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Coverage and quality of seasonal malaria chemoprevention supported by Malaria Consortium with philanthropic funding or co-funding in 2023:

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

April 2024

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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 evidence-based programmes that combat targeted diseases and promote universal health coverage.

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US EIN: 98-0627052

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Acronyms and abbreviations

ACCESS-SMC	Achieving Catalytic Expansion of Seasonal Malaria Chemoprevention in the Sahel
AQ	amodiaquine
CD	community distributor
CI	confidence interval
CISM	Centro de Investigação em Saúde de Manhiça
DIDM	data-informed decision-making
DHS	Demographic and Health Surveys
DOT	directly observed therapy
EoC	end-of-cycle
EoR	end-of-round
FCT	Federal Capital Territory
GF	Global Fund to Fight AIDS, Tuberculosis and Malaria
IDP	internally displaced person
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	US 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 highest intensity of malaria transmission occurs during the rainy season in sub-Saharan Africa, where malaria is a leading cause of illness and death among children. Seasonal malaria chemoprevention (SMC) is an intervention intended to provide 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), together known as SPAQ, to eligible children over consecutive monthly cycles during the malaria transmission season. Evidence from research and SMC implementation at scale has shown SMC to be safe, feasible, effective, and cost-effective across a range of epidemiological and geographical settings.

Malaria Consortium's SMC programme in 2023

In 2023, Malaria Consortium, through full or partial philanthropic funding, supported SMC delivery in seven countries targeting around 17.1 million children aged 3–59 months in Burkina Faso (2,183,054), Chad (1,364,199), Mozambique (1,294,464), Nigeria (11,499,416), South Sudan (61,986 children), Togo (513,148) and Uganda (153,995 children). These represent an increase of 14.6 percent from the 14.9 million children targeted during the 2022 round, driven largely by the scale up of SMC delivery in Mozambique, from four districts in the previous round to 23 districts during 2023.

Malaria Consortium remains committed to conducting rigorous monitoring and evaluation (M&E) of its SMC programme. This is important for demonstrating programme coverage by evaluating performance against coverage targets, as well as providing critical data and insights to inform decision-making and guide programme improvements. This report outlines the methods employed by Malaria Consortium in monitoring coverage and quality of SMC delivered with support from philanthropic funding, while providing estimates of key programme coverage and quality achieved in 2023. The report also highlights contextual and programmatic implications of its key findings. Furthermore, it provides recommendations on potential adaptations and future directions for refining M&E methods and approaches in 2024 and future SMC campaigns.

Methods

Administrative coverage was estimated based on routine monitoring forms referred to as SMC tally sheets in all countries in 2023. This reflects progress made with harmonising administrative coverage estimation methods, as against previous years in which stock reconciliation data were used in areas where tally sheet data were either incomplete or unavailable.

In addition to administrative coverage, SMC coverage was assessed using two types of household coverage surveys described in brief below:

- End-of-cycle (EoC) surveys employing the lot quality assurance sampling (LQAS) methodology were conducted typically within one week following all but the final monthly SMC cycle. They enabled programme implementing teams to identify areas of low coverage and quality; and to rapidly take corrective actions to improve SMC delivery in subsequent cycles.
- Comprehensive end-of-round (EoR) surveys took place typically within one month following 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), enabling the comprehensive assessment of programme performance across all monthly cycles of the SMC round.

Main findings

Administrative coverage

As in the previous years, there were consistently high levels of administrative coverage across all supported countries during the 2023 round. On average, 17,038,950 courses of SPAQ were distributed in each monthly cycle in all seven countries. Based on the total of 17,070,262 eligible children targeted, this represents administrative coverage of approximately 100 percent globally, ranging from 88.3 percent in Togo to 111.0 percent in South Sudan.

Coverage estimates from end-of-cycle and end-of-round surveys

Estimates from household surveys showed that the programme sustained the high levels of coverage and quality achieved in the previous rounds. Day 1 SPAQ coverage was above 90 percent in most cases, as were other coverage and quality indicators. Results, expressed as percentages with 95 confidence intervals (95%) for key indicators by cycle and country are highlighted in the table below and presented in greater detail in the main results section of the report:

Table 0. Summary of 2023 SMC coverage results from EoC and EoR surveys by country and cycle

Country	Cycle no.	Target population	Day 1 SPAQ coverage (95%CI)	Adherence to day 2 and 3 AQ (95% CI)	Day 1 SPAQ DOT (95%CI)	Receipt of SPAQ in all cycles (95% CI)	
Burkina Faso	cycle 1	2,183,054	96.2 (95.3–97.0)	98.6 (98.0–99.0)	89.3 (87.9–90.6)	*72.9 (66.9–78.1)	#87.2 (82.4–90.8)
	cycle 2		97.2 (96.3–97.8)	98.0 (97.3–98.6)	87.3 (85.7–88.7)		
	cycle 3		96.9 (96.0–97.6)	98.1 (97.4–98.6)	89.8 (88.4–91.1)		
	cycle 4		98.1 (97.3–98.6)	98.6 (98.0–99.1)	88.8 (87.3–90.1)		
	cycle 5		94.7 (92.5–96.3)	99.3 (98.6–99.7)	86.1 (83.3–88.5)		
Chad	cycle 1	1,364,199	94.9 (94.1–95.7)	95.4 (94.5–96.1)	91.1 (90.0–92.2)	91.9 (90.7– 93.4)	
	cycle 2		93.9 (93.1–94.7)	97.4 (96.7–97.9)	87.5 (86.3–88.7)		
	cycle 3		97.1 (96.4–97.6)	97.3 (96.7–97.8)	93.1 (92.2–94.0)		
	cycle 4		96.0 (95.0–97.0)	95.1 (94.0–97.0)	94.8 (94.0–96.0)		
Mozambique	cycle 1	1,294,464	Survey not conducted			59.3 (52.0–66.2)	
	cycle 2						
	cycle 3		89.6 (87.8–91.1)	93.3 (91.7–94.5)	94.6 (93.4–95.6)		
	cycle 4		77.2 (70.8–82.5)	99.1 (98.2–99.5)	92.3 (88.5–94.9)		
Nigeria	cycle 1	11,499,416	92.9 (92.6–93.1)	96.3 (96.1–96.5)	82.6 (82.3–83.0)	*85.7 (84.6–86.7)	#85.2 (84.4–86.0)
	cycle 2		94.0 (93.7–94.2)	97.1 (97.0–97.3)	85.7 (85.4–86.1)		
	cycle 3		93.8 (93.6–94.1)	97.6 (97.4–97.7)	85.7 (85.3–86.1)		
	cycle 4		94.0 (93.7–94.3)	98.2 (98.0–98.3)	86.6 (86.1–87.0)		
	cycle 5		94.9 (94.5–95.3)	99.0 (98.7–99.6)	92.7 (92.0–93.1)		
South Sudan	cycle 1	61,986	79.4 (71.5–85.5)	95.4 (92.8–97.1)	90.7 (80.5–95.8)	80.8 (78.7–82.7)	
	cycle 2		83.1 (74.9–88.9)	97.6 (95.8–98.6)	93.3 (84.6–97.2)		
	cycle 3		82.9 (74.0–89.1)	97.7 (95.3–98.8)	97.0 (94.4–98.4)		
	cycle 4		99.1 (98.4–99.6)	98.7 (97.9–99.2)	98.9 (98.3–99.5)		
Togo	cycle 1	513,148	99.4 (98.4–99.8)	74.8 (61.8–84.5)	96.5 (93.9–98.0)	83.0 (81.1–84.9)	

	cycle 2		99.1 (97.1–99.7)	98.1 (97.3–98.7)	87.5 (83.3–90.8)	
	cycle 3		99.7 (98.1–100)	96.4 (90.8–98.7)	95.2 (92.4–97.0)	
	cycle 4		89.1 (87.4–90.7)	99.3 (98.7–99.6)	89.1 (87.4–90.7)	
Uganda	cycle 1	153,995	100.0	97.0 (95.9–97.8)	96.0(94.8–96.9)	89.3 (85.6–92.2)
	cycle 2		98.0 (97.1–98.6)	98.0 (97.1–98.6)	90.0 (88.3–91.5)	
	cycle 3		99.0 (98.3–99.4)	99.0 (98.3–99.4)	95.0 (93.7–96.0)	
	cycle 4		98.0 (97.1–98.6)	98.0 (97.1–98.6)	94.0(92.6–95.1)	
	cycle 5		99.9 (99.1–100)	93.2 (90.3–95.3)	97.1 (94.8–98.4)	

*Areas that received four SMC cycles; #areas that received five SMC cycles; DOT: Directly observed therapy

Conclusion

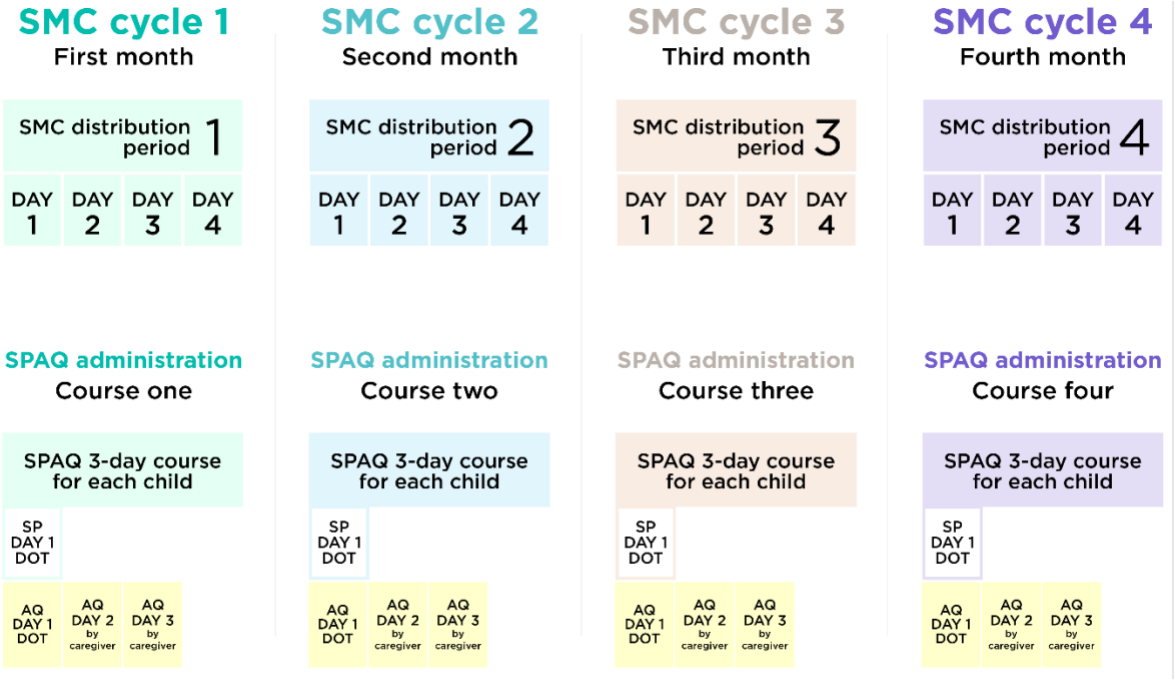
Estimates show that very high levels of SMC coverage and quality were maintained across the programme in 2023 across the seven supported countries. Identified gaps provide opportunities for programme improvement and adaptations for optimising SMC delivery in 2024. Methodological limitations in the estimation coverage and the extent to which SMC delivery adhered to quality standards in 2023 are also opportunities for refining M&E methods in future campaigns.

1. Introduction

Sub-Saharan Africa experiences the highest burden of malaria incidence, morbidity and mortality during the rainy season, with a disproportionate risk of severe disease and deaths among young children and pregnant women.[1,2] Seasonal malaria chemoprevention (SMC) is an intervention intended to protect 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 cycles during the high malaria transmission season.[3] A growing body of evidence from research, including randomised controlled 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, 5,6]

SMC is typically delivered in yearly rounds of four or five cycles during the peak of the rainy season: approximately July to October in the Sahel and December/January to March/April in countries in the Southern Hemisphere like Mozambique, with distribution periods approximately 28 days apart. 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 assigned a supervisor whose role is to ensure that activities are carried out in accordance with established SMC delivery standards. Supervisors are usually salaried facility-based health workers, who themselves receive training. In addition to the door-to-door distribution approach, fixed distribution points, for example in marketplaces, are sometimes used to maximise programme reach, for example in urban areas.

Figure 1. Illustration of schedule for a typical 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 their community distributor or community health worker to receive a replacement dose. Community distributors also provide information to caregivers on how to record the administered doses on the SMC child record card.

