region in 2022 as part of an implementation research to assess the acceptability, feasibility, and effectiveness of SMC in new geographies.

End-of-round coverage surveys were conducted independently by local research firms selected by Malaria Consortium through a competitive bidding process. The research firms are as follows:

- Burkina Faso: ISSP (Graduate Institute of Population Science)
- Chad: Cabinet CREIDS
- Nigeria: Stradel CSH
- Mozambique: CISM (Centro de Investigação da Manhiça)
- Togo: La Maison de l'Entrepreneur LMDE
- Uganda: Afrotech Management Consult

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 risk of COVID-19 transmission in the same manner as EoC surveys based on the IPC adaptations for SMC delivery.^[9]

2.3.1. Aims, objectives, and indicators

As in previous years, the EoR surveys aimed to assess SPAQ coverage defined as the proportion of eligible children that received SPAQ during the four or five monthly cycles of the 2022 SMC campaign. The surveys were designed to meet the following objectives:

- To assess program coverage in terms of compounds/households visited
- To assess coverage of eligible children in terms of day 1 SPAQ administered, and full three-day course of SPAQ received during cycle 4
- To assess adherence to program protocols, in terms of the proportion of day 1 SPAQ dose administered by community distributors adhering to DOT
- To assess 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).

Other indicators relating to the full ingestion of dispersed SPAQ, general malaria prevention, and caregivers' knowledge of SMC were also assessed. 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.

In 2022, additional variables were included in the EoR surveys to facilitate further analyses to better understand how Malaria Consortium's SMC program works and to answer specific research questions or obtain additional contextual information on SMC campaigns.

These additional variables included:

- receipt of doses of AQ by ineligible older children 60–119 months
- receipt of indoor residual spray within the last 12 months
- receipt of doses of AQ by ineligible older children 60–119 months from sources other than SMC community distributors
- sources from which day 1 SPAQ is available other than from SMC community distributors
- receipt of SPAQ by nomadic populations (Chad)
- caregiver opinions on, and engagement with, SMC community distributors during household visits (Nigeria and Burkina Faso)
- household-level decision making (Burkina Faso, Togo and Uganda)

2.3.2. Sampling methods and survey implementation

EoR surveys employed multi-stage 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 country level (state level in Nigeria), 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 six EoR surveys, only one child was sampled for questions related to both 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 margin of error for most indicators across individual Nigerian states, and a maximum of three percent by country).

All EoR surveys were conducted in November to December 2022 in Burkina Faso, Chad, Nigeria, Togo, and Uganda. In Mozambique, EoR survey was implemented in April 2022 for the 2022 SMC round which started in January 2022. All districts/LGAs were represented in the EoR sampling frames. Where survey clusters within districts were inaccessible due to insecurity or other reasons, such as in Burkina Faso, they were resampled or replaced.

In all countries where EoR surveys were conducted during 2022, data collectors were generally selected through an open process managed by the external contractor and overseen by Malaria Consortium. Contractors conducted interviews with the data collectors and, during these interviews, in addition to ascertaining whether they met other key criteria such as being able to speak the local language, the contractor also verified whether the data collectors were involved in SMC delivery in

any capacity. Individuals involved in SMC delivery were considered ineligible to work as survey data collectors.

Summaries of EoR survey sampling and implementation are presented by country below:

Burkina Faso

The EoR survey sampled from the 27 districts supported directly by Malaria Consortium in 2022, distributed in six regions: Cascades, Centre, Centre-North, Centre-South, Hauts-Bassins and Plateau Central. To ensure that the sample was representative at the country level, 106 clusters (represented by health facility catchment areas) were selected with probability proportional to population size from a list of all health facility catchment areas in the 29 districts where SMC was delivered in 2022 (**Table 8**). To ensure representativeness in terms of the number of (four- and five-cycle districts) and residence (urban and rural), the cluster selection was stratified accordingly. Four strata were thus formed: health facilities in four-cycle health districts located in rural areas, health facilities in four-cycle health districts located in urban areas, health facilities in five-cycle health districts located in rural areas and health facilities in five-cycle health districts located in urban areas. For health facilities covering more than three villages/sectors, three villages/sectors were randomly selected with equal probability. Within each selected cluster, 20 households with at least one child aged 3-59 months were sampled.

Table 8: Sampling frame for 2022 end-of-round surveys, Burkina Faso

Region	Health District	Number of Health Facilities	Number of Supervisions Areas (Number of HF Sampled)	Target Number of Compounds Surveyed
Cascades	Banfora	46	4	115
	Sindou	32	3	91
Centre	Baskuy	15	2	50
	Bogodogo	39	11	264
	Boulmiougou	46	14	332
	Nongre-Massom	10	4	122
	Sig-Nonghin	30	6	145
Centre-Nord	Boussouma	32	2	50
	Kaya	48	2	49
	Kongoussi	50	2	50

Centre-Sud	Kombissiri	38	2	50
	Manga	47	3	67
	Po	32	2	55
	Sapone	26	1	29
Hauts-Bassins	Dafra	18	7	182
	Dande	36	5	119
	Do	32	13	301
	Hounde	41	2	49
	Karangasso-Vigue	9	1	26
	Lena	16	1	24
	N'dorolla	22	1	25
	Orodara	39	4	114
Plateau Central	Bousse	34	2	52
	Ziniare	71	5	132
	Zorgho	68	7	222
Burkina Faso (Total)	n= 25	877	106	2715

Chad

In Chad, each district was classified as either urban or rural and sampling was carried out independently within those two strata as in 2021. First, 145 health facility catchment areas were randomly selected from a total of 633 across the six regions where SMC implementation was supported by Malaria Consortium, 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. Villages or wards were resampled if they were determined to be inaccessible. The target sample size was 2,900 compounds with 3962 compounds sampled eventually (**Table 9**).

Table 9: Sampling frame for 2022 end-of-round surveys, Chad

State/Region	LGA/ Health district	Number of health facilities covered	Number of settlements sampled	Target number of compounds surveyed
Chari Baguirmi	Ba- Illi	4	18	92
	Bouso	4	18	92
	Dourbali	6	28	142
	Mandelia	7	35	175
	Massenya	6	28	142
	Kouno	1	7	33
Hadjer Lamis	Bokoro	9	43	217
	Gama	3	15	75
	Karal	4	22	108
	Mani	5	23	117
	Massaguet	7	35	175
	Massacre	6	30	150
Kebbi Mayo Est	Loud	8	42	208
	Guelendeng	3	17	83
	Moulkou	3	13	67
	Gam	4	18	92
	Guelendeng	1	7	33
N'Djamena	N'djamena Centre	6	28	198
	N'Djamena East	7	35	245
	N'Djamena North	6	28	198
	N'Djamena Sud	10	48	338
	Toukra	6	28	198
Barh El Ghazal	Chaddra	6	30	150
	Michemire	4	22	108
	Moussoro	10	52	258
	Salal	5	23	117
Batha	Yao	6	30	150
Chad (Total)	N=27	145	725	3962

Nigeria

As in 2021, EoR surveys were designed to be representative at the state level in 2022. Target sample sizes were specified in advance for each state, with 1,320 compounds from 66 clusters (20 compounds per cluster) considered appropriate for estimating coverage at state level to within an accuracy of five percent (**Table 10**). At the state level, single-stage sampling was used to select 66 villages in each state, with probability proportional to population size. At the second stage, 20 eligible households were selected from each selected cluster using a simple random sampling method. This was preceded by preparation of a household listing to generate a household sampling frame. Where applicable, a mapping update of the clusters was also conducted to ensure that new changes to the existing map were reflected since the last population census was held.

These sampling methods are explained in greater detail by the national protocol (based on the 2020 protocol) produced by Malaria Consortium in partnership with the Nigerian National Malaria Elimination Programme.^[14]

Table 10: Sampling frame for 2022 end-of-round surveys, Nigeria

Region	Number of clusters sampled	Target number of compounds surveyed
Bauchi	66	1,320
Borno	66	1,320
FCT	66	1,320
Kebbi	66	1,320
Kogi	66	1,320
Nasarawa	66	1,320
Oyo	66	1,320
Plateau	66	1,320
Sokoto	66	1,320
Nigeria (total)	594	11,880

Togo

The sampling strategy employed was the same as in 2021. A random sampling procedure was performed to select clusters from a sampling frame of all clusters within the three regions of the country where SMC was delivered in 2022 (Centrale, Kara, and Savanes). This was done using a random selection tool designed by Malaria Consortium, and data on localities and their populations (provided by the country's National Malaria Control Program) were entered into the tool, which selected 200 clusters for 2022 EoR survey with probability proportional to their population size (**Table 11**). A total of 10 compounds was randomly sampled in each selected cluster.

Table 11: Sampling frame for 2022 end-of-round surveys, Togo

Region	Health district	Number of clusters (localities) sampled	Target number of compounds surveyed
Savanes	Tône	27	334
	Kpendjal	2	20
	Cinkasse	7	70
	Kpendjal-Ouest	8	85
	Oti	8	104
	Oti-Sud	9	97
	Tandjoare	11	106
Kara	Kozah	20	203
	Binah	6	61
	Assoli	6	60
	Bassar	10	108
	Dankpen	10	100
	Doufelgou	9	92
	Keran	12	128
Centrale	Tchamba	13	133
	Tchaoudjo	17	168
	Mô	3	30
	Blitta	11	102
	Sotouboua	11	131
Togo (total)	n=19	200	2,132

Mozambique

In Mozambique, surveys were self-weighting within districts (with clusters selected with probability proportional to sample size). Communities in areas with SMC delivery during 2022 were selected at random using a single-stage procedure. In total, 90 clusters were selected from which 10 households were selected at random from each cluster, giving a total sample of 900 households.

Uganda

In Uganda, 120 clusters were selected with 15 households sampled at random and surveyed per cluster; this was intended to yield a total sample of 1,800 households and was considered sufficient to provide estimates of coverage for children 3–59 months, 60–119 months, and 3–119 months with margins of error of 5.0 percent, 5.4 percent, and 3.5 percent, respectively. **Table 12** shows the actual sampling frame that was employed for the EoR survey. In each household, one child aged between three and 119 months was selected at random, and all questions related to that child and their caregiver. The survey was representative of older ineligible children 60–119 months, as all children in this age group were eligible for inclusion in the survey, not just those residing in households with at least once child 3–59 months, as in EoR surveys in other countries during 2022.

Table 12: Sampling frame for 2022 end-of-round surveys, Uganda

Region	Health district	Number of sub-counties	Number of clusters	Target number of compounds surveyed
Karamoja	Amudat	10	18	239
	Nakapiripirit	5	16	243
	Napak	11	21	230
	Abim	7	18	241
	Karenga	8	18	234
	Moroto	6	15	230
	Kotido	8	16	230
	Nabilatuk	6	15	241
Uganda (total)	n= 8	61	137	1,888

2.4. Data analysis

During 2022, data from both EoC and EoR household surveys were collected using SurveyCTO software version 2.80. Once data collection was completed, data were exported, processed and analysed by Malaria Consortium staff using STATA version 16. Coverage and related indicators were calculated using the proportion command, with 95 percent confidence intervals (CIs) calculated using a logit transform. All indicators were expressed as percentages at the country level, in addition to the state level in the case of Nigeria.

Population size weights were applied using the 'svy: command' as appropriate (such as when clusters were not selected with probability proportional to population size and surveys could not be considered self-weighting) to ensure representativeness of the results for the areas surveyed. For cycle 5 EoR data from Nigeria, results for key indicators were shown at the state level and aggregated at the country level as an average of the nine states surveyed, weighted by their target population size.