Community distributors receive training on methods to determine a child's age to ensure that only age-eligible children receive SMC medicines during monthly campaigns. 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.[7] 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. 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 philanthropic SMC programme in 2023

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. The majority of the organisation's funding for SMC comes from philanthropic sources, primarily as a result of being awarded Top Charity status by GiveWell, a non-profit dedicated to finding outstanding giving opportunities and publishing the full details of its analysis to help donors decide where to give. Based on micro-planning estimates, a total of 17,070,262 children were targeted by philanthropically funded or co-funded SMC programmes supported by Malaria Consortium in 2022. The countries included Burkina Faso, Chad, Mozambique. Nigeria, South Sudan, Togo, and Uganda (**Figure 2**). For a detailed account of how Malaria Consortium used philanthropic funding for SMC in 2023, refer to our 2023 SMC Philanthropy Report.[8]

The 17,070,262 children targeted in 2023 represent an increase of 14.6 percent from the 14,897,968 target population in 2022.[9] The increase was driven by population growths in the cohort of eligible children across countries, as well the scale up of SMC delivery in Mozambique (from four districts in 2022 to 27 districts in 2023) and South Sudan where SMC was delivered in one additional county in the country's Northern Bahr El Ghazal region during the 2023 round. Of the total target population, 2,183,054 were targeted in 29 districts across six regions in Burkina Faso; 1,364,199 in 27 districts across six regions in Chad; 1,294,464 in 23 districts in Nampula province in Mozambique; 11,501,015 in 154 local government areas (LGAs) across eight states and the Federal Capital Territory (FCT) in Nigeria; 61,986 in two counties in the Northern Bahr el Ghazal region of South Sudan; 513,148 in 19 districts in Togo; and 153,995 in five districts in the Karamoja region of Uganda.

Figure 2. Countries where Malaria Consortium supported SMC in 2023

Countries and sub-national regions/states covered by Malaria Consortium's philanthropically funded or co-funded SMC programme in 2023, dates of SMC rounds, and estimated target populations are shown in **Table 1**.

Table 1. Malaria Consortium's SMC programme supported by full or partial philanthropic funding in 2023 by number of children targeted for SMC delivery and funding source

Country	Dates of SMC round	Areas covered and funder	Number of children targeted (mean per cycle)
Burkina Faso	June–October 2023	29 health districts in seven regions: Cascades,[PF] Centre,[PF] Centre Nord,[UNICEF/PF] Centre Sud,[PF] Hauts Bassins,[PF] and Plateau Central[PF]	2,183,054 (cycles 2–5), of which 109,548 were jointly supported by UNICEF

Chad	July–October 2023	27 health districts in six regions: Barh el Gazel,[PF] Batha,[PF] Chari Baguirmi,[PF] Hadjer Lamis,[PF] Mayo Kebbi Est,[PF] and N'Djamena[PF]	1,364,199
Mozambique*	January 2023– June 2023	23 districts in one region: Nampula[PF]	1,294,464
Nigeria	June–November 2023	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]	11,499,416 (cycles 2–5), of which around 300,476 were co-funded by KOICA in two LGAs
South Sudan	August–November 2023	Two counties (Aweil South and Aweil West) in one region: Northern Bahr El Ghazal[PF]	61,986
Togo	July–October 2023	19 districts in three regions: Savanes,[UNICEF/PF] Kara,[GF/PF] Centrale,[GF/PF]	513,148, of which 311,547 were jointly supported by the GF, while 201,601 were jointly supported by UNICEF
Uganda	May–September 2023	Five districts (Amudat, [PF] Kotido,[PF] Moroto, [PF] Nabilatuk,[PF] and Nakapiripirit, [PF]) in one region: Karamoja	153,995
		Programme total	17,070,262

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.

* Note that this report includes target population figures for Mozambique for the high transmission season for which coverage figures are available at the time of writing, i.e., the 2022/23 season. In contrast, the 2023 SMC philanthropy report provides target population figures for Mozambique for the high transmission season that started in 2023, i.e., the 2023/24 season, which was ongoing at the time of writing. Also note that while this report presents exact target population estimates, the 2023 philanthropy report presents target population estimates rounded to the nearest 10,000.

Most areas were supported wholly by philanthropic funding, while the remaining areas were supported through co-funding with philanthropic and other funding sources. In the Centre Nord

region of Burkina Faso, 109,548 children were targeted in two districts with co-funding from the UNICEF. A population of 300,476 children targeted with support from KOICA in two LGAs in the state of Bauchi in Nigeria. In Centrale and Kara regions of Togo, SMC was delivered targeting 311,547 children with co-funding from the Global Fund, while 201,601 were jointly supported by UNICEF in Savanes region.

SMC was delivered in four monthly cycles in all supported districts in Chad, Mozambique, and Togo. Four cycles were delivered in parts of Burkina Faso and Nigeria, while five cycles were delivered in some areas in both countries with longer high-transmission seasons. In Burkina Faso, a fifth cycle was delivered in the southern districts in Cascades and Hauts Bassins regions (except the district of Dande), and in Pô district of the Centre-Sud region. In Nigeria, the states of Bauchi, Kogi, Nasarawa, Oyo and Plateau and the FCT received five cycles, while the states of Borno, Kebbi and Sokoto received four cycles. In Uganda, five cycles were delivered in all five supported districts. In South Sudan, the two supported counties received four SMC cycles instead of the planned five cycles due to a delayed start of the round owing to the late arrival of SMC medicines in-country. In practice, in countries where there is sub-national variation in the number of cycles, all areas receiving 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 where four cycles were delivered is referred to as 'cycle 2'. Consequently, the final cycle is referred to as 'cycle 5' in all supported areas within countries with such sub-national variation irrespective of the number of cycles delivered.

1.2 Objectives of this report

This report summarises estimates of coverage and quality of SMC implementation in areas supported by Malaria Consortium's SMC programme in 2023, including results from administrative 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 programme and quality of SMC delivery in 2023
- Provide a summary of programme coverage and degree of adherence to the programme's protocols in the period under review
- Provide recommendations on potential adaptations to SMC M&E methods for estimating coverage and quality of delivery for the 2024 and future campaigns.

Results are presented from all areas where Malaria Consortium implemented SMC in 2023 with full or partial philanthropic funding.

2. Methods

Malaria Consortium is committed to rigorously monitoring and evaluating the performance of its SMC programme. This enables the programme to track progress, while identifying successes and areas where improvements can be made; be confident that the implementation model is effective in reaching the target population and having the intended impact; and ensure accountability to stakeholders. A global framework guides M&E approaches, enabling the programme to strengthen and harmonise M&E methods, tools and processes across countries and implementation settings.[10] The framework specifies a range of indicators for each of the programme's seven core performance objectives: supply and demand; fidelity; acceptability; safety; coverage; quality; and decision making. Depending on indicators, different M&E methods are employed including quantitative, qualitative and mixed methods designs.

2.1 Administrative coverage

Administrative coverage was calculated by dividing the total number of SPAQ courses administered in a given cycle by the estimated target population of children 3–59 months. It is thus expressed as a percentage of the target population, both overall (3-59 months) and disaggregated by age group (i.e., 3–<12 months and 12–59 months, representing the two age-based formulations of SPAQ).

Target population sizes were derived from microplanning estimates. The quantity of SPAQ courses distributed was estimated using the SMC tally sheet method based on tally sheets completed and submitted by SMC community distributors. Administrative coverage was estimated based on routine monitoring forms referred to as SMC tally sheets in all countries. This reflects progress made with harmonising administrative coverage estimation methods as against previous years in which stock reconciliation data were used in places where tally sheet data were either incomplete or unavailable.

It is important to note that administrative coverage estimated using this method may exceed 100 percent. This may be due to several factors, including inaccuracies in the denominator (target population estimates) and unforeseen population movements such as in nomadic populations or internally displaced populations. Another reason why administrative coverage may exceed 100 percent is the administration of SMC medicines to ineligible children, which could inflate the numerator (number of children reached in each cycle).

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 from all the daily summary forms onto end-of-cycle reports. Information was then aggregated by

dedicated M&E staff at district and/or LGA level, to allow calculations of the number of children who received SMC in each country (and by state in the case of Nigeria) by cycle. Tally sheet data were used to give estimates of SMC programme coverage in each country and Nigerian state, defined as the proportion of eligible children 3–59 months who had received day 1 SPAQ through community distributors.

There were remarkable improvements made to the SMC tally sheet and administrative coverage estimation processes since 2022, including the digitalisation of records and reporting in two states in Nigeria and Togo with the aim of improving data accuracy and timeliness of reporting.

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 suboptimal in 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 programme coverage for the purposes of this report given the limited reliability of the cards as data sources.

2.2 Household coverage and quality monitoring surveys

To obtain more reliable measures of programme coverage and quality, Malaria Consortium conducts two types of post-cycle household surveys: end-of-cycle (EoC) surveys following all but the final monthly cycles and independent and more comprehensive end-of-round (EoR) surveys conducted following the final cycle. Both survey types enable collection of data for monitoring coverage and quality of SMC implementation in each monthly cycle.

In line with the programme's M&E framework, SMC survey coverage can be defined in various ways. Considering 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 fixed distribution points, and illegitimate sources of SPAQ, such as through private purchase). The EoC and EoR surveys also enable the monitoring of SMC quality (including caregiver SMC awareness, knowledge and perceptions) and safety indicators.

All surveys were administered using data forms in SurveyCTO (version 2.81), 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 for use in Mozambique. When required to aid respondents' comprehension, questionnaires were further translated into local languages by data collectors at the household level.

Survey questionnaires were based on those used in previous rounds, with adaptations to suit each country's specific context; for example, by changing terminology used to reflect differences in local administrative units, local usage of French, or programme 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.

2.2.1 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 2023, EoC surveys were conducted and supervised by Malaria Consortium staff in all countries, with the exception of Chad where a consultant was contracted to coordinate surveys due to in-country M&E capacity constraints. 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.

Rationale and design

EoC surveys employed the 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 local level.[11] LQAS is an efficient sampling method that enables rapid monitoring of a programme against pre-determined targets, while facilitating timely generation of local evidence to aid decision-making for programme improvement. In the context of public health programs such as SMC, LQAS subdivides programme implementation areas into smaller functional areas (such as health facility catchment areas) referred to as 'supervision areas' (SAs).[12] 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 programme improvements (i.e. between monthly SMC cycles).[12]

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.[10] Decision criteria are defined as proportions of units (i.e. compounds) per SA below which action is considered necessary to improve programme 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, programme 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 programme 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 sensitisation 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 harmonise the conduct of surveys across countries in 2023, 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 2023. Where EoC surveys were conducted, they were all completed within two weeks of the preceding cycle. This provided a consistent two-week window before the next cycle to process and analyse data, identify programme 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. The timely implementation of EoC surveys also helped to minimise the risk of recall bias in the estimation of programme coverage.

EoC survey objectives, and indicators

As in previous years, EoC surveys using LQAS methods had two main goals, the first of which was to determine whether SAs had met each of the priority indicator targets. The second goal was to provide summaries of key indicators at above-SA levels, including district/LGA, state/regional, and country levels. **Table 2** outlines the priority coverage and quality indicators assessed in EoC surveys, with their LQAS specifications.

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

2.2.2 EoC survey 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 and Uganda, where wards were used instead. A major improvement to the EoC survey during 2023 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 following a systematic random sampling approach using 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 obtain a household list, the traditional 'spin the pen' systematic random sampling method was used.[14]

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 typically conducted in the country's official language using questionnaires provided by Malaria Consortium. Where it was necessary to interview respondents in local languages, data collectors provided on-the-spot translation from the English, French, or Portuguese questionnaire.

The same survey design and sampling approaches (including the sampling of 25 households per supervision area) were followed in all countries, with context-specific adaptions as outlined for each country below. Note that in countries survey lots are randomly sampled in each cycle (such as Burkina Faso and Togo) due to limited capacity to sample all lots. In such cases, sampling frames may differ from cycle to cycle and only examples from a one cycle are illustrated in this report.

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

Eighty 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. 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 sampled.