3. Results

3.1. Administrative coverage and stock reconciliation data

Estimates of administrative coverage by cycle using data from SMC tally sheets, and mean coverage across all cycles delivered, disaggregated by age group based on data from SMC tally sheets are shown for Nigeria in **Table 13** and for Burkina Faso, South Sudan, Togo, and Uganda in **Table 14**. Results based on stock reconciliation data are presented in **Table 15** for Chad and Mozambique — where data from SMC tally sheets were unavailable or incomplete during 2022.

Based on combined estimates from both data sources a mean of 14,976,794 courses of SPAQ were distributed in per cycle across all seven SMC-implementing countries supported by Malaria Consortium in 2022. Based on the target population of 14,879,968 eligible children, the represents an administrative coverage estimate of 100.5 percent.

In Burkina Faso, a mean of 2,352,428 courses of SPAQ were distributed per cycle based on tally sheet data, representing an administrative coverage estimate of 111.6 percent of population of 2,107,982 age-eligible children targeted per cycle in 2022.

A total of 1,200,706 age-eligible children were targeted per cycle in Chad during 2022, while a mean of 1,293,389 courses of SPAQ were distributed per cycle based on stock reconciliation data. This represents an administrative coverage estimate of 107.7 percent.

In Mozambique, a mean of 120,601 courses of SPAQ were distributed per cycle based on stock reconciliation data, representing an administrative coverage estimate of 105.5 percent of population of 114,276 age-eligible children targeted per cycle in 2022.

Based on data from SMC tally sheets, the mean courses of SPAQ provided by community distributors across the nine Nigerian states was 10,464,668 per cycle, resulting in an administrative coverage estimate of average of 97.6 percent of the target population of 10,719,882 age-eligible children in 2022.

In South Sudan where SMC was delivered as part of an implementation research project in 2022, a mean of 17,377 courses of SPAQ were distributed based on tally sheet data, given an administrative coverage estimate of 93.9 percent of the population of 18,514 eligible children targeted in 2022.

In Togo, a mean of 515,778 courses of SPAQ were distributed based on tally sheet data, representing a mean administrative coverage estimate of 102.8 percent of the population of 501,696 age-eligible children targeted in 2022.

In Uganda, a mean of 212,553 courses of SPAQ were distributed based on tally sheet data, resulting in an administrative coverage estimate of 90.5 percent of the population of 234,912 eligible children targeted in 2022.

Table 13: Administrative coverage by Nigerian state, cycle and age group (tally sheet method) in 2022

Country and state	Age group*	Target population	Tally sheet method												
			cycle 1		cycle 2		cycle 3		cycle 4		cycle 5		Mean		
			Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage	
Bauchi	3–<12 months	366615	383444	104.6	388627	106.0	394662	107.7	393685	107.4	224946	106.5	357073	106.4	
	12–59 months	1568298	1591826	101.5	1615867	103.0	1642587	104.7	1627486	103.8	947280	104.8	1485009	103.6	
	3–59 months	1934913	1975270	102.1	2004494	103.6	2037249	105.3	2021171	104.5	1172226	105.1	1842082	103.9	
	Borno	3–<12 months	393928	399546	101.4	394549	100.2	393308	99.8	392705	99.7			395027	100.3
		12–59 months	1685135	1718989	102.0	1693528	100.5	1684216	99.9	1683748	99.9			1695120	100.6
		3–59 months	2079063	2118535	101.9	2088077	100.4	2077524	99.9	2076453	99.9			2090147	100.5
	FCT	3–<12 months	203677	141454	69.5	137125	67.3	125426	61.6	133093	65.3	132930	65.3	134006	65.8
		12–59 months	871284	520376	59.7	574926	66.0	537946	61.7	572344	65.7	570795	65.5	555277	63.7
		3–59 months	1074961	661830	61.6	712051	66.2	663372	61.7	705437	65.6	703725	65.5	689283	64.1
Kebbi	3–<12 months	247251	260335	105.3	261028	105.6	261147	105.6	261771	105.9			261070	105.6	
	12–59 months	1057685	1069087	101.1	1069272	101.1	1067773	101.0	1068575	101.0			1068677	101.1	
	3–59 months	1304936	1329422	101.9	1330300	101.9	1328920	101.8	1330346	101.9			1329747	101.9	
Kogi	3–<12 months	203084	211901	104.3	216462	106.6	218658	107.7	214960	105.8	222351	109.5	216866	106.8	
	12–59 months	868749	900120	103.6	910450	104.8	913724	105.2	899451	103.5	926028	106.6	909955	104.7	
	3–59 months	1071833	1112021	103.7	1126912	105.1	1132382	105.6	1114411	104.0	1148379	107.1	1126821	105.1	
	3–<12 months	154711	159968	103.4	162864	105.3	163926	106.0	164148	106.1	164886	106.6	163158	105.5	

Nigeria	Nasar awa	12–59 months	661821	667226	100.8	685356	103.6	693341	104.8	697620	105.4	700894	105.9	688887	104.1
		3–59 months	816532	827194	101.3	848220	103.9	857267	105.0	861768	105.5	865780	106.0	852046	104.3
	Oyo	3–<12 months	54125	55412	102.4	57856	106.9	58338	107.8	57357	106.0	56890	105.1	57171	105.6
		12–59 months	231533	230908	99.7	239299	103.4	239482	103.4	237098	102.4	235443	101.7	236446	102.1
		3–59 months	285657	286320	100.2	297155	104.0	297820	104.3	294455	103.1	292333	102.3	293617	102.8
	Plate au	3–<12 months	167979	176038	104.8	177426	105.6	178315	106.2	177500	105.7	177150	105.5	177286	105.5
		12–59 months	718576	739834	103.0	755060	105.1	759623	105.7	759949	105.8	760821	105.9	755057	105.1
		3–59 months	886554	915872	103.3	932486	105.2	937938	105.8	937449	105.7	937971	105.8	932343	105.2
	Sokot o	3–<12 months	239766	271790	113.4	273015	113.9	274134	114.3	274200	114.4			273285	114.0
		12–59 months	1025665	1032849	100.7	1034247	100.8	1036831	101.1	1037261	101.1			1035297	100.9
		3–59 months	1265431	1304639	103.1	1307262	103.3	1310965	103.6	1311461	103.6			1308582	103.4
	Total	3–<12 months	2031136	2059888	101.4	2068952	101.9	2067914	101.8	2069419	101.9	965519	97.0	2034942	100.2
		12–59 months	8688746	8471215	97.5	8578005	98.7	8575523	98.7	8583532	98.8	4097927	96.3	8429726	97.0
		3–59 months	10719882	10531103	98.2	10646957	99.3	10643437	99.3	10652951	99.4	5063446	96.4	10464668	97.6

*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 14: Administrative coverage by country, cycle and age group (tally sheet method)

Country		Age group*	Target population	Tally sheet method											
				cycle 1		cycle 2		cycle 3		cycle 4		cycle 5**		Mean***	
				Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage
Burkina Faso	Districts with five cycles	3-<12 months	121,748	99,807	82.0%										
		12-59 months	515,245	532,744	103.4%										
		3-59 months	636,993	632,551	99.3%										
	All districts	3-<12 months	400,305			364,570	91.1%	373,811	93.4%	383,321	95.8%	405,469	101.3%	381,793	95.4%
		12-59 months	1,707,677			1,902,241	111.4%	1,957,265	114.6%	1,985,654	116.3%	2,037,382	119.3%	1,970,636	115.4%
		3-59 months	2,107,982			2,266,811	107.5%	2,331,076	110.6%	2,368,975	112.4%	2,442,851	115.9%	2,352,428	111.6%
South Sudan	3-<12 months	3,086	5,311	172.1%	4,450	144.2%	4,463	144.6%	4,467	144.8%	4,267	138.28%	4,592	148.8%	
	12-59 months	15,428	12,370	80.2%	12,591	81.6%	12,544	81.3%	13,157	85.3%	13,265	85.98%	12,784	82.9%	
	3-59 months	18,514	17,681	95.5%	17,041	92.0%	17,007	91.9%	17,624	95.2%	17,532	94.70%	17,377	93.9%	
Togo	3-<12 months	77,848	69,447	89.2%	74,214	95.3%	75,985	97.6%	72,407	93.0%			73,013	93.8%	
	12-59 months	423,848	409,799	96.7%	445,194	105.0%	456,804	107.8%	459,264	108.4%			442,765	104.5%	
	3-59 months	501,696	479,246	95.5%	519,408	103.5%	532,789	106.2%	531,671	106%			515,778	102.8%	

Uganda	Districts that received 5 cycles	3-<12 months	38,721	42,412	109.5%											
		12-59 months	127,538	107,582	84.3%											
		3-59 months	166,259	149,994	90.2%											
	All districts	3-<12 months	58,320			55496	95.2%	54,280	93.1%	54,891	94.1%	54,246	93.0%	54,728	93.8%	
		12-59 months	176,592			154905	87.7%	159,820	90.5%	159,161	90.1%	157,413	89.1%	157,825	89.5%	
		3-59 months	234,912			210,401	89.6%	214,100	91.1%	214,052	91.3%	211,659	90.1%	212,553	90.5%	

*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 15: Administrative coverage by country, cycle and age group (stock reconciliation method)

Country	Age group	Target population	Stock reconciliation method											
			cycle 1		cycle 2		cycle 3		cycle 4		cycle 5		Mean	
			Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage
Chad*	3-<12 months	240,141	237,456	98.9%	324,247	135.0%	243,305	101.5%	245,150	102.1%			262,540	109.3%
	12-59 months	960,565	1,002,853	104.4%	1,026,861	106.9%	1,045,654	109.0%	1,048,031	109.1%			1,030,850	107.3%
	3-59 months	1,200,706	1,240,309	103.3%	1,351,108	112.5%	1,288,959	107.5%	1,293,181	107.7%			1,293,389	107.7%
Mozambique	3-<12 months	20,913	23,744	113.5%	25,539	122.1%	23,315	111.5%	23,558	112.6%			24,039	114.9%
	12-59 months	93,363	92,528	99.1%	100,264	107.4%	95,538	102.3%	97,918	104.9%			96,562	103.4%

	3-59 months	114,276	116,272	101.7%	125,803	110.1%	118,853	104.0%	121,476	106.3%			120,601	105.5%
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3.2. Coverage surveys

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

3.2.1. Households with eligible children visited by a community distributor

Tables 16 – 18 show proportions of households visited by a community distributor in each cycle for which a survey was conducted, with 95% CI and sample sizes.

Generally, high coverage in terms of the proportion of households visited by a community distributor was observed across all countries and cycles (**Tables 16-18**). The trend was in keeping with those observed in the previous round in 2021.

In Burkina Faso, the proportion of households visited by a community distributor in 2022 was 98.3 percent (95% CI: 97.8-98.7), 95.8 percent (95% CI: 94.8-96.6), 98.3 percent (95% CI: 97.7-98.8), 98.2 percent (95% CI: 97.5-98.7) and 96.8 percent (95% CI: 95.7-97.6) during cycles 1, 2, 3, 4 and 5, respectively.

In Chad, the proportion of households visited by a community distributor was 88.4 percent (95% CI: 87.4-89.4), 91.0 percent (95% CI: 90.1-92.0) and 95.9 percent (95% CI: 95.2-96.5) during cycles 1, 2 and 4, respectively.

In Mozambique, coverage in terms of the proportion of households that received a visit from a community distributor was 83.8 percent (95% CI: 81.5-86.1), 88.6 percent (95% CI: 86.5-90.8) and 88.0 percent (95% CI: 86.2-89.7) during cycles 1, 3 and 4, respectively across the four districts in 2022.

In Nigeria, the proportion of households visited by a community distributor was 93.6 percent (95% CI: 92.3-94.3), 95.9 percent (95% CI: 95.3-96.4), 95.1 percent (95% CI: 94.5-95.5), 93.9 percent (95% CI: 93.0-94.6) and 94.9 percent (95% CI: 93.3-96.1) during cycles 1, 2, 3, 4 and 5, respectively in 2022.

In South Sudan, the proportion of households that received a visit from a community distributor was 91.8 percent (95% CI: 84.6-95.8) and 93.8 percent (95% CI: 85.0-97.5) during cycles 2 and 4, respectively.

In Togo, estimates of coverage in terms of proportion of households that received a visit from a community distributor were 96.3 percent (95% CI: 94.3-97.6), 99.6 percent (95% CI: 99.4-99.7),

97.7 percent (95% CI: 96.2-98.6) and 97.7 percent (95% CI: 97.0-98.3) during cycles 1, 2, 3 and 4, respectively.

In Uganda, coverage in terms of the proportion of households visited by a community distributor was 92.8 percent (95% CI: 91.5-94.2), 94.9 percent (95% CI: 92.7-97.0), 89.3 percent (95% CI: 87.3-91.3) and 95.6 percent (95% CI: 94.2-97.0) during cycles 1, 2,3 and 5 respectively in 2022.

Table 16: Proportions of households with eligible children visited by a community distributor by country and survey

	Number of households sampled	Proportion of households covered	95% CI
Burkina Faso (11 districts)			
EoC: cycle 1	3,589	98.3	97.8-98.7
Burkina Faso (27 districts)			
EoC: cycle 2	1,850	95.8	94.8-96.6
EoC: cycle 3	1,920	98.3	97.7-98.8
EoC: cycle 4	2,000	98.2	97.5-98.7
Burkina Faso (27 districts)			
EoR: cycle 5	2,662	96.8	95.7-97.6
Chad			
EoC: cycle 1	3,660	88.4	87.4-89.4
EoC: cycle 2	3,641	91.0	90.1-92.0
EoR: cycle 4	3,561	95.9	95.2-96.5
Mozambique (Malema, Mecubúri, Muecate and Lalaua districts; Nampula region)			
EoC: cycle 1	950	83.8	81.5-86.1
EoC: cycle 3	950	88.6	86.5-90.8
EoR: cycle 4	1,331	88.0	86.2-89.7
Nigeria (all states; total, weighted proportion)			
EoC: cycle 1	41,885	93.6	92.3-94.3
EoC: cycle 2	41,520	95.9	95.3-96.4
EoC: cycle 3	42,972	95.1	94.5-95.5
Nigeria (areas with five cycles, FCT, Kogi, Nasarawa, Oyo and Plateau states and 10 LGA in Bauchi state; total, weighted proportion)			

EoC: cycle 4	22,409	93.9	93.0-94.6
Nigeria (all states; total, weighted proportion)			
EoR: cycle 4/5	11,880	94.9	93.3-96.1
South Sudan (Aweil South County, weighted proportion)			
EoC: cycle 2	436	91.8	84.6-95.8
EoC: cycle 4	457	93.8	85.0-97.5
Togo			
EoC: cycle 1	1,595	96.3	94.3-97.6
EoC: cycle 2	1,607	99.6	99.4-99.7
EoC: cycle 3	1,638	97.7	96.2-98.6
EoR: cycle 4	2,132	97.7	97.0-98.3
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk districts; Karamoja region)			
EoC: cycle 1	1,366	92.8	91.5-94.2
Uganda (Amudat and Nakapiripirit districts; Karamoja region)			
EoC: cycle 2	410	94.9	92.7-97.0
Uganda (Kotido, Moroto and Nabilatuk districts; Karamoja region)			
EoC: cycle 3	906	89.3	87.3-91.3
Uganda (Amudat, Moroto, Nakapiripirit, Kotido and Nabilatuk districts; Karamoja region)			
EoR: cycle 5	860	95.6	94.2-97.0

Table 17: Proportions of households with eligible children visited by a community distributor by Nigerian state and survey (states with five cycles)

Data source	Number of households sampled	Proportion of households covered	95% CI
Bauchi			
EoC: cycle 1	7,756	93.7	92.2-94.9
EoC: cycle 2	7,755	95.8	94.6-96.8
EoC: cycle 3	7,689	94.8	93.5-95.9
EoC: cycle 4	3,673	95.6	93.9-96.9
EoR: cycle 5	1,320	99.4	98.7-99.7
FCT			
EoC: cycle 1	1,350	92.5	86.9-95.8

EoC: cycle 2	1,466	87.3	80.0-92.3
EoC: cycle 3	1,449	85.6	79.3-90.3
EoC: cycle 4	1,436	87.4	81.2-91.8
EoR: cycle 5	1,320	83.7	77.3-88.6
Kogi			
EoC: cycle 1	5,002	93.9	92.2-95.3
EoC: cycle 2	5,412	96.9	96.0-97.6
EoC: cycle 3	5,567	94.9	93.3-96.1
EoC: cycle 4	5,450	92.8	91.2-94.1
EoR: cycle 5	1,320	91.3	79.9-96.6
Nasarawa			
EoC: cycle 1	3,487	92.9	90.7-94.5
EoC: cycle 2	3,468	94.2	91.9-95.9
EoC: cycle 3	3,473	95.4	93.5-96.7
EoC: cycle 4	3,483	95.1	93.0-96.6
EoR: cycle 5	1,320	97.5	94.5-98.9
Oyo			
EoC: cycle 1	1,277	94.1	88.7-96.9
EoC: cycle 2	1,393	94.2	89.7-96.9
EoC: cycle 3	1,318	97.8	95.7-98.9
EoC: cycle 4	1,441	90.7	87.2-93.3
EoR: cycle 5	1,320	96.3	94.6-97.5
Plateau			
EoC: cycle 1	6243	92.7	90.9-94.1
EoC: cycle 2	5,876	95.3	93.8-96.5
EoC: cycle 3	7,037	95.7	94.5-96.9
EoC: cycle 4	6,926	95.2	93.6-96.3
EoR: cycle 5	1,320	98.7	95.9-99.6

Table 18: Proportions of households with eligible children visited by a community distributor by Nigerian state and survey (states with four cycles)

Data source	Number of households sampled	Proportion of households covered	95% CI
Borno			
EoC: cycle 1	5,180	92.5	89.2-94.8
EoC: cycle 2	4,573	95.6	92.9-97.3
EoC: cycle 3	4,994	96.0	94.4-97.2
EoR: cycle 4	1,320	95.5	91.2-97.8
Kebbi			
EoC: cycle 1	5652	94.8	92.7-96.3
EoC: cycle 2	5,664	97.2	95.9-98.1
EoC: cycle 3	5,550	94.9	93.6-95.9
EoR: cycle 4	1,320	98.9	97.6-99.5
Sokoto			
EoC: cycle 1	5938	95.1	93.1-96.5
EoC: cycle 2	5,913	98.1	97.0-98.9
EoC: cycle 3	5,895	95.8	94.5-96.8
EoR: cycle 4	1,320	92.3	93.3-96.1

3.2.2. Day 1 SPAQ provided to eligible children aged three to 59 months

Results from EoC and EoR survey showed high coverage in terms of day 1 SPAQ provided by community distributors across cycles and countries (**Tables 19 - 21**). Coverage exceeded 90 percent in all cycles in all countries, with the exception of Mozambique (cycles 1 and 4). The trend in day 1 coverage remained generally stable across cycles in each country. The coverage estimates for the indicator are summarized as follows:

In Burkina Faso, the proportion of age-eligible children who received day 1 SPAQ during home visits across cycles in 2022 was 100 percent, 96.1 percent (95% CI: 95.3-96.7), 96.8 percent (95% CI: 96.1-97.3), 96.4 percent (95% CI: 95.7-96.9) and 95.4 percent (95% CI: 93.9-96.5) during cycles 1, 2, 3, 4 and 5, respectively. In Chad, day 1 SPAQ coverage was 95.3 percent (95% CI: 94.6-96.0), 95.4 percent (95% CI: 94.7-96.1) and 94.2 percent (95% CI: 93.4-95.0) in cycles 1, 2 and 4, respectively. In Mozambique, it was 89.9 percent (95% CI: 88.0-91.8), 92.2 percent (95% CI: 90.5-93.9) and 80.7 percent (95% CI: 78.5-82.8) during cycles 1, 3 and 4, respectively across the four districts in 2022.

Across the nine states in Nigeria, weighted average day 1 SPAQ coverage was 94.2 percent (95% CI: 93.5-94.8), 95.7 percent (95% CI: 95.2-96.2), 94.1 percent (95% CI: 93.5-94.6), 93.3 percent (95% CI: 92.5-94.0) and 93.9 percent (95% CI: 92.4-95.0) during cycles 1, 2, 3, 4 and 5, respectively in 2022. In South Sudan, it was 91.5 percent (95% CI: 83.8-95.8) and 93.8 percent (95% CI: 83.3-97.5) during cycles 2 and 4, respectively. In Togo, it was 99.5 percent (95% CI: 98.7-99.8), 99.7 percent (95% CI: 99.1-99.9), 99.9 percent (95% CI: 99.6-99.9) and 97.3 percent (95% CI: 96.5-97.9) during cycles 1, 2, 3 and 4, respectively in 2022. In Uganda, estimates of day 1 SPAQ coverage were 94.2 percent (95% CI: 93.0-95.5), 97.8 percent (95% CI: 96.4-99.2), 90.7 percent (95% CI: 88.8-92.6) and 94.0 percent (95% CI: 92.4-95.6) during cycles 1, 2, 3 and 5 respectively in 2022.

Table 19: Proportions of eligible children (3–59 months) who received day 1 SPAQ by country and survey in 2022

Data source	Number of children sampled	Proportion of children covered	95% CI
Burkina Faso (11 districts)			
EoC: cycle 1	3,589	100	-
Burkina Faso (27 districts)			
EoC: cycle 2	3,295	96.1	95.3-96.7
EoC: cycle 3	3,600	96.8	96.1-97.3
EoC: cycle 4	3,578	96.4	95.7-96.9
Burkina Faso (27 districts)			
EoR: cycle 5	2,662	95.4	93.9-96.5
Chad			
EoC: cycle 1	3,660	95.3	94.6-96.0
EoC: cycle 2	3,641	95.4	94.7-96.1
EoR: cycle 4	3,561	94.2	93.4-95.0

Mozambique (Malema, Mecubúri, Muecate and Lalaua districts; Nampula region)			
EoC: cycle 1	950	89.9	88.0-91.8
EoC: cycle 3	950	92.2	90.5-93.9
EoR: cycle 4	1,329	80.7	78.5-82.8
Nigeria (all states; total, weighted proportion)			
EoC: cycle 1	41,885	94.2	93.5-94.8
EoC: cycle 2	41,520	95.7	95.2-96.2
EoC: cycle 3	42,972	94.1	93.5-94.6
Nigeria (areas with five cycles, FCT, Kogi, Nasarawa, Oyo and Plateau states and 10 LGA in Bauchi state; total, weighted proportion)			
EoC: cycle 4	22,409	93.3	92.5-94.0
Nigeria (all states; total, weighted proportion)			
EoR: cycle 4/5	11,880	93.9	92.4-95.0
South Sudan			
EoC: cycle 2	399	91.5	83.8-95.8
EoC: cycle 4	430	93.8	83.3-97.5
Togo			
EoC: cycle 1	1,572	99.5	98.7-99.8
EoC: cycle 2	1,589	99.7	99.1-99.9
EoC: cycle 3	1,632	99.9	99.6-99.9
EoR: cycle 4	2,127	97.3	96.5-97.9
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk; Karamoja region)			
EoC: cycle 1	1,366	94.2	93.0-95.5
Uganda (Amudat and Nakapiripirit districts; Karamoja region)			
EoC: cycle 2	410	97.8	96.4-99.2
Uganda (Moroto, Kotido and Nabilatuk districts; Karamoja region)			
EoC: cycle 3	906	90.7	88.8-92.6
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk; Karamoja region)			
EoR: cycle 5	817	94.0	92.4-95.6