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 803 health facility catchment areas in the 29 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. Districts determined to be inaccessible due to insecurity or other operational constraints during survey periods were excluded from the survey sampling frames, as was the case for the districts of Barsalogho 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 2023 end-of-cycle surveys, Burkina Faso (cycle 4 example)

Region	Health district	Number of health facilities	Number of supervision areas	Target number of households sampled
Cascades	Banfora	49	4	100
	Sindou	33	2	50
Centre	Sig-Nonghin	30	5	125
	Bogodogo	39	11	275
	Boumiougou	47	1	25
	Nongremassom	10	5	125
	Baskuy	16	5	125
Centre Nord	Kongoussi	50	4	100
	Kaya	52	5	125
	Boussouma	32	3	75
Centre Sud	Kombissiri	39	1	25
	Sapone	26	1	25
	Po	34	2	50
	Manga	49	3	75
Hauts-Bassins	Karangasso Vigue	11	2	50
	Dande	39	2	50
	Dafra	18	5	125
	Do	33	8	200
	Hounde	43	3	75
	Orodara	44	3	75
Plateau Central	Zorgho	73	4	100
	Bousse	36	1	25
Burkina Faso (Total)	n= 22	803	80	2,000

Chad (cycles 1, 2 and 3)

EoC surveys were carried out after cycles 1, 2 and 3 in Chad in 2023. The surveys were conducted by a consultant due to staffing issues and limited M&E capacity among Malaria Consortium's country team at the time. The survey was carried out in the six regions where the SMC programme was implemented, namely: Barh El Gazal, Batha, Chari Baguirmi, Hadjer Lamis, Mayo Kebbi East and N'Djamena. All health districts across the six regions 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 all health facility catchment areas in which SMC was delivered and resulted in a target sample size of 3,775 compounds across 456 health facility catchments- the final sample consisted of 3,213 compounds. 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 2023 end-of-cycle surveys, Chad (cycle 3 example)

Region	Health district	Number of health facilities	Number of supervision areas	Target number of households sampled
Chari Baguirmi	Ba-Illi	13	4	100
	Bousso	12	4	100
	Dourbali	18	6	150
	Mandelia	22	7	175
	Massenya	17	6	150
	Kouno	4	1	25
Hadjer Lamis	Bokoro	26	9	225
	Gama	10	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	9	3	75
	Gam	11	4	100
	Katoa	4	1	25

N'Djamena	N'Djamena Centre	19	6	150
	N'Djamena Est	24	8	200
	N'Djamena Nord	20	7	175
	N'Djamena Sud	30	10	250
	Toukra	18	6	150
Barh El Ghazal	Chaddra	19	6	150
	Michemire	14	5	125
	Moussoro	32	11	275
	Salal	14	5	125
Batha	Yao	19	6	150
Chad (total)	n=27	456	151	3,775

Mozambique (cycle 3)

EoC surveys were conducted after cycle 3 in Mozambique. It was not feasible to conduct EoC surveys following the earlier cycles due to insufficient internal capacity and constraints with the procurement of materials needed for the surveys. The surveys sampled from 242 SAs across the 23 districts in which SMC was delivered during 2023. 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 2023 end-of-cycle surveys, Mozambique (cycle 3)0

Province	District	Number of supervision areas	Target number of households sampled
Nampula	Nampula District	22	625
	Murrupula	8	200
	Rapale	8	200
	Mecuburi	13	325
	Ribaue	10	250
	Lalaua	8	200
	Malema	11	275
	Mogovolas	8	200
	Moma	11	275
	Larde	9	225
	Angoche	20	500
	Liupo	3	75
	Mogincual	6	150

	Muecate	11	275
	Meconta	8	200
	Nacaroa	7	175
	Memba	14	350
	Erati	11	275
	Monapo	17	425
	Mossuril	12	300
	Ilha de Moçambique	5	125
	Nacala Porto	13	325
	Nacala-á-Velha	6	150
Mozambique (Total)	n= 23	242	6,050

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

EoC surveys were conducted in all but the final cycles in Nigeria during 2023. 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. Sampling units in areas determined to be high risk due to insecurity or inaccessible due to other contextual factors during survey periods. Surveys were not conducted in Borno state following cycle 3 due to operational constraints.

Note that due to the sub-national variation in the number of cycles, all areas receiving five cycles started the SMC round earlier than areas implementing four cycles. Therefore, for the purposes of this report, the first cycle in areas that received five cycles is referred to as 'cycle 1,' while the first cycle of the SMC round in areas where four cycles were delivered is referred to as 'cycle 2'. Consequently, the final cycle is referred to as 'cycle 5' in all supported areas irrespective of the number of monthly cycles delivered.

Table 6. Sampling frame for 2023 end-of-cycle surveys, Nigeria (cycle 1 example)

State	Number of health facility catchment areas/wards sampled	Target number of households sampled
Bauchi	323	8,075
Borno	207	5,175
FCT	64	1,600

Kebbi	225	5,625
Kogi	239	5,975
Nasarawa	147	3,575
Oyo	60	1,500
Plateau	250	6,250
Sokoto	244	6,100
Nigeria (total)	1,759	43,875

South Sudan (cycles 1, 2 and 3)

EoC surveys were conducted three days after the end of every SMC distribution cycle in Aweil South and West counties. From the total of 53 bomas which constituted the supervision areas (23 in Aweil South and 30 in Aweil west counties), 40 bomas were randomly selected (20 in each county). In each selected boma, 25 eligible households were sampled **(Table 7)**. One age-eligible child was then sampled from each selected household to give a consistent boma sample size of 25 households/children. In bomas where there was an influx of populations (including SMC eligible children) displaced by the humanitarian situation in neighbouring Sudan, internally displaced person (IDP) camps in such bomas were included in survey sampling frames.

Table 7. Sampling frame for 2023 end-of-cycle surveys, South Sudan (cycle 1 example)

County	Health Facility	Number of supervision areas	Target number of households sampled
Aweil South	Panthou PHCC	2	50
	Nyieth PHCU	2	50
	Makueialel PHCU	1	25
	Tiaraliet PHCU	2	50
	Malekalel PHCC	2	50
	Wathmouk PHCU	2	50
	Wuncum PHCU	2	50
	Akach PHCU	1	25
	Mabior PHCU	1	25
	Alueth PHCU	1	25
	Aluel PHCU	1	25
	Macharkou PHCU	1	25
	Ayai PHCU	2	50
Aweil West	Nyamlel PHCC	2	50
	Marail Baai PHCC	2	50
	Aguat PHCU	1	25

	Amatngang PHCU	1	25
	Maker PHCU	1	25
	Goungnou PHCU	1	25
	Chelkou PHCC	1	25
	Nyinboulic PHCC	2	50
	MajokDengdit PHCU	1	25
	Mayomakuakrel PHCU	1	25
	Wungiir PHCU	1	25
	Udhum PHCC	1	25
	Anyoupjang PHCU	1	25
	Wedwil PHCU	2	50
	Maduany PHCU	2	50
South Sudan (Total)	n= 28	40	1000

PHCC: primary health care centre; PHCU: primary health care unit

Togo (cycles 1, 2, and 3)

Survey SAs were represented by health facility catchment areas. The sampling frame included 55 health facility catchment areas (including 165 localities) in 18 districts in cycle 1 (**Table 8**)**.** Notably, **c**ertain localities in the Savanes region were excluded from the sampling frame due to insecurity**.** Three villages were randomly selected from each locality, and eight or nine compounds were sampled from each to give a total of 25 compounds sampled per locality. Surveys aimed to sampled 25 eligible households in each locality and one age-eligible child sampled from each selected household.

Table 8. Sampling frame for 2023 end-of-cycle surveys, Togo (cycle 1 example)

Region	Health district	Number of health facilities	Number of supervision areas	Target number of households sampled
	Tône	6	18	156
	Kpendjal	0	0	0
	Cinkasse	2	6	50
	Kpendjal-Ouest	0	0	0
	Oti	4	12	101
	Oti-Sud	2	6	51
Savanes	Tandjoare	3	9	73
	Kozah	4	12	105
	Binah	4	12	102
	Assoli	1	3	27
	Bassar	4	11	101

	Dankpen	2	7	58
Kara	Doufelgou	5	15	75
	Keran	2	6	50
	Tchamba	2	6	51
	Tchaoudjo	6	18	156
	Mô	2	6	50
Centrale	Blitta	1	3	25
	Sotouboua	5	15	125
Togo (total)	n= 18	55	165	1,406

Uganda (cycles 1, 2, 3 and 4)

EoC surveys were conducted in the five districts that were exclusively or primarily supported with philanthropic funding (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk). As in 2022, 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 (**Table 9**).

Table 9. Sampling frame for 2023 end-of-cycle surveys, Uganda (cycle 1 example)

Region	Health district	Number of supervision areas	Target number of households sampled
Karamoja	Amudat	10	250
	Kotido	16	400
	Moroto	12	300
	Nabilatuk	6	150
	Nakapiripirit	12	300
Uganda (Total)	n= 5	56	1,400

2.2.3 End-of-round surveys

EoR surveys were conducted following the last cycle in all countries where Malaria Consortium supported SMC implementation during 2023. The 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: Institute of Population Science
- Chad: Cabinet CREIDS
- Nigeria: Qualiquant Services Limited
- Mozambique: N&K Consultants
- South Sudan: Devcom Consult Limited
- Togo: Cabinet LMDE

- Uganda: Afrotech Management Consult Limited

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. Sampling units in areas that were deemed inaccessible due to insecurity or other operational factors were excluded and replaced. Compounds in which residents refused or were unable to participate, or without a child aged under five years, were resampled. Interviews were conducted in official languages (English, French and Portuguese) using questionnaires provided by Malaria Consortium, with data collectors providing local language translations as needed and assigning responses to predefined answer categories in SurveyCTO.

EoR survey 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 2023 SMC campaign. The surveys were designed to meet the following objectives:

- To assess programme 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 programme 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 indicators were similar to those assessed in EoC survey, as outlined earlier in **Table 2**. In addition to those, EoR surveys enabled the estimation of the proportion of eligible children who received SPAQ in all monthly cycles of the round. 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 previous rounds, additional variables were included in the EoR surveys to facilitate further analyses to better understand how Malaria Consortium's SMC programme works and to answer specific research questions or obtain additional contextual information on SMC campaigns. These additional variables included those relating to the coverage and use of insecticide-treated nets; malaria testing and treatment-seeking for febrile children; coverage of SMC in nomadic populations in Chad, and caregiver satisfaction with the engagement of SMC community distributors during household visits (Nigeria, Togo, and Burkina Faso)

EoR survey design, sampling methods and survey implementation

EoR surveys employed multi-stage random samples of households in areas covered by Malaria Consortium's philanthropic SMC programme, and they were intended to achieve a representative sample of the target population at country level (or administrative units supported by Malaria Consortium's philanthropic SMC programme) and at (state level in Nigeria. 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 seven EoR surveys, only one child was sampled for questions related to both coverage and adherence to delivery SMC standards. This method was statistically efficient, due to the likely high within-household correlation of coverage status among eligible children.

To ensure representative results, the surveys required a sample of 75 clusters, each comprising 20 households, making a total of 1500 household for each country (or state in the case of Nigeria). The sample size was determined based on the following parameters and assumptions:

- Estimated coverage rate: 75-80%.
- Confidence level: 95%
- Margin of error: 5%
- Number of households in each cluster: 20
- Inter-cluster correlation: 0.2
- Design effect: 4.8
- Non-response rate: 5%.
- Without finite population correction

All EoR surveys were conducted in November to December 2023 in Burkina Faso, Chad, Nigeria, South Sudan, Togo, and Uganda. In Mozambique, the EoR survey was implemented in June 2023. All district-level administrative units 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 and Togo, they were resampled or replaced.

EoR survey 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 districts supported by Malaria Consortium in 2023, distributed across six regions: Cascades, Centre, Centre-North, Centre-South, Hauts-Bassins and Plateau Central. To ensure that the sample was representative at the country level, 75 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 2023 **(Table 10).** 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 10. Sampling frame for 2023 end-of-round surveys, Burkina Faso

Region	Health district	Number of health facilities	Number of supervision areas	Target number of compounds Surveyed
Cascades	Sindou	33	2	40
	Mangodara	26	2	40
Centre	Sig-Nonghin	30	5	100
	Bogodogo	39	9	180
	Boumiougou	47	10	200
	Baskuy	16	3	60
Centre Nord	Kaya	52	3	60
	Boussouma	32	6	120
Centre Sud	Kombissiri	39	2	40
	Po	34	1	20
	Manga	49	2	40
Hauts-Bassins	Dande	39	3	60
	Dafra	18	5	100
	Do	33	8	160
	Hounde	43	2	40
	Orodara	44	1	20
Plateau Central	Zorgho	73	3	60
	Ziniaré	72	2	40
	Bousse	36	2	40
Burkina Faso (Total)	n= 19	803	75	1,500

Chad

In Chad, the survey was conducted in the 27 supported districts across six regions. To ensure representativeness, a sample of 1,500 children from 1500 households (1 child/household) were sampled from 75 clusters (20 households per survey cluster in accordance with the cluster size recommended in the survey protocol).

Cluster selection was based on probability proportional to population size. As a first step, an exhaustive list of all the target districts in the Malaria Consortium intervention area and the number of corresponding health centres was drawn, and a total of 456 health centres were identified for all districts. To obtain the 75 clusters, we applied a probability proportional to size and these are divided into supervision zones. Within each cluster, five villages were sampled, and within each village, four randomly selected households per village were surveyed. This approach allowed to obtain 20 households in each cluster and to reach a size of 1500 households (**Table 11**).