Table 20: Proportions of eligible who received day 1 SPAQ, by Nigerian state and survey (states with four cycles)

Data source	Number of households sampled	Proportion of children covered	95% CI
Bornu			
EoC: cycle 1	5,180	92.8	89.4-95.1
EoC: cycle 2	4,573	96.3	94.0-97.7
EoC: cycle 3	4,994	94.6	92.4-96.4
EoR: cycle 4	1,320	96.3	98.6-99.7
Kebbi			
EoC: cycle 1	5,652	95.9	94.7-96.9
EoC: cycle 2	5,664	96.8	95.4-97.7
EoC: cycle 3	5,550	93.4	91.8-94.7
EoR: cycle 4	1,320	98.0	96.5-99.0
Sokoto			
EoC: cycle 1	5,938	96.9	95.3-97.9
EoC: cycle 2	5,913	98.3	97.1-99.0
EoC: cycle 3	5,895	95.6	94.2-96.7
EoR: cycle 4	1,320	92.3	87.3-95.4

Table 21: Proportions of eligible who received day 1 SPAQ, by Nigerian state and survey (states with five cycles)

Data source	Number of households sampled	Proportion of children covered	95% CI
Bauchi			
EoC: cycle 1	7,756	94.7	93.5-95.6
EoC: cycle 2	7,755	95.5	94.6-96.3
EoC: cycle 3	7,689	93.1	91.6-94.4
EoC: cycle 4	3,673	94.3	92.3-95.7
EoR: cycle 5	1,320	99.3	98.5-99.7
FCT			
EoC: cycle 1	1,350	91.9	86.0-95.5
EoC: cycle 2	1,466	89.6	83.9-93.4
EoC: cycle 3	1,449	88.7	83.2-92.4
EoC: cycle 4	1,436	92.0	87.1-95.1
EoR: cycle 5	1,320	82.1	75.6-87.1
Kogi			
EoC: cycle 1	5002	94.8	93.6-95.7
EoC: cycle 2	5,412	96.3	95.3-97.1
EoC: cycle 3	5,567	93.6	92.4-94.6
EoC: cycle 4	5,450	91.6	90.0-93.0
EoR: cycle 5	1,320	90.6	81.3-95.5
Nasarawa			
EoC: cycle 1	3487	91.9	89.6-93.8
EoC: cycle 2	3,468	92.9	90.5-94.8
EoC: cycle 3	3,473	94.2	92.1-95.6
EoC: cycle 4	3,483	94.1	92.0-95.7

EoR: cycle 5	1,320	94.0	90.0-96.5
Oyo			
EoC: cycle 1	1,277	95.5	91.6-97.7
EoC: cycle 2	1,393	92.8	88.2-95.7
EoC: cycle 3	1,318	96.7	94.6-98.1
EoC: cycle 4	1,441	88.6	84.8-91.6
EoR: cycle 5	1,320	94.0	92.1-95.5
Plateau			
EoC: cycle 1	6,243	91.5	89.1-93.3
EoC: cycle 2	5,876	95.4	94.0-96.5
EoC: cycle 3	7,037	94.8	93.5-95.7
EoC: cycle 4	6,926	94.9	93.5-96.0
EoR: cycle 5	1,320	98.0	96.1-98.9

Table 22 shows day 1 SPAQ coverage of eligible children by cycle based on retrospective reporting by caregivers during EoR surveys following the last cycle of SMC delivery.

Results from EoR surveys (**Table 22**) can be assessed against those obtained from EoC surveys (**Table 19**). In all countries, results of EoR surveys show notably lower day 1 coverage estimates in earlier cycles compared to those reported in EoC surveys. For example, the coverage estimated for cycle 2 in Togo based on EoR survey was 89.3 percent (95% CI: 87.9-90.6); considerably lower than that estimated from the cycle 2 EoC survey (99.7 percent; 95% CI: 99.1-99.9). Given the retrospective nature of these EoR estimates and the potential for recall bias, their corresponding EoC estimates are likely to be more accurate.

Table 22: Proportions of eligible children (3–59 months) who received day 1 SPAQ by country, EoR survey

Number of cycles	Number of children sampled	Proportion of children covered	95% CI
Burkina Faso (districts with four cycles)			
EoR: cycle 2	1,549	80.3	75.4-84.4
EoR: cycle 3		93.0	89.6-95.3
EoR: cycle 4		96.1	94.3-97.4
EoR: cycle 5		98.7	97.9-99.2
Burkina Faso (districts with five cycles)			
EoR: cycle 1	940	77.2	72.2-81.5
EoR: cycle 2		83.0	76.1-88.2
EoR: cycle 3		91.4	88.4-93.7
EoR: cycle 4		92.1	84.5-96.1
EoR: cycle 5		92.4	88.7-95.0
Chad			
EoR: cycle 1	3,561	85.6	84.4-86.7
EoR: cycle 2		86.8	85.6-87.9
EoR: cycle 3		89.0	87.9-90.0
EoR: cycle 4		94.2	93.4-95.0
Nigeria (all states; total, weighted proportion)			
EoR: cycle 1	11,880	91.0	89.2-92.5
EoR: cycle 2		91.3	89.5-92.8
EoR: cycle 3		91.0	89.2-92.6
Nigeria (areas with four cycles; total, weighted proportion)			
EoR: cycle 4	4,620	96.1	94.5-97.3
Nigeria (areas with five cycles: FCT, Kogi, Nasarawa, Oyo and Plateau states and 10 LGA in Bauchi state; total, weighted proportion)			
EoR: cycle 5	7,260	92.4	90.8-93.8
Togo			
EoR: cycle 1	2,127	88.6	87.2-89.9
EoR: cycle 2		89.3	87.9-90.6
EoR: cycle 3		90.9	89.6-92.0

EoR: cycle 4		97.3	96.5-97.9
Mozambique (Malema, Mecubúri, Muecate and Lalaua districts; Nampula region)			
EoR: cycle 1	1,329	72.2	69.7-74.8
EoR: cycle 2		71.9	69.3-74.4
EoR: cycle 3		70.9	68.3-73.5
EoR: cycle 4		80.7	78.4-82.9
Uganda (Moroto, Kotido, Nabilatuk, Amudat and Nakapiripiriti districts; Karamoja region)			
EoR: cycle 1	817	82.6	80.0-85.2
EoR: cycle 2		83.4	80.8-85.9
EoR: cycle 3		82.9	80.3-85.4
EoR: cycle 4		79.2	76.4-82.0
EoR: cycle 5		94.0	92.4-95.6

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

Both EoC and EoR surveys found that very high proportions of children received AQ doses on both day two and day three from their caregivers (**Tables 23 - 25**). Overall, the trend remained fairly stable across cycles in each country, except in Mozambique and South Sudan where the proportions were higher in the later than earlier cycles.

In Burkina Faso, adherence to day 2 and day 3 AQ doses among children who received day 1 SPAQ was 98.0 percent (95% CI: 97.5-98.4), 98.4 percent (95% CI: 97.9-98.8), 98.1 percent (95% CI: 97.6-98.5), 98.1 percent (95% CI: 97.6-98.5) and 98.9 percent (95% CI: 97.3-99.5) during cycles 1, 2, 3, 4 and 5, respectively.

In Chad, of the children who received day 1 SPAQ, 95.9 percent (95% CI: 95.2-96.6), 95.9 percent (95% CI: 95.2-96.5) and 96.7 percent (95% CI: 96.1-97.3) received both day 2 and day 3 AQ in cycles 1, 2 and 4.

In Mozambique, coverage in terms of the proportion of children who received day 1 SPAQ, who also received both day 2 and day 3 AQ from caregivers was 90.8 percent (95% CI: 88.8-92.7), 93.4 percent (95% CI: 91.7-95.0) and 98.0 percent (95% CI: 97.2-98.9) during cycles 2, 3 and 4, respectively. These reflect a steady increase across cycles.

In Nigeria, average weighted coverage relating to the proportion of children who received day 1 SPAQ, who also received both day 2 and day 3 AQ from caregivers was 97.1 percent (95% CI: 96.9-97.4), 97.5 percent (95% CI: 97.3-97.8), 97.2 percent (95% CI: 96.9-97.5), 97.1 percent (95% CI: 96.7-97.4) and 97.8 percent (95% CI: 97.3-98.2) during cycles 1, 2, 3, 4 and 5, respectively.

In South Sudan, coverage in terms of the proportion of children who received day 1 SPAQ, who also received the subsequent doses on day 2 and day 3 was 88.2 percent (95% CI: 77.2-94.3) and 99.2 percent (95% CI: 97.3- 99.8) during cycles 2 and 4, respectively.

In Togo, coverage in terms receipt of the full three-day course of SPAQ was 82.8 percent (95% CI: 72.2-89.9), 96.2 percent (95% CI: 92.4- 98.1), 92.8 percent (95% CI: 83.6-97.0), 98.3 percent (95% CI: 97.6- 98.8) during cycles 1, 2, 3 and 4, respectively.

In Uganda, adherence to the full three-day course of SPAQ was observed in 98.8 percent (95% CI: 98.2-99.4), 93.3 percent (95% CI: 90.8-95.7), 98.2 percent (95% CI: 97.3-99.1) and 99.7 percent (95% CI: 99.4-100) of children during cycles 1, 2, 3 and 5, respectively.

Table 23: 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	Proportion of children received full course	95% CI
Burkina Faso (11 districts)			
EoC: cycle 1	3,589	98.0	97.5-98.4
Burkina Faso (27 districts)			
EoC: cycle 2	3,295	98.4	97.9-98.8
EoC: cycle 3	3,600	98.1	97.6-98.5
EoC: cycle 4	3,448	98.1	97.6-98.5
Burkina Faso (27 districts)			
EoR: cycle 5	2,117	98.9	97.3-99.5
Chad			
EoC: cycle 1	3,487	95.9	95.2-96.6
EoC: cycle 2	3,474	95.9	95.2-96.5
EoR: cycle 4	3,327	96.7	96.1-97.3
Mozambique (Malema, Mecubúri, Muecate and Lalaua districts; Nampula region)			

EoC: cycle 1	854	90.8	88.8-92.7
EoC: cycle 3	876	93.4	91.7-95.0
EoR: cycle 4	1,061	98.0	97.2-98.9
Nigeria (all states; total, weighted proportion)			
EoC: cycle 1	39,438	97.1	96.9-97.4
EoC: cycle 2	39,755	97.5	97.3-97.8
EoC: cycle 3	40,426	97.2	96.9-97.5
Nigeria (areas with five cycles, FCT, Kogi, Nasarawa, Oyo and Plateau states and 10 LGA in Bauchi state; total, weighted proportion)			
EoC: cycle 4	20,902	97.1	96.7-97.4
Nigeria (all states; total, weighted proportion)			
EoR: cycle 4/5	11,149	97.8	97.3-98.2
South Sudan (Aweil South County)			
EoC: cycle 2	399	88.2	77.2-94.3
EoC: cycle 4	430	99.2	97.3-99.8
Togo			
EoC: cycle 1	1,385	82.8	72.2-89.9
EoC: cycle 2	1,479	96.2	92.4-98.1
EoC: cycle 3	1,494	92.8	83.6-97.0
EoR: cycle 4	2,055	98.3	97.6-98.8
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk; Karamoja region)			
EoC: cycle 1	1,287	98.8	98.2-99.4
Uganda (Amudat and Nakapiripirit districts; Karamoja region)			
EoC: cycle 2	401	93.3	90.8-95.7
Uganda (Moroto, Kotido, Nabilatuk districts; Karamoja region)			
EoC: cycle 3	822	98.2	97.3-99.1
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk; Karamoja region)			
EoR: cycle 5	761	99.7	99.4-100