Table 11. Sampling frame for 2023 end-of-round surveys, Chad

Region	Health district	Target number of compounds surveyed
Chari Baguirmi	Ba-Illi	40
	Bousso	40
	Dourbali	60
	Kouno	20
	Mandelia	80
	Massenya	60
Hadjer Lamis	Bokoro	80
	Gama	40
	Karal	40
	Mani	40
	Massaguet	60
	Massakory	60
Kebbi Mayo Est	Bongor	80
	Gam	40
	Guelendeng	40
	Katoa	20
	Moulkou	40
N'Djamena	N'Djamena Centre	60
	N'Djamena Est	80
	N'Djamena Nord	60

	N'Djamena Sud	100
	Toukra	60
Barh El Ghazal	Barh Elgazal	240
	Chaddra	60
	Michemire	40
	Moussoro	100
Batha	Yao	60
Chad (Total)	n=27	1,500

Mozambique

In Mozambique, survey samples were self-weighted within districts (with clusters selected with probability proportional to sample size). The main sampling frame for the selection process was a list of enumeration areas in all 23 SMC districts. First, 67 clusters were randomly selected using probability proportional to size. This allowed for a self-weighted sample. Clusters were the primary unit of sampling through which households and eligible children were selected randomly. Second, from each selected cluster, 20 household with age-eligible children (aged 3 – 59 months) (**Table 12**), and 15 households with ineligible children (aged 60 – 119 months) were selected independently. Note that sampling strategy here was such that older ineligible children (aged 60 – 119 months) were sampled irrespective of whether they resided in the same households as eligible children, unlike in other countries (except Uganda) where older ineligible children were sampled opportunistically in the same households as eligible children. The survey was thus more representative of older ineligible children than those based on opportunistic sampling.

Table 12. Sampling frame for 2023 end-of-round surveys, Mozambique

Province	District	Number of Clusters	Target number of compounds
Nampula	Angoche	5	100
	Cidade de Ilha de Mocambique	1	20
	Cidade de Nampula	5	100
	Erati	5	100
	Lalaua	1	20
	Larde	1	20
	Liupo	2	40
	Malema	3	60
	Meconta	4	80
	Mecuburi	4	80

	Memba	5	100
	Mogincual	2	40
	Mogovolas	5	100
	Moma	3	60
	Monapo	2	40
	Mossuril	2	40
	Muecate	2	40
	Murrupula	2	40
	Nacala Porto	4	80
	Nacala Velha	1	20
	Nacaroa	2	40
	Rapale	2	40
	Ribaue	4	80
Mozambique (Total)	n= 23	67	1,340

Nigeria

EoR surveys were designed to be representative at the state level. 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 13**). At the state level, single-stage sampling was used to select 66 enumeration areas (cluster units) in each of the eight states and the FCT, with probability proportional to population size. At the second stage, 20 eligible households were be selected from each selected cluster using a systematic 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.[15]

Table 13. Sampling frame for 2023 end-of-round surveys, Nigeria

State	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

South Sudan

To ensure representative results, a sample of 1,500 households in 75 clusters of 20 households each was required for the survey. The sample size was determined based on parameters and assumptions, including an estimated coverage rate of 75-80%, a confidence level of 95%, a margin of error of 5%, and a non-response rate of 5%, without finite population correction.

The survey employed a multi-stage random sampling method in areas covered by Malaria Consortium's SMC programme, aiming for a representative sample of the target population in Aweil South and West, Northern Bahr el Ghazal state. The clusters were selected with a probability proportional to their population. Using a spreadsheet, at least 75 clusters were randomly generated. The selection was done in a single phase without stratification. Malaria Consortium provided a list of clusters selected to the research assistants who sampled 20 households in each site. **Table 14** shows sampling frame employed for the EoR survey.

In each household, eligible children between 3 and 59 months were listed, and a child was randomly selected for the survey. For older children (5-9 years), selected for specific questions, the interviewers assessed the level of receipt of SMC medicines among ineligible children. On average, each cluster was located 7.9 km from its health centre. In surveys where there was an influx of populations (including SMC eligible children) displaced by the humanitarian situation in neighbouring Sudan, IDP camps in such clusters were included in the survey sampling frame.

Table14. Sampling frame for 2023 end-of-round surveys, South Sudan

County	Health Facility	Number of supervision areas	Target number of compounds surveyed
Aweil South	Panthou PHCC	2	40
	Nyieth PHCU	3	60
	Makueialel PHCU	2	40
	Tiaraliet PHCU	3	60

	Malekalel PHCC	3	60
	Wathmouk PHCU	5	100
	Wuncum PHCU	3	60
	Akach PHCU	3	60
	Mabior PHCU	3	60
	Alueth PHCU	2	40
	Aluel PHCU	1	20
	Macharkou PHCU	2	40
	Ayai PHCU	3	60
Aweil West	Nyamlel County Hosp	5	100
	Marail Baai PHCC	4	80
	Aguat PHCU	2	40
	Amatngang PHCU	1	20
	Maker PHCU	2	40
	Goungnou PHCU	2	40
	Chelkou PHCC	4	80
	Nyinboulic PHCC	2	40
	MajokDengdit PHCU	2	40
	Mayomakuakrel PHCU	3	60
	Wungiir PHCU	2	40
	Udhum PHCC	4	80
	Anyoupjang PHCU	2	40
	Wedwil PHCU	2	40
	Maduany PHCU	3	60
Total	n=28	75	1,500

PHCC: primary health care centre; PHCU: primary health care unit

Togo

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 2023 (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 Programme) were entered into the tool, which selected 75 clusters for 2023 EoR survey with probability

proportional to their population size (**Table 15**). A total of 20 compounds was randomly sampled in each selected cluster.

Table 15. Sampling frame for 2023 end-of-round surveys, Togo

Region	Health district	Number of clusters (localities) sampled	Target number of compounds surveyed
Savanes	Tône	10	200
	Kpendjal	0	0
	Cinkasse	4	80
	Kpendjal-Ouest	4	80
	Oti	5	100
	Oti-Sud	4	80
	Tandjoare	4	80
Kara	Kozah	8	160
	Binah	2	40
	Assoli	2	40
	Bassar	4	80
	Dankpen	4	80
	Doufelgou	3	60
	Keran	4	80
Centrale	Tchamba	4	80
	Tchaoudjo	7	140
	Mô	1	20
	Blitta	3	60
	Sotouboua	2	40
Togo (total)	n=19	75	1,500

Uganda

A total of 75 clusters were selected with probability proportional to population size from all districts where SMC was delivered in 2023, with 42 clusters in the five districts supported with full or partial philanthropic funding (**Table 16**). Twenty households with SMC eligible children were randomly selected in each selected cluster. Furthermore, a sample of 1,000 ineligible children were selected for a few indicators pertaining to the level of receipt of SMC medicines among ineligible children. Note that sampling strategy here was such that older ineligible children were sampled irrespective of whether they resided in the same households as eligible children, unlike in other countries (except Mozambique) where older ineligible children were sampled opportunistically in the same

households as eligible children. The survey was thus more representative of older ineligible children 60–119 months than those based on opportunistic sampling of older children.

Table 16 shows the sampling frame for the five districts supported with philanthropic funding.

Table 16. Sampling frame for 2023 end-of-round surveys, Uganda

Region	Health district	Number of sub-counties	Number of clusters	Target number of compound surveyed
Karamoja	Amudat	8	8	264
	Nakapiripirit	8	8	264
	Moroto	8	8	264
	Kotido	10	10	350
	Nabilatuk	8	8	264
Uganda (total)	n= 5	42	42	1,406

2.3 Data analysis

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 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 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

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 in **Table 17** for Burkina Faso, Chad, Mozambique, South Sudan, Togo, and Uganda and in **Table 18** for Nigeria.

Based on combined estimates for all countries a mean of 17,440,950 courses of SPAQ were distributed per cycle across all seven SMC-implementing countries supported by Malaria Consortium in 2023. Based on the target population of 17,070,262 eligible children, this represents an administrative coverage estimate of 102.2 percent.

In Burkina Faso, a mean of 2,416,614 courses of SPAQ were distributed per cycle based on tally sheet data, representing an administrative coverage estimate of 110.7 percent of the target population of 2,183,054 age-eligible children per cycle in 2023.

A total of 1,364,199 age-eligible children were targeted per cycle in Chad during 2023, while a mean of 1,384,351 courses of SPAQ were distributed per cycle. This represents an administrative coverage estimate of 101.5 percent.

In Mozambique, a mean of 1,299,323 courses of SPAQ were distributed per cycle representing an administrative coverage estimate of 100.4 percent of the population of 1,294,464 age-eligible children targeted per cycle in 2023.

The mean courses of SPAQ provided by community distributors across the nine Nigerian states was 11,670,786 per cycle, resulting in an administrative coverage estimate of average of 101.5 percent of the target population of 11,499,413 age-eligible children in 2023.

In South Sudan, a mean of 68,807 courses of SPAQ were distributed based on tally sheet data, given an administrative coverage estimate of 111.0 percent of the population of 61,986 eligible children targeted in 2023.

In Togo, a mean of 453,159 courses of SPAQ were distributed based on tally sheet data, representing a mean administrative coverage estimate of 88.3 percent of the population of 513,148 age-eligible children targeted in 2023.

In Uganda, a mean of 154,219 courses of SPAQ were distributed based on tally sheet data, resulting in an administrative coverage estimate of 100.1 percent of the population of 153,995 eligible children targeted in 2023.

Table 17. Administrative coverage by country, cycle and age group (tally sheet method)

Country		Age group	Target population	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 (11 districts)	3–<12 months	125934	104295	82.8%									104295	82.8%
		12–59 months	532998	541114	101.5%									541114	101.5%
		3–59 months	658932	645409	97.9%									645409	97.9%
	All districts (29 districts)	3–<12 months	415581			378461	91.1%	389383	93.7%	391752	94.3%	405025	97.5%	391155	94.1%
		12–59 months	1767468			1960097	110.9%	2022732	114.4%	2043199	115.6%	2075807	117.4%	2025459	114.6%
		3–59 months	2183049			2338558	107.1%	2412115	110.5%	2434951	111.5%	2480832	113.6%	2416614	110.7%
Chad		3–<12 months	272839	265519	97.3%	269824	98.9%	271595	99.5%	270574	99.2%			269378	98.7%
		12–59 months	1091360	1090972	100.0%	1113075	102.0%	1128321	103.4%	1127523	103.3%			1114973	102.2%
		3–59 months	1364199	1356491	99.4%	1382899	101.4%	1399916	102.6%	1398097	102.5%			1384351	101.5%
Mozambique		3–<12 months	284783	421862	148.1%	341581	119.9%	247125	86.8%	301875	106.0%			328111	115.2%
		12–59 months	1009681	936579	92.8%	968448	95.9%	963835	95.5%	1015985	100.6%			971212	96.2%

		3–59 months	1294464	1358441	104.9%	1310029	101.2%	1210960	93.5%	1317860	101.8%			1299323	100.4%
South Sudan		3–<12 months	10537	13000	123.4%	14376	136.4%	13731	130.3%	13938	132.3%			13761	130.6%
		12–59 months	51449	48040	93.4%	55823	108.5%	57411	111.6%	58909	114.5%			55046	107.0%
		3–59 months	61986	61040	98.5%	70199	113.2%	71142	114.8%	72847	117.5%			68807	111.0%
Togo*		3–<12 months	66,597	ND	ND	ND	ND	ND	ND	ND	ND			ND	ND
		12–59 months	408167	ND	ND	ND	ND	ND	ND	ND	ND			ND	ND
		3–59 months	513148	427547	83.3%	448095	87.3%	473009	92.2%	463986	90.4%			453159	88.3%
Uganda	**All districts**	3–<12 months	36679	36304	99.0%	35498	96.8%	36270	98.9%	37342	101.8%	36901	100.6%	36463	99.4%
		12–59 months	117316	116129	99.0%	117788	100.4%	118604	101.1%	117849	100.5%	118411	100.9%	117756	100.4%
		3–59 months	153995	152433	99.0%	153286	99.5%	154874	100.6%	155191	100.8%	155312	100.9%	154219	100.1%

ND: no data available (no age-disaggregated date was provided for Togo as those were yet to be validated by the country's national malaria programme at the time of writing this report)

Table 18. Administrative coverage by Nigerian state, cycle and age group (tally sheet method) in 2023