Table 24: 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 (states with four cycles)

Data source	Number of households sampled	Proportion of children received full course	95% CI
Bornu			
EoC: cycle 1	4,805	98.4	97.7-98.9
EoC: cycle 2	4,403	98.2	96.5-99.1
EoC: cycle 3	4,732	99.0	98.5-99.4
EoR: cycle 4	1,272	97.8	96.4-98.6
Kebbi			
EoC: cycle 1	5,421	97.1	96.3-97.8
EoC: cycle 2	5,480	97.7	96.9-97.4
EoC: cycle 3	5,185	95.6	94.7-96.4
EoR: cycle 4	1,294	95.9	93.2-97.5
Sokoto			
EoC: cycle 1	5,753	98.2	97.5-98.7
EoC: cycle 2	5,814	98.7	97.2-97.8
EoC: cycle 3	5,637	97.2	96.3-97.9
EoR: cycle 4	1,218	97.7	96.6-98.6

Table 25: 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 (states with five cycles)

Data source	Number of households sampled	Proportion of children received full course	95% CI
Bauchi			
EoC: cycle 1	7,341	97.8	97.3-98.2
EoC: cycle 2	7,409	97.5	96.9-97.9
EoC: cycle 3	7,162	97.4	96.8-97.9
EoC: cycle 4	3,463	97.3	96.5-98.0
EoR: cycle 5	1,311	99.3	98.2-99.7
FCT			
EoC: cycle 1	1,241	97.1	95.3-98.2
EoC: cycle 2	1,313	96.0	94.0-97.4
EoC: cycle 3	1,285	97.7	96.4-98.6
EoC: cycle 4	1,321	98.5	97.0-99.3
EoR: cycle 5	1,083	96.1	93.8-97.6
Kogi			
EoC: cycle 1	4,742	96.5	95.6-97.3
EoC: cycle 2	5,213	96.8	96.0-97.5
EoC: cycle 3	5,210	96.2	95.5-97.0
EoC: cycle 4	4,991	95.7	94.9-96.4
EoR cycle 5	1,196	97.7	96.3-98.6
Nasarawa			
EoC: cycle 1	3,205	96.0	95.0-96.8
EoC: cycle 2	3,223	96.4	95.5-97.3
EoC: cycle 3	3,272	97.3	96.4-98.1

EoC: cycle 4	3,279	97.1	96.2-97.8
EoR: cycle 5	1,241	97.7	96.3-98.5
Oyo			
EoC: cycle 1	1,220	95.9	93.8-97.3
EoC: cycle 2	1,293	96.0	94.4-97.1
EoC: cycle 3	1,275	97.8	96.0-98.8
EoC: cycle 4	1,277	95.5	92.8-97.2
EoR: cycle 5	1,241	98.4	97.3-98.9
Plateau			
EoC: cycle 1	5,710	95.9	95.1-96.6
EoC: cycle 2	5,607	97.8	97.2-98.3
EoC: cycle 3	6,668	97.5	97.0-98.0
EoC: cycle 4	6,571	97.9	97.4-98.3
EoR: cycle 5	1,293	99.0	97.8-99.5

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 (**Table 26**). Overall, the trend was generally stable across cycles in each country, except in Burkina Faso and Togo where DOT adherence proportions were substantially lower in the final cycle compared to the earlier cycles.

In Burkina Faso, the proportion of children whose day 1 SPAQ dose was directly observed by a community distributor was 95.7 percent (95% CI: 95.0-96.4), 92.7 percent (95% CI: 91.9-93.7), 92.8 percent (95% CI: 92.0-93.5), 94.6 percent (95% CI: 93.8-95.3) and 83.7 percent (95% CI: 79.3-87.3) during cycles 1, 2, 3, 4 and 5, respectively.

In Chad, administration of day 1 SPAQ dose was directly observed by a community distributor in 91.2 percent (95% CI: 90.3-92.2), 91.7 percent (95% CI: 90.7-92.6) and 83.3 percent (95% CI: 82.1-84.6) of all children who received day 1 SPAQ in cycles 1, 2 and 4, respectively.

In Mozambique, directly observed therapy for day 1 SPAQ was reported in 91.9 percent (95% CI: 90.1-93.8), 94.1 percent (95% CI: 92.5-95.6) and 97.8 percent (95% CI: 97.0-98.7) of all children who received day 1 SPAQ dose during cycles 1, 3 and 4, respectively.

In Nigeria, adherence to directly observed therapy was reported in 87.7 percent (95% CI: 86.7-88.7), 89.4 percent (95% CI: 88.3-90.3), 86.6 percent (95% CI: 85.6-87.6), 86.2 percent (95% CI: 84.8-87.5) and 89.1 percent (95% CI: 87.5-90.4) of all children who received day 1 SPAQ in cycles 1, 2, 3, 4 and 5, respectively.

In South Sudan, directly observed therapy was reported in 98.3 percent (95% CI: 96.6-99.2) and 96.2 percent (95% CI: 92.6-98.1) of all children who received day 1 SPAQ in cycles 2 and 4, respectively.

In Togo, administration of day 1 SPAQ dose was directly observed by a community distributor in 92.3 percent (95% CI: 88.9-94.8), 97.8 percent (95% CI: 96.2-98.7), 97.7 percent (95% CI: 96.5-98.6) and 89.7 percent (95% CI: 88.3-91.0) of all children who received day 1 SPAQ during cycles 1, 2, 3 and 4, respectively.

In Uganda, the proportion of children whose first doses were directly observed by a community distributor was 96.9 percent (95% CI: 96.0-97.9), 96.0 percent (95% CI: 94.1-97.9), 97.9 percent (95% CI: 96.9-98.9) and 99.5 percent (95% CI: 99.0-100) among all children who received day 1 SPAQ during cycles 1,2,3 and 5, respectively.

Table 26: Proportions of eligible children (3–59 months) who received day 1 SPAQ by community distributors adhering to DOT among those who received day 1 SPAQ by community distributors during home visits, by country and survey

Data source	Number of children sampled	Proportion administered SMC by DOT	95% CI
Burkina Faso (11 districts)			
EoC: cycle 1	3,589	95.7	95.0-96.4
Burkina Faso (27 districts)			
EoC: cycle 2	3,295	92.7	91.9-93.7
EoC: cycle 3	3,600	92.8	92.0-93.5
EoC: cycle 4	3,448	94.6	93.8-95.3
Burkina Faso (27 districts)			

EoR: cycle 5	2,662	83.7	79.3-87.3
Chad			
EoC: cycle 1	3,344	91.2	90.3-92.2
EoC: cycle 2	3,446	91.7	90.7-92.6
EoR: cycle 4	3,327	83.3	82.1-84.6
Mozambique (Malema, Mecubúri, Muecate and Lalaua districts; Nampula region)			
EoC: cycle 1	854	91.9	90.1-93.8
EoC: cycle 3	876	94.1	92.5-95.6
EoR: cycle 4	1,061	97.8	97.0-98.7
Nigeria (all states; total, weighted proportion)			
EoC: cycle 1	39,313	87.7	86.7-88.7
EoC: cycle 2	39,694	89.4	88.3-90.3
EoC: cycle 3	40,357	86.6	85.6-87.6
Nigeria (areas with five cycles, FCT, Kogi, Nasarawa, Oyo and Plateau states and 10 LGA in Bauchi state; total, weighted proportion)			
EoC: cycle 4	20,871	86.2	84.8-87.5
Nigeria (all states; total, weighted proportion)			
EoR: cycle4/ cycle 5	11,149	89.1	87.5-90.4
South Sudan (Aweil South County)			
EoC: cycle 2	453	98.3	96.6-99.2
EoC: cycle 4	446	96.2	92.6-98.1
Togo			
EoC: cycle 1	1,444	92.3	88.9-94.8
EoC: cycle 2	1,495	97.8	96.2-98.7
EoC: cycle 3	1,573	97.7	96.5-98.6
EoR: cycle 4	2,055	89.7	88.3-91.0
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk; Karamoja region)			
EoC: cycle 1	1278	96.9	96.0-97.9
Uganda (Amudat and Nakapiripirit districts; Karamoja region)			
EoC: cycle 2	399	96.0	94.1-97.9
Uganda (Kotido, Moroto and Nabilatuk districts; Karamoja region)			
EoC: cycle 3	811	97.9	96.9-98.9
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk; Karamoja region)			

EoR: cycle 5	761	99.5	99.0-100
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Table 27: 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 (states with five cycles)

Data source	Number of households sampled	Proportion administered SMC by DOT	95% CI
Bauchi			
EoC: cycle 1	7,325	79.5	76.3-82.3
EoC: cycle 2	7,402	79.6	76.4-82.5
EoC: cycle 3	7,160	75.9	72.7-78.7
EoC: cycle 4	3,462	77.4	72.5-81.6
EoR: cycle 5	1,311	95.8	92.9-97.5
FCT			
EoC: cycle 1	1,240	94.1	90.5-96.4
EoC: cycle 2	1,312	89.0	83.3-92.9
EoC: cycle 3	1,283	84.5	77.4-89.6
EoC: cycle 4	1,319	91.7	87.2-94.7
EoR: cycle 5	1,272	82.5	77.3-86.7
Kogi			
EoC: cycle 1	4,711	94.0	92.3-95.3
EoC: cycle 2	5,201	94.6	92.7-96.1
EoC: cycle 3	5,202	93.5	91.8-94.8
EoC: cycle 4	4,980	90.2	87.8-92.2
EoR: cycle 5	1,196	90.7	83.8-94.9
Nasarawa			
EoC: cycle 1	3,202	81.7	77.6-85.1
EoC: cycle 2	3,223	84.0	80.2-87.1
EoC: cycle 3	3,265	84.2	80.5-87.4
EoC: cycle 4	3,275	84.6	80.8-87.7
EoR: cycle 5	1,241	88.6	85.5-91.2
Oyo			
EoC: cycle 1	1,219	83.0	75.1-88.8

EoC: cycle 2	1,293	91.3	86.6-94.5
EoC: cycle 3	1,275	95.6	92.8-97.3
EoC: cycle 4	1,277	92.8	89.3-95.2
EoR: cycle 5	1,241	89.6	85.1-92.8
Plateau			
EoC: cycle 1	5,694	86.3	83.9-88.5
EoC: cycle 2	5,582	90.4	88.3-92.1
EoC: cycle 3	6,650	85.7	83.4-87.8
EoC: cycle 4	6,558	86.3	83.6-88.5
EoR: cycle 5	1,293	93.8	90.9-95.9

Table 28: 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 (states with four cycles)

Data source	Number of households sampled	Proportion administered SMC by DOT	95% CI
Bornu			
EoC: cycle 1	4,798	91.6	88.2-94.0
EoC: cycle 2	4,392	91.1	87.6-93.6
EoC: cycle 3	4,719	91.6	88.5-94.0
EoR: cycle 4	1,272	90.6	86.7-93.5
Kebbi			
EoC: cycle 1	5,421	91.4	89.1-93.3
EoC: cycle 2	5,478	93.5	90.8-95.4
EoC: cycle 3	5,177	87.3	83.8-90.2
EoR: cycle 4	1,294	88.5	83.2-92.2
Sokoto			
EoC: cycle 1	5,703	90.6	87.7-92.9
EoC: cycle 2	5,811	93.6	90.9-95.5
EoC: cycle 3	5,626	90.2	87.0-92.8
EoR: cycle 4	1,218	79.8	73.8-84.8

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

Results based on EoR survey data show that less than 1.5 percent of caregivers reported receipt of day 1 SPAQ by eligible children outside home visits by community distributors during EoR surveys in all countries (**Table 29**).