Country and state		Age group	Target population	cycle 1		cycle 2		cycle 3		cycle 4		cycle 5		Mean	
				Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage	Doses	Coverage
Nigeria	Bauchi	3–<12 months	394852	407764	103.3%	411891	104.3%	412964	104.6%	414004	104.9%	414232	104.9%	412171	104.4%
		12–59 months	1689088	1693770	100.3%	1706514	101.0%	1708574	101.2%	1709848	101.2%	1710296	101.3%	1705801	101.0%
		3–59 months	2083940	2101534	100.8%	2118405	101.7%	2121538	101.8%	2123852	101.9%	2124528	101.9%	2117972	101.6%
	Borno	3–<12 months	444093	430104	96.8%	433932	97.7%	435378	98.0%	435259	98.0%	-	-	433669	97.7%
		12–59 months	1899731	1833293	96.5%	1837765	96.7%	1841685	96.9%	1841635	96.9%	-	-	1838595	96.8%
		3–59 months	2343824	2263397	96.6%	2271688	96.9%	2277063	97.2%	2276894	97.1%	-	-	2272261	96.9%
	FCT	3–<12 months	173367	169093	97.5%	173401	100.0%	177638	102.5%	176836	102.0%	161009	92.9%	171596	99.0%
		12–59 months	741626	736660	99.3%	744261	100.4%	771839	104.1%	778507	105.0%	698689	94.2%	745992	100.6%
		3–59 months	914993	905753	99.0%	917662	100.3%	949477	103.8%	955343	104.4%	859698	94.0%	917587	100.3%
	Kebbi	3–<12 months	260057	275453	105.9%	276080	106.2%	276142	106.2%	276796	106.4%	-	-	276118	106.2%
		12–59 months	1112465	1122146	100.9%	1119959	100.7%	1128797	101.5%	1123554	101.0%	-	-	1123614	101.0%

	3–59 months	1372522	1397599	101.8%	1396039	101.7%	1404939	102.4%	1400350	102.0%	-	-	1399732	102.0%
Kogi	3–<12 months	223555	241770	108.1%	276238	123.6%	274600	122.8%	274956	123.0%	243274	108.8%	262168	117.3%
	12–59 months	956318	969908	101.4%	1033045	108.0%	1030417	107.7%	1015088	106.1%	972630	101.7%	1004218	105.0%
	3–59 months	1179873	1211678	102.7%	1309283	111.0%	1305017	110.6%	1290044	109.3%	1215904	103.1%	1266385	107.3%
Nasarawa	3–<12 months	176031	182312	103.6%	183623	104.3%	183544	104.3%	184169	104.6%	184671	104.9%	183664	104.3%
	12–59 months	753021	760911	101.0%	763189	101.4%	763570	101.4%	764177	101.5%	764558	101.5%	763281	101.4%
	3–59 months	929052	943223	101.5%	946812	101.9%	947114	101.9%	948346	102.1%	949229	102.2%	946945	101.9%
Oyo	3–<12 months	58200	58564	100.6%	58167	99.9%	58482	100.5%	58514	100.5%	58086	99.8%	58363	100.3%
	12–59 months	248966	246515	99.0%	246354	99.0%	247021	99.2%	246863	99.2%	245896	98.8%	246530	99.0%
	3–59 months	307166	305079	99.3%	304521	99.1%	305503	99.5%	305377	99.4%	303982	99.0%	304892	99.3%
Plateau	3–<12 months	189599	198667	104.8%	196549	103.7%	196873	103.8%	196743	103.8%	197049	103.9%	197176	104.0%
	12–59 months	811061	82769	10.2%	829794	102.3%	830758	102.4%	833129	102.7%	833555	102.8%	682001	84.1%
	3–59 months	1000660	1026362	102.6%	1026343	102.6%	1027631	102.7%	1029872	102.9%	1030604	103.0%	1028162	102.7%
Sokoto	3–<12 months	259083	271893	104.9%	274519	106.0%	274720	106.0%	290072	112.0%	-	-	277801	107.2%

		12–59 months	1108300	1120230	101.1%	1122443	101.3%	1127046	101.7%	1186480	107.1%	-	-	1139050	102.8%
		3–59 months	1367383	1392123	101.8%	1396962	102.2%	1401766	102.5%	1476552	108.0%	-	-	1416851	103.6%
	Total	3–<12 months	2178837	2235620	102.6%	2284400	104.8%	2290341	105.1%	2307349	105.9%	1258321	103.5%	2272725	104.3%
		12–59 months	9320576	8566202	91.9%	9403324	100.9%	9449707	101.4%	9499281	101.9%	5225624	100.5%	9249081	99.2%
		3–59 months	11499413	11546748	100.4%	11687715	101.6%	11740048	102.1%	11806630	102.7%	6483945	101.1%	11670786	101.5%

3.2 Coverage surveys

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

3.2.1 Households with eligible children visited by a community distributor

Tables 19–21 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, with relatively levels seen in Mozambique and some Nigerian states (**Tables 19–21**). The trend was in keeping with those observed in the previous round in 2022.

In Burkina Faso, the proportion of households with eligible children visited by a community distributor in 2023 was 96.9 percent (95% CI: 96.0–97.6), 98.3 percent (95% CI: 97.6–98.7), 99.0 percent (95% CI: 98.5–99.4), 98.3 percent (95% CI: 97.6–98.7) and 97.1 percent (95% CI: 95.6–98.0) during cycles 1, 2, 3, 4 and 5, respectively.

In Chad, the proportion of eligible households visited by a community distributor was 94.4 percent (95% CI: 93.5–95.2), 94.7 percent (95% CI: 93.9–95.4), 97.6 percent (95% CI: 97.0–98.1) and 100 percent during cycles 1, 2, 3 and 4, respectively.

In Mozambique, the proportion was 85.5 percent (95% CI: 83.2–87.5) and 79.2 percent (95% CI: 72.8–84.5) during cycles 3 and 4, respectively in 2023.

In Nigeria, household coverage exceeded 90 percent in most states and cycles, with relatively lower levels observed in the FCT. Country-level weighted average estimates of household coverage were 94.5 percent (95% CI: 94.2–94.7), 95.2 percent (95% CI: 95.0–95.4), 95.4 percent (95% CI:95.2–95.6), 97.1 percent (95% CI: 96.9–97.4) and 95.6 percent (95% CI: 95.2–96.0) of households with eligible children were visited by a community distributor during cycles 1, 2, 3, 4 and 5, respectively in 2023.

In South Sudan, the proportion of households that received a visit from a community distributor was 84.9 percent (95% CI: 76.3–90.7), 85.1 percent (95% CI: 76.3–91.0), 86.4 percent (95% CI: 79.1–91.4) and 89.9 percent (95% CI: 88.4–91.4) during cycles 1, 2, 3 and 4, respectively.

In Togo, estimates of coverage in terms of proportion of households that received a visit from a community distributor were 97.1 percent (95% CI: 92.7–98.9), 97.9 percent (95% CI: 96.1–98.9), 98.3 percent (95% CI: 95.7–99.4) and 99.9 percent (95% CI: 99.4–100.0) during cycles 1, 2, 3 and 4, respectively.

In Uganda, coverage in terms of the proportion of households visited by a community distributor was 100 percent, 100 percent, 99.0 percent (95% CI: 98.3–99.4), 98.0 percent (95% CI: 97.1–98.6) and 97.4 percent (95% CI: 95.8–98.4) during cycles 1, 2,3, 4 and 5 respectively in 2023.

Table 19: 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	1,998	96.9	96.0–97.6
Burkina Faso (29 districts)			
EoC: cycle 2	2,000	98.3	97.6–98.7
EoC: cycle 3	2,000	99.0	98.5–99.4
EoC: cycle 4	2,000	98.3	97.6–98.7
EoR: cycle 5	2,008	97.1	95.6–98.0
Chad (27 districts)			
EoC: cycle 1	2,692	94.4	93.5–95.2
EoC: cycle 2	3,265	94.7	93.9–95.4
EoC: cycle 3	3,246	97.6	97.0–98.1
EoR: cycle 4	1,500	100%	
Mozambique (23 districts, Nampula region; weighted proportion)			
EoC: cycle 3	5,362	85.5	83.2–87.5
EoR: cycle 4	1,624	79.2	72.8–84.5
Nigeria (nine states states; total, weighted proportion)			
EoC: cycle 1	36,082	94.5	94.2–94.7
EoC: cycle 2	41,385	95.2	95.0–95.4
EoC: cycle 3	37,090	95.4	95.2–95.6
Nigeria (states with five cycles, FCT, Kogi, Nasarawa, Oyo and Plateau and Bauchi states; total, weighted proportion)			
EoC: cycle 4	15,680	97.1	96.9–97.4
Nigeria (nine states; total, weighted proportion)			
EoR: cycle 4/5	11,880	95.6	95.2–96.0
South Sudan (Aweil South and West Counties, weighted proportion)			
EoC: cycle 1	999	84.9	76.3–90.7
EoC: cycle 2	997	85.1	76.3–91.0
EoC: cycle 3	980	86.4	79.1–91.4
EoR: cycle 4	1,500	89.9	88.4–91.4
Togo (19 districts)			
EoC: cycle 1	1,406	97.1	92.7–98.9
EoC: cycle 2	1,624	97.9	96.1–98.9
EoC: cycle 3	1,448	98.3	95.7–99.4
EoR: cycle 4	1,500	99.9	99.4–100
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk districts; Karamoja region)			
EoC: cycle 1	1,400	100.0	
EoC: cycle 2	1,400	100.0	
EoC: cycle 3	1,400	99.0	98.3–99.4
EoC: cycle 4	1,400	98.0	97.1–98.6
EoR: cycle 5	853	97.4	95.8–98.4

Table 20. 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	4,431	94.7	94.0–95.4
EoC: cycle 2	4,638	96.8	96.2-97.2
EoC: cycle 3*	n/a	n/a	n/a
EoR: cycle 4	1,320	97.9	96.9–98.5
Kebbi			
EoC: cycle 1	5,345	94.5	93.9–95.1
EoC: cycle 2	5,606	95.4	94.8–95.9
EoC: cycle 3	5,617	96.1	95.5–96.6
EoR: cycle 4	1,320	94.1	92.7–95.2
Sokoto			
EoC: cycle 1	5,730	91.9	91.2–92.6
EoC: cycle 2	5,831	92.1	91.3–92.7
EoC: cycle 3	5,843	93.4	92.8–94.0
EoR: cycle 4	1,320	95.6	94.4–96.6

*Due to operational constraints, no EoC survey was conducted following cycle 3 in Borno state

Table 21. 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	7,823	93.8	93.3–94.3
EoC: cycle 2	7,761	96.2	95.8–96.6
EoC: cycle 3	7,711	94.4	93.8–94.8
EoC: cycle 4	7,796	94.5	94.0–95.0
EoR: cycle 5	1,320	96.5	95.4–97.4
FCT			
EoC: cycle 1	1,541	84.5	82.6–86.2
EoC: cycle 2	1,530	84.0	82.1–85.7
EoC: cycle 3	1,557	84.1	82.2–85.8
EoC: cycle 4	1,546	83.6	81.7–85.4
EoR: cycle 5	1,320	86.0	84.0–87.8
Kogi			
EoC: cycle 1	5,687	93.8	93.1–94.4
EoC: cycle 2	5,574	96.5	96.0–96.9
EoC: cycle 3	5,726	97.0	96.5–97.4

EoC: cycle 4	5,677	96.5	96.0–97.0
EoR: cycle 5	1,320	98.3	97.5–98.9
Nasarawa			
EoC: cycle 1	3,477	92.7	91.8–93.5
EoC: cycle 2	3,604	93.9	93.1–94.7
EoC: cycle 3	3,525	96.3	95.6–96.8
EoC: cycle 4	3,755	95.4	94.7–96.1
EoR: cycle 5	1,320	97.4	96.4–98.2
Oyo			
EoC: cycle 1	1,502	96.3	95.3–97.2
EoC: cycle 2	1,479	97.1	96.1–97.8
EoC: cycle 3	1,500	98.7	97.9–99.1
EoC: cycle 4	1,500	98.0	97.0–98.6
EoR: cycle 5	1,320	98.0	97.0–98.6
Plateau			
EoC: cycle 1	5,564	98.0	97.6–98.3
EoC: cycle 2	5,362	98.0	97.5–98.3
EoC: cycle 3	5,611	98.2	97.8–98.5
EoC: cycle 4	4,926	98.8	98.4–99.1
EoR: cycle 5	1,320	96.9	95.8–97.7

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 22–24**). Coverage exceeded 90 percent among eligible children sampled in most cycles across countries, with the exception of Mozambique (cycles 3 and 4), South Sudan (cycles 1, 2 and 3) and Togo (cycle 4). The trend in day 1 coverage remained generally stable across cycles in each country. The coverage estimates for the indicator are summarised as follows:

In Burkina Faso, the proportion of age-eligible children who received day 1 SPAQ during home visits across cycles in 2023 was 96.2 percent (95% CI: 95.3–97.0), 97.2 percent (95% CI: 96.3–97.8), 96.9 percent (95% CI: 96.0–97.6), 98.1 percent (95% CI: 97.3–98.6) and 94.7 percent (95% CI: 92.5–96.3) during cycles 1, 2, 3, 4 and 5, respectively.