The proportion of eligible children who received SPAQ by means other than home visits by community distributors was found to be lower than that reported in the 2021 across the six countries (lower than 1 percent), with the exception of Burkina Faso (where there was 0 instance of receipt of SPAQ outside of distributor visits was reported in Ipelcé, Burkina Faso in 2021).

As in previous years, the majority of instances of receipt of SPAQ outside home visits were via personnel at local health facilities and from community distributors handing out SPAQ at fixed distribution points; these sources may be considered legitimate sources of SPAQ. Outside of these sources, the most common alternative source of SMC medicines were family or friends.

Table 29: Receipt of SPAQ by eligible children outside of home visits by community distributors by country

Data source	Number of eligible children sampled	Proportion of eligible children covered	95% CI
Burkina Faso (27 districts with 4/5 cycles)			
EoR: cycle 5	2,662	0.5	0.2-1.3
Chad			
EoR: cycle 4	3,355	0.1	0.0-0.3
Mozambique (Malema, Mecubúri, Muecate and Lalaua districts; Nampula region)			
EoR: cycle 4	1,072	0.4	0.0-0.7
Nigeria (all states; total, weighted proportion)			
EoR: cycle4/ cycle5	11,036	0.4	0.2-0.5
Togo			
EoR: cycle 4	2,132	0.6	0.4-1.1
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk districts; Karamoja region)			
EoR: cycle 5	768	0.1	0.0-0.4

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 monthly SMC cycles

Tables 30 –35 show the proportions of eligible children by country and state by number of day 1 SPAQ received across cycles during the 2022 SMC campaign.

In Burkina, 77.4 percent (95% CI:72.3-81.8) and 64.6 percent (95% CI:58.1-70.6) of eligible children received day 1 SPAQ during each of the monthly cycles for the districts in which four cycles and five cycles were implemented in 2022, respectively.

Across the nine states in Nigeria, EoR survey estimates show that 89.9 (95% CI:87.4-91.9) and 80.7 percent (95% CI:77.3-83.7) of eligible children received day 1 SPAQ during each of the monthly cycles in areas that implemented four SMC cycles and five SMC cycles, respectively.

In Chad, Mozambique and Togo, 79.8 percent (95% CI: 78.4-81.1, 60.0 percent (95% CI: 57.2-62.9), 81.2 percent (95% CI:79.5-82.8) of eligible children, respectively, received SPAQ in all four cycles in 2022. In Uganda, 71.6 percent (95% CI: 68.5-74.7) of eligible children received day 1 SPAQ during each of the five monthly cycles delivered during 2022.

The proportion of eligible children receiving no cycles was less than five percent in all countries, with the exception of Mozambique where the proportion was 10.2 percent (95% CI: 8.5-12.0). The proportion was also greater than five percent in the FCT; 9.6 percent (95% CI: 6.3-14.1) and Sokoto state; 6.5 percent (95% CI: 3.5-11.8) in Nigeria.

Table 30: Proportions of eligible children (3–59 months) who received day 1 SPAQ by community distributors by number of cycles during 2021 (EoR survey), by country

Number of cycles	Number of children sampled	Proportion of eligible children covered	95% CI
Burkina Faso (districts with four cycles)			
None	1,549	0.3	0.0-0.9
Four		77.4	72.3-81.8
Burkina Faso (districts with five cycles)			
None	940	0.1	0.0-0.9
Five		64.6	58.1-70.6
Chad			
None	3,561	2.5	2.0-3.1
One		5.0	4.3-5.7
Two		6.7	5.8 -7.5
Three		6.1	5.3-6.9
Four		79.8	78.4-81.1
Mozambique (Malema, Mecubúri, Muecate and Lalaua districts; Nampula region)			
None	1,329	10.2	8.5-12.0
One		14.8	12.8-16.9
Two		4.5	3.3-5.7
Three		10.4	8.6-12.1
Four		60.0	57.2-62.9
Nigeria: (areas with four cycles; total, weighted proportion)			
None	4,620	2.5	1.5-4.1
One		1.3	0.8-1.9
Two		1.9	1.3-2.6
Three		4.4	3.5-5.6
Four		89.9	87.4-91.9

Nigeria (areas with five cycles, FCT, Kogi, Nasarawa, Oyo and Plateau states and 10 LGA in Bauchi state; total, weighted proportion)			
None	7,260	3.2	2.1-4.7
One		2.0	1.5-2.6
Two		3.9	3.1-4.8
Three		3.8	3.3-4.5
Four		6.4	5.4-7.3
Five		80.7	77.3-83.7
Togo			
None	2,132	0.3	0.1-0.6
One		4.1	3.4-5.1
Two		6.3	5.4-7.4
Three		8.1	7.0-9.3
Four		81.2	79.5-82.8
Uganda (Moroto, Kotido, Nabilatuk, Amudat and Nakapiripirit districts; Karamoja region)			
None	817	2.0	1.0-2.9
One		16.9	14.3-19.5
Two		1.6	0.7-2.4
Three		3.2	2.0-4.4
Four		4.8	3.3-6.2
Five		71.6	68.5-74.7

Table 31: Proportions of eligible children (3–59 months) who received day 1 SPAQ by community distributors by number of cycles during 2021 (EoR survey), by Nigerian state (states with five cycles)

Number of cycles	Number of children sampled	Proportion of eligible children covered	95% CI
Bauchi			
None	660	0.2	0.001-1.1
One		0.0	
Two		0.6	0.2-1.5
Three		0.8	0.2-2.1
Four		1.1	0.4-2.6
Five		97.4	95.3-98.6
FCT			

None	1,320	9.6	6.3-14.1
One		5.0	3.4-7.2
Two		10.1	7.6-13.1
Three		9.2	7.4-11.4
Four		9.6	7.9-11.6
Five		56.5	49.0-63.7
Kogi			
None	1,320	4.9	1.6-13.7
One		2.4	1.1-5.4
Two		3.3	1.9-5.5
Three		3.9	2.6-5.8
Four		7.1	4.9-10.2
Five		78.4	65.4-87.6
Nasarawa			
None	1,320	1.3	0.4-4.1
One		0.9	0.5-1.8
Two		2.6	1.3-5.0
Three		1.4	0.8-2.6
Four		6.1	3.9-9.4
Five		87.7	82.1-91.8
Oyo			
None	1,320	1.1	0.5-2.1
One		2.1	1.4-3.2
Two		4.8	3.5-6.6
Three		5.4	4.2-6.9
Four		8.6	6.6-11.2
Five		78.0	73.9-81.6
Plateau			
None	1,320	0.6	0.2-2.2
One		0.6	0.1-2.6
Two		0.7	0.3-1.6
Three		0.8	0.7-1.5
Four		3.0	1.9-4.6
Five		94.3	91.5-96.2

Table 32: Proportions of eligible children (3–59 months) who received day 1 SPAQ by community distributors by number of cycles during 2021 (EoR survey), by Nigerian state (states with four cycles)

Number of cycles	Number of children sampled	Proportion of eligible children covered	95% CI
Bauchi			
None	660	0.2	0.02-1.2
One		0.3	0.1-1.2
Two		0.9	0.3-2.9
Three		1.4	0.5-3.4
Four		97.3	95.1-98.5
Borno			
None	1,320	1.4	0.5-4.4
One		1.6	0.7-3.5
Two		2.1	1.0-4.3
Three		6.2	4.1-9.4
Four		88.7	81.9-93.2
Kebbi			
None	1,320	0.7	0.3-1.5
One		0.7	0.3-1.4
Two		1.6	0.8-3.0
Three		4.3	2.7-6.8
Four		92.7	89.2-95.2
Sokoto			
None	1,320	6.5	3.5-11.8
One		2.1	1.1-4.0
Two		2.6	1.6-4.0
Three		4.3	3.1-6.1
Four		84.5	79.0-88.8

3.2.7 SPAQ provided to ineligible children aged five years and above

Table 33 and Table 34 show the proportions of ineligible children 60–119 months who received SPAQ, based on data from EoR surveys.

For Chad, Mozambique and Togo, the proportion of ineligible children who received day 1 SPAQ in the last cycle was comparable to that observed in the 2021 SMC round. In Chad, it was 15.1 percent (95% CI: 12.0-18.2) compared with 17.5 percent (95% CI: 15.1-20.2) during 2021. IN Mozambique, it was 18.5 percent (95% CI: 14.8-22.2) compared with 15.3 percent (95% CI: 11.5-20.1) in 2021, while in Togo, it was 10.8 percent (95% CI: 8.8-13.2) compared with 9.7 percent (95% CI: 8.2-11.5) during the 2021 round.

In Burkina Faso, the proportion (10.9 percent; 95% CI: 8.2-14.3) was considerably lower than that reported in 2021 (28.2 percent; 95% CI: 23.2-33.9). Reduction in this proportion was also observed in the results for Uganda (53.4 percent; 95% CI: 46.8-60.0 compared with 62.5 percent; 95% CI: 57.7-67.1 in 2021), and Nigeria (23.7 percent; 95% CI: 20.9-26.6 compared with 31.9 percent; 95% CI: 30.4-33.5)

Table 33: Proportions of ineligible children (60 –119 months) who received day 1 SPAQ (EoR survey) by country

Data source	Number of ineligible children sampled	Proportion of ineligible children covered	95% CI
Burkina Faso¹ (27 districts with 4/5 cycles)			
EoR: cycle 5	1,545	10.9	8.2-14.3
Chad¹			
EoR: cycle 4	504	15.1	12.0-18.2
Mozambique (Malema, Mecubúri, Muecate and Lalaua districts, Nampula region)			
EoR: cycle 4	416	18.5	14.8-22.2
Nigeria (total, weighted proportion)¹			
EoR: cycle4/ cycle5	2,934	23.7	20.9-26.6
Togo¹			
EoR: cycle 4	768	10.8	8.8-13.2
Uganda (Moroto, Kotido, Nabilatuk, Amudat and Nakapiripirit districts Karamoja region)			
EoR: cycle 5	221	53.4	46.8-60.0

Table 34: Proportions of ineligible children (60 –119 months) who received day 1 SPAQ (EoR survey), by Nigerian state

Data source	Number of ineligible children sampled	Proportion of eligible children covered	95% CI
State: Bauchi			
EoR: cycle 5	488	13.7	10.1-18.4
FCT			
EoR: cycle 5	359	16.7	11.9-23.1
Kogi			
EoR: cycle 5	361	18.8	13.5-25.6
Nasarawa			
EoR: cycle 5	401	21.2	16.0-27.6
Oyo			
EoR: cycle 5	113	48.6	35.5-62.1
Plateau			
EoR: cycle 5	100	28.0	16.9-42.7
Bornu			
EoR: cycle 4	185	55.6	40.4-69.9
Kebbi			
EoR: cycle 4	281	25.2	17.3-35.4
Sokoto			
EoR: cycle 4	646	24.3	18.3-31.6

4. Discussion

SMC Program target and scale up in 2022

A total number of 14,897,968 children targeted for SMC delivery in 2022 represents an increase of 22.3 percent from the 12,191,005 children targeted in 2020/21.^[8] This increase was driven by the expansion of SMC delivery in Mozambique (from two districts in 2020/2021 to four districts in 2022), Nigeria (from 129 LGAs in 2021 to 154 in 2022), and Uganda (from two districts in 2021 to eight districts in 2022); and the introduction of SMC in South Sudan in 2022 through an implementation research study assessing the effectiveness of SMC in Aweil South County in the country's Northern Bahr El Ghazal region.