In Chad, day 1 SPAQ coverage was 94.9 percent (95% CI: 94.1–95.7), 93.9 percent (95% CI: 93.1–94.7), 97.1 percent (95% CI: 96.4–97.6) and 96.0 percent (95% CI: 95.0–97.0) in cycles 1, 2, 3 and 4, respectively. In Mozambique, the weighted average proportion was 89.6 percent (95% CI: 87.8–91.1) and 77.2 percent (95% CI: 70.8–82.5) during cycles 3 and 4, respectively across the 23 districts in 2023.

In Nigeria, day 1 coverage exceeded 90 percent in most states and cycles, with relatively lower levels observed in the FCT. Across the nine states in Nigeria, weighted average day 1 SPAQ coverage was 92.9 percent (95% CI: 92.6–98.1), 94.0 percent (95% CI: 93.7–94.2), 93.8 percent (95% CI:93.6–94.1), 94.0 percent (95% CI: 93.7-94.3) and 94.9 percent (95% CI: 94.5–95.3) during cycles 1, 2, 3, 4 and 5, respectively in 2023.

In South Sudan, the weighted average was 79.4 percent (95% CI: 71.5–85.5), 83.1 percent (95% CI: 74.9–88.9), 82.9 percent (95% CI: 74.0–89.1) and 99.1 percent (95% CI: 98.4–99.6) during cycles 1, 2, 3 and 4, respectively.

In Togo, the proportion was 99.4 percent (95% CI: 98.4–99.8), 99.1 percent (95% CI: 97.1–99.7), 99.7 percent (95% CI: 98.1–100) and 89.1 percent (95% CI: 87.4–90.7) during cycles 1, 2, 3 and 4, respectively in 2023.

In Uganda, estimates of day 1 SPAQ coverage were 100 percent, 98.0 percent (95% CI: 97.1–98.6), 99.0 percent (95% CI: 98.3–99.4), 98.0 percent (95% CI: 97.1–98.6) and 99.9 percent (95% CI: 99.1–100) during cycles 1, 2,3, 4 and 5 respectively in 2023.

Table 22. Proportions of eligible children (3–59 months) who received day 1 SPAQ by country and survey in 2023

Data source	Number of children sampled	Proportion of children covered	95% CI
Burkina Faso (11 districts)			
EoC: cycle 1	1,998	96.2	95.3–97.0
Burkina Faso (29 districts)			
EoC: cycle 2	2,000	97.2	96.3–97.8
EoC: cycle 3	2,000	96.9	96.0–97.6
EoC: cycle 4	2,000	98.1	97.3–98.6
EoR: cycle 5	2,008	94.7	92.5–96.3
Chad			
EoC: cycle 1	2,692	94.9	94.1–95.7
EoC: cycle 2	3,265	93.9	93.1–94.7
EoC: cycle 3	3,246	97.1	96.4–97.6
EoR: cycle 4	1,500	96.0	95.0–97.0
Mozambique (Nampula region; weighted proportion)			
EoC: cycle 3	5,362	89.6	87.8–91.1
EoR: cycle 4	1,608	77.2	70.8–82.5
Nigeria (all states; total, weighted proportion)			
EoC: cycle 1	41,097	92.9	92.6–98.1
EoC: cycle 2	41,385	94.0	93.7–94.2
EoC: cycle 3	37,090	93.8	93-6–94.1

Nigeria (areas with five cycles, FCT, Kogi, Nasarawa, Oyo and Plateau states and Bauchi states; total, weighted proportion)			
EoC: cycle 4	25,022	94.0	93.7–94.3
Nigeria (all states; total, weighted proportion)			
EoR: cycle 4/5	11,880	94.9	94.5–95.3
South Sudan (Aweil South and West counties; weighted proportion)			
EoC: cycle 1	999	79.4	71.5–85.5
EoC: cycle 2	997	83.1	74.9–88.9
EoC: cycle 3	980	82.9	74.0–89.1
EoR: cycle 4	1,348	99.1	98.4–99.6
Togo			
EoC: cycle 1	1,406	99.4	98.4–99.8
EoC: cycle 2	1,624	99.1	97.1–99.7
EoC: cycle 3	1,448	99.7	98.1–100
EoR: cycle 4	1,500	89.1	87.4–90.7
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk; Karamoja region)			
EoC: cycle 1	1,400	100	
EoC: cycle 2	1,400	98	97.1–98.6
EoC: cycle 3	1,400	99	98.3–99.4
EoC: cycle 4	1,400	98	97.1–98.6
EoR: cycle 5	803	99.9	99.1–100

Table 23. 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
Borno			
EoC: cycle 1	4,431	96.2	95.6–96.8
EoC: cycle 2	4,638	97.3	96.8–97.7
EoC: cycle 3*	n/a	n/a	n/a
EoR: cycle 4	1,320	97.5	96.5–98.2
Kebbi			
EoC: cycle 1	5,345	92.4	91.7–93.1
EoC: cycle 2	5,606	94.0	93.3–94.6
EoC: cycle 3	5,617	94.9	94.3–95.4
EoR: cycle 4	1,320	93.6	92.1–94.8
Sokoto			
EoC: cycle 1	5,730	91.5	90.8–92.2
EoC: cycle 2	5,831	91.1	90.3–91.8

EoC: cycle 3	5,843	91.2	90.4–91.9
EoR: cycle 4	1,320	95.0	93.7–96.1

*Due to operational constraints, no EoC survey was conducted following cycle 3 in Borno state

Table 24. 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	7,823	91.7	91.0–92.3
EoC: cycle 2	7,761	94.1	93.6–94.6
EoC: cycle 3	7,711	92.9	92.3–93.5
EoC: cycle 4	7,796	92.6	92.0–93.2
EoR: cycle 5	1,320	96.7	95.6–97.5
FCT			
EoC: cycle 1	1,541	84.0	82.1–85.7
EoC: cycle 2	1,530	82.5	80.5–84.3
EoC: cycle 3	1,557	82.6	80.6–84.4
EoC: cycle 4	1,546	83.2	81.2–85.0
EoR: cycle 5	1,320	85.0	83.0–86.8
Kogi			
EoC: cycle 1	5,687	91.6	90.9–92.3
EoC: cycle 2	5,574	94.4	93.7–94.9
EoC: cycle 3	5,726	94.3	93.6–94.9
EoC: cycle 4	5,677	94.3	93.6–94.8
EoR: cycle 5	1,320	97.1	96.0–97.8
Nasarawa			
EoC: cycle 1	3,474	91.0	90.0–91.9
EoC: cycle 2	3,604	93.2	92.4–94.0
EoC: cycle 3	3,525	95.2	94.5–95.9
EoC: cycle 4	3,577	94.2	93.3–94.9
EoR: cycle 5	1,320	96.6	95.5–97.5
Oyo			
EoC: cycle 1	1,502	95.0	93.8–96.0
EoC: cycle 2	1,479	95.4	94.2–96.4
EoC: cycle 3	1,500	96.8	95.8–97.6
EoC: cycle 4	1,500	95.4	94.2–96.4
EoR: cycle 5	1,320	96.7	95.6–97.5
Plateau			
EoC: cycle 1	5,564	98.0	97.6–98.3
EoC: cycle 2	5,362	97.1	96.6–97.5

EoC: cycle 3	5,611	97.8	97.4–98.2
EoC: cycle 4	4,926	98.8	98.4–99.1
EoR: cycle 5	1,320	95.8	94.6–96.8

Table 25 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 25**) can be assessed against those obtained from EoC surveys (**Table 22**). 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 1 in Burkina Faso based on EoR survey was 77.8 percent (95% CI: 71.6–83.0); considerably lower than that estimated from the cycle 1 EoC survey (96.2 percent; 95% CI: 95.3–97.0). 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 25. 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	1,255	77.8	71.6–83.0
EoR: cycle 3		88.5	81.9–92.9
EoR: cycle 4		93.1	85.7–96.8
EoR: cycle 5		96.7	95.0–97.9
Burkina Faso (districts with five cycles)			
EoR: cycle 1	653	90.9	86.8–93.7
EoR: cycle 2		93.7	90.8–95.7
EoR: cycle 3		91.8	87.5–94.7
EoR: cycle 4		94.8	92.0–96.7
EoR: cycle 5		96.3	94.2–97.7
Chad			
EoR: cycle 1	1,440	91.9	90.4–93.2
EoR: cycle 2		94.7	93.5–95.8
EoR: cycle 3		94.1	92.8–95.3
EoR: cycle 4		96.0	94.9–96.9
Mozambique (Nampula region; weighted proportion)			
EoR: cycle 1	1,001	83.1	78.5–86.8
EoR: cycle 2		84.6	80.7–87.8
EoR: cycle 3		76.0	70.1–81.1
EoR: cycle 4	1,608	77.2	70.8–82.5
Nigeria (all states; total, weighted proportion)			

EoR: cycle 1	11,880	94.3	93.8–94.7
EoR: cycle 2		94.2	93.8–94.6
EoR: cycle 3		94.1	93.7–94.5
Nigeria (areas with four cycles; total, weighted proportion)			
EoR: cycle 4	2,960	92.1	91.6–02.6
Nigeria (areas with five cycles: FCT, Kogi, Nasarawa, Oyo and Plateau states and Bauchi states; total, weighted proportion)			
EoR: cycle 5	7,920	91.2	90.5–91.8
South Sudan (Aweil South and West, weighted proportions)			
EoR: cycle 1	1,500	88.9	87.2–90.5
EoR: cycle 2		89.5	87.8–91.0
EoR: cycle 3		88.1	86.3–89.7
EoR: cycle 4		88.1	86.3–89.7
Togo			
EoR: cycle 1	1,500	92.9	91.5–94.1
EoR: cycle 2		97.3	96.4–98.1
EoR: cycle 3		96.1	94.9–97.0
EoR: cycle 4		99.9	99.5–100.0
Uganda (Moroto, Kotido, Nabilatuk, Amudat and Nakapiripiriti districts; Karamoja region)			
EoR: cycle 1	803	97.4	95.5–98.0
EoR: cycle 2		93.6	91.0–94.6
EoR: cycle 3		91.4	88.8–92.8
EoR: cycle 4		88.2	85.6–90.1
EoR: cycle 5		99.9	99.1–100

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 who received day 1 SPAQ also received AQ doses on both day 2 and day 3 from their caregivers (**Tables 26 - 28**). Overall, the trend remained fairly stable across cycles in each country, except in Togo where the proportions was substantially lower in the first cycle compared to the later cycles.

In Burkina Faso, adherence to day 2 and day 3 AQ doses among children who received day 1 SPAQ was 98.6 percent (95% CI: 98.0-99.0), 98.0 percent (95% CI: 97.3-98.6), 98.1 percent (95% CI: 97.4-98.6), 98.6 percent (95% CI: 98.0- 99.1) and 99.3 percent (95% CI: 98.6-99.7) during cycles 1, 2, 3, 4 and 5, respectively.

In Chad, these were 95.4 percent (95% CI: 94.5-96.1), 97.4 percent (95% CI: 96.7-97.9), 97.3 percent (95% CI: 96.7-97.8) and 95.1 percent (95% CI: 94.0-96.0) in cycles 1, 2, 3 and 4, respectively.

In Mozambique, the proportions were 93.3 percent (95% CI: 91.7–94.5) and 99.1 percent (95% CI: 98.2–99.5) during cycles 3 and 4, respectively.

In Nigeria, the proportions were consistently over 90 percent in all states and cycle, although slightly lower in the FCT compared with other states. Average country-level weighted proportions were 96.3 percent (95% CI: 96.1–96.5), 97.1 percent (95% CI: 97.0–97.3), 97.6 percent (95% CI: 97.4–97.7), 98.2 percent (95% CI: 98.0–98.3) and 99.0 percent (95% CI: 98.7–99.6) during cycles 1, 2, 3, 4 and 5, respectively.

In South Sudan, average weighted proportions were 95.4 percent (95% CI: 92.8–97.1), 97.6 percent (95% CI: 95.8–98.6), 97.7 percent (95% CI: 95.3–98.8) and 98.7 percent (95% CI: 97.9–99.2) during cycles 1, 2, 3 and 4, respectively.