Administrative coverage

Estimates from administrative program data show that a very high level of coverage was maintained across all countries where Malaria Consortium supported SMC delivery in 2022, exceeding 95 percent in most countries and higher than 90 percent in all countries. Administrative coverage estimates reflect the proportion of SPAQ treatment courses provided by community distributors as a share of the target population of eligible children aged 3 – 59 months. These were based on data from SMC tally sheets in Burkina Faso, Nigeria, Togo, South Sudan and Uganda; and SPAQ stock reconciliation data, as was the case in Chad and Mozambique. Within-country variation in administrative coverage was seen in Nigeria, where it ranged from 64.1 percent in the FCT to 105.2 percent in Plateau State. Such variations may be due to differences in the ease of obtaining accurate population estimates and population dynamics, and the extent to which the target population of children is reachable across settings. The relatively lower administrative coverage seen in the FCT, for example, might have been due to difficulty in enumeration of compounds, inconsistencies in population figures obtained from official sources and the specific challenges of implementing SMC in urban settings.

Administrative coverage exceeded 100 percent in some instances. This may have resulted from several reasons, including inaccuracies in target population estimates, migration such as of nomadic target populations and the provision of SMC to ineligible children. In 2023, measures will be taken to estimate target populations more accurately, such as by intensifying efforts to obtain accurate population figures during microplanning and adjusting for anticipated population changes during the round as much as necessary. This will require improvements to engagement with

country-level and community leaders to identify and adjust for anticipated changes in target population, such as those resulting from periodic migration of nomadic populations.

SMC program coverage among eligible children

Data from EoC and EoR household surveys across countries suggest that SMC campaigns supported by Malaria Consortium achieved high levels of program coverage and adherence to the SMC protocol. Across cycles, coverage in terms of receipt of day 1 SPAQ by eligible children 3–59 months exceeded 90 percent in most countries and Nigerian states. While estimates did not vary substantially across cycles within countries, there were variations across states in Nigeria, with relatively lower coverage seen in some cases, such as in the FCT in Nigeria where coverage was below 90 percent in three of the five cycles delivered during 2022. This is likely due to the complexity of implementing SMC in a highly urbanised setting like the FCT in Nigeria where SMC was delivered for the first time in 2022.

A high proportion of children received the full three-day course of SMC (among those who had received day 1 SPAQ), exceeding 90 percent in all countries and Nigerian states across all cycles, with the exception of South Sudan in cycle 2 and Togo in cycle 1. Overall, these results indicate that the SMC was delivered to a high standard in terms of ensuring that children received the full course of SMC medicines. The effectiveness of SMC as a malaria chemoprevention strategy depends on optimal adherence to day 2 and day 3 AQ.^[4] Hence, these results imply that SMC programs supported by Malaria Consortium in 2022 achieved a high degree of success in providing effective protection against malaria to a high proportion of the target population of eligible children during the high transmission season. The results also suggest that efforts to increase adherence to the full treatment regimen by delivering all doses as DOT, which would result in a substantial cost increase, are unlikely to be cost-effective. Other, less resource-intensive strategies, such as the lead mothers or role model approaches tested by Malaria Consortium in several of the countries we support, are likely to be more appropriate.

Coverage in terms of receipt of SMC in all cycles varied widely between countries and Nigerian states. There were improvements in Nigeria (89.9 percent and 80.7 percent in the four and five-cycle states in 2022, respectively compared to 77.8 percent and 65.8 percent in 2021) and Togo (81.2 percent in 2022 compared to 70.2 percent in 2021). There were notable improvements seen in Borno State of Nigeria, where the complex operational environment and prevailing security situation make implementing SMC challenging. The proportion of eligible children in the state who received SMC in all five cycles increased from 55.1 percent in 2021 to 88.7 percent during 2022. It is likely that these improvements illustrate that program adaptations were effective in improving

SMC delivery and coverage in operationally challenging contexts. Success and lessons learned from delivering SMC in Borno are described in a recent Malaria Consortium learning brief.^[15]

Conversely, results in Burkina Faso (77.4 percent in 2022, compared to 93.8 percent in 2021), Mozambique (60.0 percent in 2022; 77.0 percent in 2020/21) and Uganda (71.6 percent in 2022; 82.2 in 2021) represent a noticeable decline in coverage. In the case of Burkina Faso, the decline might have been due in part to the operational challenges of insecurity and inaccessibility of affected areas in 2022. The decline in the proportion of eligible children receiving SMC in all cycles in Mozambique and Uganda may have been due to challenges in reaching an optimal level of coverage in new districts where SMC was introduced in 2022. Both countries saw significant scale up of SMC during 2022 (from two districts in 2021 to four in 2022 in Mozambique and from two districts to eight in Uganda). The proportion of children receiving SMC in all cycles was also notably lower in Nigeria's FCT (56.5 percent), with a tenth of children having not received SMC in any cycle during 2022. This trend is consistent with the relatively lower average administrative coverage seen in the FCT (64.1 percent) during 2022. These could be attributed to the challenges of delivering SMC in a new and complex urban setting like the FCT.

Yet, these challenges present opportunities for program improvement and optimising SMC delivery, coverage and quality in 2023. The operational constraints posed by insecurity in Burkina Faso and elsewhere where there were significant security risks necessitate program adaptation efforts to strengthen the resilience of our SMC programs in reaching communities and children in operationally delicate areas. There are important lessons to be learned from the successful adaptation of SMC delivery in Borno state of Nigeria, which saw significant improvements in coverage despite lingering security risks in the state during 2022, as described in a recent Malaria Consortium learning brief.^[15] The lower coverage estimates seen across key program indicators in FCT, compared to other states in Nigeria underscore the need for context-specific strategies to ensure quality delivery of SMC in complex urban settings. The low proportion of children who received SMC in all cycles in the new SMC districts in Uganda also necessitate corrective measures through insights and learnings from 2022 for optimizing coverage across cycles in the next round in 2023.

Receipt of SMC outside of home visits by community distributors

The proportion of eligible children who received SPAQ by means other than home visits by community distributors was found to be lower than that reported in the 2021 across the six

countries (lower than 1 percent in 2022), with the exception of Burkina Faso (where there was 0 instance of receipt of SPAQ outside of distributor visits was reported in Ipelcé, Burkina Faso in 2021). This is an indication that SMC programs supported by Malaria Consortium continued to be delivered according to the drug distribution standards through door-to-door distribution by community distributors during the 2022 campaign.

As in previous years, the majority of instances of receipt of SPAQ outside home visits were via personnel at local health facilities and from community distributors handing out SPAQ at fixed distribution points; these sources may be considered legitimate sources of SPAQ. Outside of these sources, the most common alternative source of SMC medicines were family or friends.

Receipt of SMC by ineligible children aged five years and older

According to the results of the EoR surveys, the proportion of ineligible older children receiving day 1 SPAQ showed wide variation across countries, ranging from 10.8 percent in Togo to 53.4 percent in Uganda. EoR surveys in Mozambique and Uganda were designed to provide a representative sample at the country level and are more likely to provide accurate estimates of receipt of SMC by ineligible older children in both countries. Country-level data from EoR surveys in Nigeria (when state-level data are aggregated) may also provide a representative sample.

The proportions of ineligible children who received day 1 SPAQ in the last cycle were comparable to those observed during the previous round, substantial reductions in proportions were observed in Burkina Faso, where the proportion was 10.9 percent in 2022 compared to 28.2 percent during 2021. Reduction in this proportion was also observed in the results for Nigeria (23.7 percent in 2022 compared to 31.9 percent in 2021).

While the percentage remains particularly high (53.4 percent) in Uganda during 2022, it was substantially lower than the level recorded in 2021 (62.5 percent). It is important to note, however, that while the estimate in Uganda was adequately powered, it may not be representative, as older children were sampled opportunistically from households with age-eligible children while older children in households without age eligible children were not sampled. Given our understanding that village health teams (VHTs) who serve as community distributors in Uganda tend to be well trained and competent in determining children's age with a considerable level of accuracy, we are of the view that the high proportion of receipt of SMC by older children may have been due the novelty of SMC in the country, as well as pressure from caregivers on VHTs to administer SMC to older children in households visited by VHTs. It nonetheless warrants further efforts to assess and

better understand the magnitude of the problem to identify the most effective remedial actions to address it in the 2023 campaign.

Overall, estimates of SMC coverage among ineligible children may not reflect the true extent to which older ineligible children receive SMC due to sampling limitations. Owing to the opportunistic sampling of older children from households with eligible children and exclusion of older children in households without age eligible children in the analytic sample, estimates of receipt of SMC by older children are likely to have been overestimated in all countries and may not be representative of the general population of older children in the areas where SMC was delivered in each country. While the exact extent of the receipt of SMC by ineligible children remains uncertain, findings from these surveys and those of the previous years have consistently shown that administration of SMC medicines to older children is a common issue across countries. This, in addition to inaccurate denominators and population movement, may be key factors contributing to the higher-than-expected administrative coverage estimates reported, more than 100 percent in some cases.

Comparability of results between years and surveys

While results of surveys are comparable to an extent across cycles, countries and years, in terms of their overall design, sampling approach and analysis, it should be noted that comparability is complicated by several factors. First, results of certain surveys at the country level may not be comparable across years due to differences in the sampling frame of each individual survey. For instance, unlike in 2021 when EoC surveys were implemented only in the Mò district in the Centrale region in Togo, surveys were conducted in 19 districts during 2022. In Nigeria there were differences in the states where SMC was delivered (with the addition of Oyo and the FCT in 2022), resulting in sampling frames for both EoC and EoR surveys being different from those of the 2021 surveys, for instance.

Comparisons of survey results are also complicated by between-cycle differences in EoC sampling frames, as was the case in Togo where, due to the security situation, the Kpendjal district was not sampled in EoC surveys following cycles 1 and 2. Between-cycle comparisons are complicated further by the introduction of a fifth cycle of SMC in specific areas in Burkina Faso and Nigeria with longer high transmission seasons. For example, results for cycle 1 EoC survey in Burkina Faso are representative of only areas where five cycles were delivered (Cascades, Centre Sud, and Hauts Bassins regions), and not of all areas where SMC was delivered with support from Malaria Consortium as in the subsequent EoC surveys. Moreover, the proportion of children receiving SMC

in all cycles may not be comparable between areas with four and five cycles in the same country, as this tends to be lower in the latter areas.

Time between delivery of day 1 SPAQ and coverage surveys may have influenced our results through recall bias and may explain differences in coverage estimates between EoC and EoR surveys. This is particularly the case when comparing EoC results of earlier cycles with coverage results based on retrospective self-reports by caregivers for the same cycles (i.e., when comparing results shown in **Table 19** and **Table 22**). As with previous years, EoR survey estimates of day 1 SPAQ coverage in earlier cycles tended to be lower than those of EoC surveys for the same cycles. To mitigate this, efforts were made to conduct the EoR surveys in a timelier manner in 2022, with all surveys conducted within two months of completion of the final cycle. This may have reduced the potential for recall bias, which is likely to have been a contributor to smaller differences between coverage estimates based on EoC and EoR surveys in some Nigerian states in 2022.^[5]

Improvements to survey implementation and data analysis in 2022

Further improvements were made to survey design and implementation in 2022. Comprehensive and representative EoR surveys were conducted in all countries except South Sudan. Efforts were made to conduct EoC surveys in a timelier manner during 2022. In all cases, EoC surveys were completed within two weeks of the preceding cycle. This helped to minimize the risk of recall bias in the estimation of program coverage.