In Togo, 74.8 percent (95% CI: 61.8–84.5) of children who received day 1 SPAQ also received AQ doses on both day 2 and day 3 during cycle 1, increasing considerably to 98.1 percent (95% CI: 97.3–98.7), 96.4 percent (95% CI: 90.8–98.7) and 99.3 percent (95% CI: 98.7–99.6) during cycles 2, 3 and 4, respectively.

In Uganda, adherence to the full three-day course of SPAQ was observed in 97.0 percent (95% CI: 95.9–97.8), 98.0 percent (95% CI: 97.1–98.6), 99.0 percent (95% CI: 98.3–99.4), 98.0 percent (95% CI: 97.1–98.6) and 93.2 percent (95% CI: 90.3–95.3) of children during cycles 1, 2, 3, 4 and 5, respectively.

Table 26. 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	1,923	98.6	98.0–99.0
Burkina Faso (29 districts)			
EoC: cycle 2	1,943	98.0	97.3–98.6
EoC: cycle 3	1,938	98.1	97.4–98.6
EoC: cycle 4	1,961	98.6	98.0–99.1
EoR: cycle 5	1,714	99.3	98.6–99.7
Chad			
EoC: cycle 1	2,556	95.4	94.5–96.1
EoC: cycle 2	3,067	97.4	96.7–97.9
EoC: cycle 3	3,151	97.3	96.7–97.8
EoR: cycle 4	1,500	95.1	94.0–96.0
Mozambique (Nampula region; weighted proportion)			
EoC: cycle 3	4,840	93.3	91.7–94.5
EoR: cycle 4	1,178	99.1	98.2–99.5

Nigeria (all states; total, weighted proportion)			
EoC: cycle 1	38,161	96.3	96.1–96.5
EoC: cycle 2	38,891	97.1	97.0–97.3
EoC: cycle 3	34,799	97.6	97.4–97.7
Nigeria (areas with five cycles, Bauchi, FCT, Kogi, Nasarawa, Oyo and Plateau states; total, weighted proportion)			
EoC: cycle 4	23,524	98.2	98.0–98.3
Nigeria (all states; total, weighted proportion)			
EoR: cycle 4/5	11,271	99.0	98.7–99.6
South Sudan (Aweil South and West Counties, weighted proportion)			
EoC: cycle 1	791	95.4	92.8–97.1
EoC: cycle 2	827	97.6	95.8–98.6
EoC: cycle 3	810	97.7	95.3–98.8
EoR: cycle 4	1,386	98.7	97.9–99.2
Togo			
EoC: cycle 1	1,406	74.8	61.8–84.5
EoC: cycle 2	1,624	98.1	97.3–98.7
EoC: cycle 3	1,448	96.4	90.8–98.7
EoR: cycle 4	1,500	99.3	98.7–99.6
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk; Karamoja region)			
EoC: cycle 1	1,400	97.0	95.9–97.8
EoC: cycle 2	1,400	98.0	97.1–98.6
EoC: cycle 3	1,400	99.0	98.3–99.4
EoC: cycle 4	1,400	98.0	97.1–98.6
EoR: cycle	802	93.2	90.3–95.3

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 four cycles)

Data source	Number of households sampled	Proportion of children received full course	95% CI
Borno			
EoC: cycle 1	4,264	98.0	97.6–98.4
EoC: cycle 2	4,511	98.9	98.6–99.2
EoC: cycle 3*	n/a	n/a	n/a
EoR: cycle 4	1,287	99.5	98.9–99.7
Kebbi			
EoC: cycle 1	4,940	96.3	95.7–96.8
EoC: cycle 2	5,268	96.7	96.2–97.2

EoC: cycle 3	5,328	97.6	97.2–98.0
EoR: cycle 4	1,235	98.4	97.5–99.0
Sokoto			
EoC: cycle 1	5,243	96.2	95.7–96.7
EoC: cycle 2	5,309	97.4	96.9–97.8
EoC: cycle 3	5,326	97.5	97.1–97.9
EoR: cycle 4	1,254	99.1	98.4–99.5

*Due to operational constraints, no EoC survey was conducted following cycle 3 in Borno state

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 five cycles)

Data source	Number of households sampled	Proportion of children received full course	95% CI
Bauchi			
EoC: cycle 1	7,171	96.2	95.7–96.6
EoC: cycle 2	7,305	97.5	97.2–97.9
EoC: cycle 3	7,165	97.8	97.4–8.1
EoC: cycle 4	7,222	98.5	98.1–98.7
EoR: cycle 5	1,276	99.3	98.7–99.6
FCT			
EoC: cycle 1	1,294	92.4	90.9–93.8
EoC: cycle 2	1,262	91.1	89.3–92.5
EoC: cycle 3	1,286	93.6	92.2–94.8
EoC: cycle 4	1,286	95.7	94.5–96.7
EoR: cycle 5	1,122	97.7	96.6–98.4
Kogi			
EoC: cycle 1	5,210	95.9	95.4–96.4
EoC: cycle 2	5,259	96.2	95.6–96.7
EoC: cycle 3	5,398	97.2	96.7–97.6
EoC: cycle 4	5,351	97.7	97.3–98.1
EoR cycle 5	1,281	99.5	99.0–99.8
Nasarawa			
EoC: cycle 1	3,161	95.5	94.7–96.1
EoC: cycle 2	3,360	96.7	96.1–97.3
EoC: cycle 3	3,356	97.3	97.9–97.8
EoC: cycle 4	3,368	97.9	97.4–98.4
EoR: cycle 5	1,275	98.8	98.1–99.3
Oyo			
EoC: cycle 1	1,427	96.1	94.9–97.0
EoC: cycle 2	1,411	97.6	96.7–98.3

EoC: cycle 3	1,452	95.6	97.9–99.1
EoC: cycle 4	1,431	98.5	97.7–99.0
EoR: cycle 5	1,276	99.5	98.9–99.7
Plateau			
EoC: cycle 1	5,451	97.3	96.8–97.7
EoC: cycle 2	5,206	97.8	97.3–98.1
EoC: cycle 3	5,488	98.4	98.0–98.7
EoC: cycle 4	4,866	98.8	98.5–99.1
EoR: cycle 5	1,265	98.2	97.3–98.8

3.2.4 SPAQ administration directly supervised by community distributors adhering to DOT

The EoC survey consistently showed high levels of adherence to DOT among eligible children who received day 1 SPAQ (**Table 29**). Levels of DOT adherence were generally over 90 percent in most countries and cycle, except for Burkina Faso and Nigeria. Overall, the trend was generally stable across cycles in each country, except in Chad and Togo where DOT adherence proportions varied across the cycles.

In Burkina Faso, administration of day 1 SPAQ dose was directly observed by a community distributor in 89.3 percent (95% CI: 87.9–90.6), 87.3 percent (95% CI: 85.7–88.7), 89.8 percent (95% CI: 88.4–91.1), 88.8 percent (95% CI: 87.3–90.1) and 86.1 percent (95% CI: 83.3–88.5) during cycles 1, 2, 3, 4 and 5, respectively.

In Chad, the proportion of children whose day 1 SPAQ dose was directly observed by a community distributor was 91.1 percent (95% CI: 90.0–92.2), 87.5 percent (95% CI: 86.3–88.7), 93.1 percent (95% CI: 92.2–94.0) and 94.8 percent (95% CI: 94.0–96.0) of all children who received day 1 SPAQ in cycles 1, 2, 3 and 4, respectively.

In Mozambique, administration of day 1 SPAQ as DOT was reported in 94.6 percent (95% CI: 93.4–95.6) and 92.3 percent (95% CI: 88.5–94.9) of all children who received day 1 SPAQ dose during cycles 3 and 4, respectively.

In Nigeria, though exceeding 80 percent in most cases, DOT adherence varied considerably across states, with relatively lower levels observed in Bauchi state and the FCT. Country-level weighted average adherence to DOT was 82.6 percent (95% CI: 82.3–83.0), 85.7 percent (95% CI: 85.4–86.1), 85.7 percent (95% CI: 85.3–86.1), 86.6 percent (95% CI: 86.1–87.0) and 92.7 percent (95% CI: 92.2–93.1) among children who received day 1 SPAQ in cycles 1, 2, 3, 4 and 5, respectively.

In South Sudan, day 1 SPAQ DOT adherence was reported in 90.7 percent (95% CI: 80.5–95.8), 93.3 percent (95% CI: 84.6–97.2), 97.0 percent (95% CI: 94.4–98.4) and 98.9 percent (95% CI: 98.3–99.5) of all children who received day 1 SPAQ in cycles 1, 2, 3 and 4, respectively.

In Togo, administration of day 1 SPAQ dose was directly observed by a community distributor in 96.5 percent (95% CI: 93.9-98.0), 87.5 percent (95% CI: 83.3-90.8), 95.2 percent (95% CI: 92.4-97.0) and 89.1 percent (95% CI: 87.4-90.7) 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 96.0 percent (95% CI: 94.8-96.9), 90.0 percent (95% CI: 88.3-91.5), 95.0 percent (95% CI: 93.7-96.0), 94.0 percent (95% CI: 92.6-95.1) and 97.1 percent (95% CI: 94.8-98.4) among all children who received day 1 SPAQ during cycles 1, 2, 3, 4 and 5, respectively.

Table 29. 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	1,923	89.3	87.9–90.6
Burkina Faso (29 districts)			
EoC: cycle 2	1,943	87.3	85.7–88.7
EoC: cycle 3	1,938	89.8	88.4–91.1
EoC: cycle 4	1,961	88.8	87.3–90.1
EoR: cycle 5	2,008	86.1	83.3–88.5
Chad			
EoC: cycle 1	2,556	91.1	90.0–92.2
EoC: cycle 2	3,067	87.5	86.3–88.7
EoC: cycle 3	3,151	93.1	92.2–94.0
EoR: cycle 4	1,500	94.8	94.0–96.0
Mozambique (Nampula region; weighted proportion)			
EoC: cycle 3	4,840	94.6	93.4-95.6
EoR: cycle 4	1,178	92.3	88.5-94.9
Nigeria (all states; total, weighted proportion)			
EoC: cycle 1	38,099	82.6	82.3–83.0
EoC: cycle 2	38,865	85.7	85.4–86.1
EoC: cycle 3	34,773	85.7	85.3–86.1
Nigeria (areas with five cycles, FCT, Kogi, Nasarawa, Oyo and Plateau states and Bauchi states; total, weighted proportion)			
EoC: cycle 4	23,500	86.6	86.1–87.0
Nigeria (all states; total, weighted proportion)			
EoR: cycle4/ cycle 5	11,271	92.7	92.2–93.1
South Sudan (Aweil South and West Counties, weighted proportion)			

EoC: cycle 1	791	90.7	80.5–95.8
EoC: cycle 2	826	93.3	84.6–97.2
EoC: cycle 3	810	97.0	94.4–98.4
EoR: cycle 4	1,336	98.9	98.3–99.5
Togo			
EoC: cycle 1	1,406	96.5	93.9–98.0
EoC: cycle 2	1,624	87.5	83.3–90.8
EoC: cycle 3	1,448	95.2	92.4–97.0
EoR: cycle 4	1,500	89.1	87.4–90.7
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk; Karamoja region)			
EoC: cycle 1	1,400	96.0	94.8–96.9
EoC: cycle 2	1,400	90.0	88.3–91.5
EoC: cycle 3	1,400	95.0	93.7–96.0
EoC: cycle 4	1,400	94.0	92.6–95.1
EoR: cycle 5	853	97.1	94.8–98.4

Table 30. 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 Nigerian state and survey (states with four cycles)

Data source	Number of households sampled	Proportion administered SMC by DOT	95% CI
Borno			
EoC: cycle 1	4,241	91.2	90.3–92.0
EoC: cycle 2	4,501	95.3	94.7–95.9
EoC: cycle 3*	n/a	n/a	n/a
EoR: cycle 4	1,287	93.2	91.7–94.4
Kebbi			
EoC: cycle 1	4,937	86.2	85.2–87.1
EoC: cycle 2	5,268	86.5	85.5–87.4
EoC: cycle 3	5,325	88.8	87.8–89.6
EoR: cycle 4	1,235	92.3	89.5–92.7
Sokoto			
EoC: cycle 1	5,238	84.3	84.2–85.2
EoC: cycle 2	5,305	87.0	86.1–87.9
EoC: cycle 3	5,324	88.3	87.4–89.1
EoR: cycle 4	1,254	88.7	86.8–90.3

*Due to operational constraints, no EoC survey was conducted following cycle 3 in Borno state

Table 31. 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 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	7,155	68.7	67.6–69.7
EoC: cycle 2	7,305	75.1	74.1–76.0
EoC: cycle 3	7,159	72.3	71.2–73.3
EoC: cycle 4	7,220	77.7	76.7–78.6
EoR: cycle 5	1,276	96.9	95.8–97.7
FCT			
EoC: cycle 1	1,290	82.5	80.3–84.5
EoC: cycle 2	1,261	79.7	77.4–81.8
EoC: cycle 3	1,285	80.2	77.9–82.3
EoC: cycle 4	1,285	78.6	76.3–80.8
EoR: cycle 5	1,122	83.8	81.5–85.8
Kogi			
EoC: cycle 1	5,206	87.5	86.5–88.3
EoC: cycle 2	5,255	90.2	89.3–90.9
EoC: cycle 3	5,391	90.6	89.8–91.4
EoC: cycle 4	5,346	91.8	91.0–92.5
EoR: cycle 5	1,281	94.1	92.6–95.2
Nasarawa			
EoC: cycle 1	3,157	82.6	81.3–83.9
EoC: cycle 2	3,359	88.2	87.0–89.2
EoC: cycle 3	3,351	89.3	88.2–90.3
EoC: cycle 4	3,356	90.4	89.4–91.4
EoR: cycle 5	1,275	94.0	92.5–95.1
Oyo			
EoC: cycle 1	1,427	90.4	88.8–91.8
EoC: cycle 2	1,411	93.4	92.0–94.6
EoC: cycle 3	1,452	96.8	95.7–97.6
EoC: cycle 4	1,431	98.0	97.1–98.6
EoR: cycle 5	1,276	97.9	96.9–98.6
Plateau			
EoC: cycle 1	5,448	83.0	81.9–83.9
EoC: cycle 2	5,200	83.6	82.6–84.6
EoC: cycle 3	5,486	89.2	88.3–90.0
EoC: cycle 4	4,862	90.1	89.2–90.9
EoR: cycle 5	1,265	93.2	91.7–94.5

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 two 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 32**).