In 2022, measures were also taken to assure the quality of data collected. Such measures included the use of real-time auditing measures, and improvements in training of data collectors to enhance their competences in administering surveys questionnaires, eliciting responses and capturing responses. Real time data quality auditing measures were taken to enable prompt remediation of data quality issues during survey implementation. These included the use of Global Positioning System (GPS) tracking of interviewers to check duration and location of interviews, and to compare geospatial coordinates with those of assigned communities as per the sampling plans. There was also more routine use of GPS coordinates taken at the beginning and end of each interview to track and ensure that interviews started and ended in the same location. Other auditing measures included audio recording of survey interviews and random selection of a sample (such as 5%) of recordings to be reviewed by a supervisor; and re-surveying a sample of households by supervisors to check that interviews had been conducted as per the survey protocol. Additional data quality assurance measures included the continued use of hidden variables introduced to check time taken for interview segments to ensure sufficient time was allocated specific segments, such as questions

on day 2 and day 3 AQ doses that often require probing and caregivers' recall when not documented on children's SMC cards. Where issues were identified through the audits, affected data points were deleted from the dataset and interviews were repeated under supervision to ensure collection of data in compliance with the survey protocol.

Use of LQAS results to improve delivery of SMC

The conduct of EoC surveys in a timelier manner during 2022 helped to facilitate the use of results to inform program decision making and improve delivery. The early implementation of the EoC surveys provided ample time of up to two weeks before the next cycle to process and analyse data, identify program improvement needs, 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. In nearly all cases, it was possible to complete analysis and obtain LQAS hypothesis test results at least one week before the start of the next cycle. These results and recommendations for actions in each SA were communicated with health authorities at district, state/regional and national levels, and malaria control programs, as a starting point for engagement to implement improvements in SMC delivery.

Examples of country-specific successes in the use of EoC survey data to drive decision making and improvements in SMC delivery are described below:

In Burkina Faso, Malaria Consortium team facilitated monthly meetings at the end of each cycle, in which key findings and recommendations from EoC surveys were shared and discussed with stakeholders and health authorities at district and regional levels. The meetings provided opportunities for partners to collectively determine remedial actions and assign roles to address identified issues. Following these meetings, district health managers communicated decisions and recommendations to their respective health facility managers during district-level preparatory meetings before the next cycle. This enabled execution of remedial actions at the health facility (SA) level, such as through improved training and supervision of community distributors. This proved to be an effective strategy as the problems encountered in the earlier cycles were mitigated and seen less commonly in subsequent cycles. For the 2023 round, there are plans to incorporate other strategies for better communication of EoC survey findings and timelier remediation of coverage and quality issues identified.

In Mozambique, EoC surveys were used to track and compare SMC delivery in the four districts (Mecuburi, Malema, Muecate and Lalaua). For example, the surveys helped to identify gaps in SMC

knowledge and perceptions among caregivers in the two districts where SMC was introduced during 2022 (Muecate and Lalaua). Findings were used to inform improvements in community engagement and sensitization to boost SMC knowledge and perception in the subsequent cycles, such as by using town criers and pre-cycle mass sensitization campaigns. Survey data also allowed for comparisons of coverage results between the 2022 and 2020/21 SMC rounds, while highlighting SAs needing improvement from the previous round.

In Nigeria, EoC surveys facilitated the provision of timely feedback to local stakeholders and partners. Survey results helped to identify particularly hard-to-reach SAs in states such as Borno, by monitoring the proportions of households not visited by community distributors in each cycle. Survey feedback tools were used to communicate and engage with state ministries of health and malaria elimination programmes to develop and implement strategies for improving compound coverage in the affected SAs. This contributed to an appreciable increase in compound coverage as seen in the subsequent cycles in those SAs.

In Uganda, a mobile supervision tool was designed to improve coverage and adherence to DOT, particularly in areas found to be performing lower than expected following a review of cycle 1 EoC survey results. The tool was used by supervisors and monitors (including district leaders, staff of the ministry of health and Malaria Consortium staff) to supervise distribution of SMC medicines through village health teams. There was an improvement in the proportion of children who received day 1 SPAQ by DOT following the roll out of this improved supervision strategy. The supervision tool will continue to be used in 2023.

We aim to report lessons and progress made with the operationalization of the SMC M&E framework and adaptation of the LQAS methodology to Malaria Consortium's SMC program in a peer-reviewed publication later in 2023.

4.1. Strengths and limitations

Our survey design and analysis have several notable strengths. A key strength was the improved standardization and comparability EoC surveys in 2022, compared to those of previous years. As alluded to earlier, modifications have been made to the LQAS methodology and survey implementation to improve the EoC surveys since 2019. These included improvements to data collection processes and consistent specification of LQAS lot sizes of 25 households per SA to facilitate standardized hypothesis tests based on realistic targets and decision criteria during 2022.

Efforts were also made to conduct EoC surveys in a timelier manner during 2022, with EoC surveys completed within two weeks of the preceding cycle in virtually all cases in 2022. This provided a two-week window before the subsequent cycle for processing and analyse EoC survey data, as well as identifying, communicating and addressing program improvement needs in partnership with stakeholders at all levels. In addition, the timely implementation of EoC surveys helped to minimize the risk of recall bias in the estimation of program coverage for indicators relying on caregivers' recall.

The use of independent partners to conduct comprehensive EoR coverage surveys in all countries where surveys were carried out during 2022 helped to promote objectivity and reduce bias. In addition, it allowed for the mobilization of external resources to ensure that surveys were implemented in a timely manner, with the time between the end of final cycle and the EoR surveys being generally shorter in 2022 than in 2021 and previous years. Another strength of the EoR surveys was their self-weighting multi-stage sampling designs were employed with clusters selected with probability proportional to the size. This ensured that estimates of program coverage were representative of the populations targeted for SMC administration at country level (and at state level in Nigeria), as appropriate to the country setting. Furthermore, as in previous years, instances of missing responses for key indicators in EoR datasets were consistently low in 2022 (generally <2 percent across indicators, surveys and countries).

Our approach was not without limitations. First, target populations used for calculation of administrative coverage were estimated based on official population figures, which were often based on outdated national census data and adjusted for projected population growth. Estimates of population sizes may not adequately reflect population movements due to migration or internal displacement. The major limitation of coverage surveys is their reliance on self-reporting. The use of SMC child record cards for estimation of coverage was not feasible due to sub-optimal retention and completion, making the cards an unreliable home-based data source for determining SMC coverage. Consequently, survey findings may be subject to recall and social desirability bias.

Although EoR surveys were conducted in a timelier manner during 2022 than in previous years, the potential for recall bias might have influenced trends observed in results of EoR surveys in Chad, Mozambique, Nigeria and Togo showing lower coverage estimates in earlier cycles compared with the estimates reported during EoC surveys, that is when contrasting results from EoC surveys (**Table 19**) against those obtained from EoR surveys (**Table 22**). Lastly, the likelihood that meanings and nuances might have been lost in translation was a potential source of limitation, especially as questionnaires were only provided in English, French and Portuguese and relied on data collectors to translate questions when interviewing caregivers.

4.2. Conclusions, recommendations, and next steps

Our estimates show that very high levels of administrative coverage were maintained across all countries where Malaria Consortium supported SMC delivery with philanthropic funding or co-funding in 2022. Data from EoC and EoR household surveys also show that SMC campaigns supported by Malaria Consortium generally achieved high levels of program coverage and adherence to SMC quality standards, with coverage in terms of receipt of day 1 SPAQ and adherence to the full three-day course of SMC medicines exceeding 90 percent in most places and cycles during 2022. Coverage gaps remain, however, especially for indicators such as receipt of SMC medicines in all cycles by each eligible child targeted. While results indicate that our SMC program has continued to be delivered to a high standard, with notable improvements in key coverage indicator estimates, there were notable instances of coverage decline owing to several factors like insecurity, and challenges with implementing SMC in new and complex urban contexts. These gaps and challenges therefore provide opportunities for program improvement and adaptations for optimising SMC delivery, coverage and quality in 2023.

While there have been improvements to our coverage estimation methods since 2019, further consideration will be given to strengthening administrative coverage and survey methods in 2023. Further efforts will be made to digitalize SMC tally sheets, as was initiated in Nigeria during 2022, with the aim of improving administrative coverage estimation process efficiency, data accuracy and timeliness of reporting. As administrative coverage estimates are less reliable for measuring program coverage, a greater focus will be on improving the methods and utility of our EoC and EoR surveys. Going forward, we aim to strengthen household survey data quality assurance by operationalizing auditing measures and data quality checks more routinely and systematically. We expect to more widely implement real-time use of GPS tracking to ensure interviews are conducted within assigned communities as per the sampling plans across countries. We are committed to enhancing the capacity of data collectors and M&E staff at all levels through training and re-training and improved supervision. For example, we have planned a refresher comprehensive LQAS training workshop for country M&E managers ahead of the start of the 2023 SMC campaigns. We aim to advance ongoing efforts to standardize LQAS methodology and survey implementation across countries while allowing for adaptations like stratification of sampling units as suited to country contexts. In this regard, there will be measures such as consistent sampling of LQAS supervision areas using probability proportional to size methods to achieve self-weighted

and more representative survey samples. This will bolster comparability of results of EoC coverage and other key indicators within and across countries.

Considerations will be given to efforts at bolstering timeliness of EoC surveys in 2023 by conducting them not later than a week after the last day of SPAQ distribution. This will provide ample time to analyse data, identify program improvement needs and disseminate results and recommendations before the next SMC cycle. One way we plan to achieve this is by introducing an SMC cyclic activity tracker to monitor and ensure timely completion of key SMC activities in each cycle, including EoC survey implementation, data processing, hypothesis testing and dissemination of results to relevant stakeholders to inform program decision making. Likewise, efforts will be made to conduct EoR surveys in a timelier manner, as this will help minimize the risk of recall bias in the estimation of program coverage.

To enhance the use of routine program data to inform decision making, we plan to advance operationalization of the recently developed SMC M&E framework, which specifies a range of indicators relating to program inputs, outputs, outcomes, and impacts, and aligning these with key SMC program quality standards. We aim to share progress made, lessons learned and next steps in a peer-reviewed publication later in 2023. The framework will continue to guide how we monitor and evaluate SMC delivery, identify gaps, take actions in response to these issues between cycles and drive quality improvement initiatives between annual SMC rounds.

Finally, as in past years, household surveys will continue to be used to collect data on important variables to enable secondary analyses of survey data for answering research questions. Secondary analyses will include those evaluating the effectiveness of SMC in preventing malaria in eligible children using routine program data, such as by assessing the association between children's SMC status, and caregiver-reported malaria episodes in the month following the previous SMC cycle. Routine program data will also be vital to current efforts to further our understanding of the magnitude and predictors of receipt of SMC medicines by ineligible children. Examining child, caregiver and household factors associated with receipt of SMC by older ineligible children using routine data will provide useful insights for contextualizing remedial measures targeted at addressing the issue. Our surveys can also be useful for determining the coverage of co-interventions such as insecticide-treated nets in locations where we implement SMC. That can enable us understand the interaction between SMC and co-interventions, while providing useful baseline data for guiding further co-implementation of SMC and other community-level intervention.

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