The proportion of eligible children who received SPAQ by means other than home visits by community distributors was found to be comparable to that reported in the 2022 in Burkina Faso and South Sudan. A similar increase was observed in the proportions reported for Chad and Mozambique- from 0.1 percent and 0.4 percent in 2022 to 1.8 percent and 1.9 percent, respectively.

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 32: 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 (29 districts with 4/5 cycles)			
EoR: cycle 5	2,008	0.3	0.1–1.0
Chad			
EoR: cycle 4	1,440	1.8	1.1–2.5
Mozambique (Nampula region; weighted proportion- estimated)			
EoR: cycle 4	1,608	1.9	1.3–2.6
Nigeria (all states; total, weighted proportion)			
EoR: cycle4/ cycle5	11,880	0.1	0.1–0.2
South Sudan (Aweil South and West counties; weighted proportion)			
EoR: cycle 4	1,386	0.0	
Togo			
EoR: cycle 4	1,500	0.0	
Uganda (Amudat, Nakapiripirit, Moroto, Kotido and Nabilatuk districts; Karamoja region)			
EoR: cycle 5	802	0.0	

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 33–38 show the proportions of eligible children by country and state by number of day 1 SPAQ received across cycles during the 2023 SMC campaign. The proportions varied widely among the countries.

In Burkina Faso, 72.9 percent (95% CI: 66.9–78.1) and 87.2 percent (95% CI: 82.4–90.8) 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 2023, respectively.

In Chad, Mozambique, South Sudan and Togo, 91.9 percent (95% CI: 90.7–93.4), 59.3 percent (95% CI: 52.0–66.2), 80.8 percent (95% CI: 78.7–82.7) and 83.0 percent (95% CI: 81.1–84.9) of eligible children, respectively, received SPAQ in all four cycles in 2023. In Uganda, 89.3 percent (95% CI: 85.6–92.2) of eligible children received day 1 SPAQ during each of the five monthly cycles delivered during 2023.

In Nigeria, the extent to which eligible children received day 1 SPAQ in all cycles of the round exceeded 80 percent in most states, with a notable exception in the FCT where estimates were lower than 80%. Across the nine states in Nigeria (**Table 34**), average estimates were 85.7 percent (95% CI: 84.6–86.7) and 85.2 percent (95% CI: 84.4–86.0) 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.

The proportion of eligible children receiving no cycles was less than five percent in all countries.

Table 33. Proportions of eligible children (3–59 months) who received day 1 SPAQ by community distributors by number of cycles during 2023 (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	1,270	1.0	0.5–2.0
One		5.5	2.1–13.6
Two		6.4	4.4–9.2
Three		14.3	11.0–18.2
Four		72.9	66.9–78.1
Burkina Faso (districts with five cycles)			
None	640	2.2	1.1–4.2
One		2.1	1.0–4.3
Two		1.5	0.7–2.9
Three		2.6	1.2–5.5
Four		4.5	2.3–8.5
Five		87.2	82.4–90.8

Chad			
None	1,440	4.3	3.1–5.2
One		1.3	0.8–2.1
Two		2	1.4–2.8
Three		0.5	0.2–1.0
Four		91.9	90.7–93.4
Mozambique (Nampula region; weighted proportion)			
None	1,521	0.09	0.0–0.7
One		8.5	5.7–12.6
Two		11.9	9.0–15.6
Three		20.2	16.2–25.0
Four		59.3	52.0–66.2
Nigeria: (areas with four cycles; total, weighted proportion)			
None	3,960	2.0	1.6–2.5
One		1.7	1.3–2.1
Two		2.4	2.0–3.0
Three		8.2	7.4–9.1
Four		85.7	84.6–86.7
Nigeria: (areas with five cycles; total, weighted proportion)			
None	7,920	1.2	0.9–1.4
One		2.3	2.0–2.7
Two		2.3	2.0–2.7
Three		2.9	2.6–3.3
Four		6.1	5.6–6.6
Five		85.2	84.4–86.0
South Sudan (Aweil South and West, weighted proportions)			
None	1,478	4.4	3.5–5.6
One		1.6	1.0–2.3
Two		4.8	3.8–6.0
Three		8.4	7.1–9.9
Four		80.8	78.7–82.7
Togo			
None	1,500	3.3	2.4–4.2
One		3.8	2.8–4.8
Two		4.1	3.1–5.1
Three		5.8	4.6–7.0
Four		83	81.1–84.9
Uganda (Moroto, Kotido, Nabilatuk, Amudat and Nakapiripirit districts; Karamoja region)			

None	853	1.6	0.8–3.2
One		0.5	0.2–1.2
Two		0.9	0.3–3.4
Three		1.2	0.5–2.5
Four		6.4	4.5–9.2
Five		89.3	85.6–92.2

Table 34. Proportions of eligible children (3–59 months) who received day 1 SPAQ by community distributors by number of cycles during 2023 (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	1,320	0.2	0.0–0.6
One		0.9	0.5–1.6
Two		0.9	0.5–1.6
Three		1.5	1.0–2.3
Four		4.4	3.4–5.6
Five		92.1	90.5–93.5
FCT			
None	1,320	4.3	3.4–5.6
One		4.5	3.5–5.7
Two		4.1	3.2–5.3
Three		5.2	4.2–6.6
Four		10.6	9.1–12.4
Five		71.3	68.8–73.7
Kogi			
None	1,320	0.8	0.4–1.4
One		2.4	1.7–3.4
Two		2.6	1.9–3.6
Three		2.5	1.8–3.5
Four		5.1	4.0–6.4
Five		86.7	84.7–88.4
Nasarawa			
None	1,320	0.8	0.4–1.4
One		1.1	0.7–1.9
Two		1.9	1.3–2.8
Three		2.3	1.6–3.2
Four		4.4	3.4–5.6
Five		89.6	87.8–91.1

Oyo			
None	1,320	0.5	03–1.1
One		2.8	2.0–3.9
Two		2.8	2.0–3.9
Three		3.4	2.6–4.5
Four		4.7	3.7–6.0
Five		85.8	83.8–87.5
Plateau			
None	1,320	0.4	0.2–0.9
One		2.1	1.4–3.0
Two		1.7	1.2–2.6
Three		2.5	1.8–3.5
Four		7.4	6.1–9.0
Five		85.9	83.9–87.7

Table 35. Proportions of eligible children (3–59 months) who received day 1 SPAQ by community distributors by number of cycles during 2023 (EoR survey), by Nigerian state (states with four cycles)

Number of cycles	Number of children sampled	Proportion of eligible children covered	95% CI
Borno			
None	1,320	0.3	0.1–0.8
One		0.3	0.1–0.8
Two		1.0	0.6–1.7
Three		12.2	10.5–14.1
Four		86.2	84.2–88.0
Kebbi			
None	1,320	3.9	3.0.0–5.1
One		1.6	1.0–2.4
Two		2.4	1.7–3.4
Three		6.0	4.8–7.4
Four		86.1	84.2–87.9
Sokoto			
None	1,320	1.7	1.2–2.6
One		3.2	2.4–4.3
Two		3.9	3.0–5.1
Three		6.5	5.3–8.0
Four		84.7	282.7–86.5

3.2.7 SPAQ provided to ineligible children aged five years and above

Table 36 and Table 37 show the proportions of ineligible children 60–119 months who received SPAQ, based on data from EoR surveys.

For Burkina Faso, Chad and Togo, the proportion of age-ineligible children who received day 1 SPAQ in the last cycle was lower than that observed in the 2022 SMC round. In Burkina Faso and Togo, it was 7.9 percent (95% CI: 5.3–11.7) compared with 10.9 percent (95% CI: 8.2–14.3) and 7.3 percent (95% CI: 5.3–9.8) compared with 10.8 percent (95% CI: 8.8-13.2) in 2022, respectively. In Chad, the proportion decreased from 15.1 percent (95% CI: 12.0–18.2) during 2022 to 12.8 percent (95% CI: 10.3–15.8). In South Sudan, 49.7 percent (95% CI: 5.3–9.8) of ineligible children received day 1 SPAQ. A substantial increase in this proportion was observed in the results for Nigeria (36.6 percent; 95% CI: 34.2–39.0 compared with 23.7 percent; 95% CI: 20.9–26.6 in 2022).

It should be noted, however, the surveys in those five countries were not designed to provide a representative sample of children 60–119 months; estimates of the proportion of this group receiving day 1 SPAQ are likely to represent an overestimate as only children in this group residing in households with eligible children 3–59 months were included in the sample. The surveys were designed to be representative of this group in Mozambique and Uganda.

Table 36. 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 Faso (29 districts with 4/5 cycles)			
EoR: cycle 5	1,173	7.9	5.3–11.7
Chad			
EoR: cycle 4	570	12.8	10.3–15.8
Mozambique (Nampula region; weighted proportion)			
EoR: cycle 4	1,465	21.9	17.7–26.9
Nigeria (total, weighted proportion)			
EoR: cycle 4/ cycle 5	1,557	36.6	34.2–39.0
South Sudan (Aweil South and West counties; weighted proportion)			
EoR: cycle 4	191	49.7	42.6–56.8
Togo			
EoR: cycle 4	537	7.3	5.3–9.8
Uganda (Moroto, Kotido, Nabilatuk, Amudat and Nakapiripirit districts Karamoja region)			
EoR: cycle 5	1,031	21.4	16.3–27.6

Table 37. 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 ineligible children covered	95% CI
State: Bauchi			
EoR: cycle 5	43	74.4	59.0–85.5
FCT			
EoR: cycle 5	175	37.8	30.8–45.2
Kogi			
EoR: cycle 5	134	47.0	38.7–55.6
Nasarawa			
EoR: cycle 5	260	36.5	30.9–42.6
Oyo			
EoR: cycle 5	291	17.5	13.6–22.4
Plateau			
EoR: cycle 5	164	36.6	29.5–44.3
Borno			
EoR: cycle 4	92	75.0	65.0–82.9
Kebbi			
EoR: cycle 4	94	44.7	34.9–54.9
Sokoto			
EoR: cycle 4	304	36.6	25.0–35.3

4. Discussion

Target populations across the SMC programme in 2023

The 17,070,262 children targeted for SMC delivery across the seven countries supported in 2023 represent an increase of 14.6 percent from the 14.9 million children targeted in 2022.[9] This increase was mainly due to population growths in the cohort of eligible children across countries, as well the geographical expansion of SMC delivery in Mozambique (from four districts in 2022 to 23 districts in 2023) and South Sudan where SMC was delivered in one additional county in the Northern Bahr El Ghazal region in 2023.

Administrative programme coverage

Estimates from SMC tally sheet data indicate that very high levels of administrative coverage were maintained in 2023, ranging from 88.3 percent in Togo to 111.0 percent in South Sudan. 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. In 2023, estimates were based on data from SMC tally sheets in all countries, reflecting progress made with harmonising administrative coverage estimation methods unlike in previous years' use of stock reconciliation data in places where tally sheet data were either incomplete or unavailable. As with previous years, within-country variations in administrative coverage persist in Nigeria, where it ranged from 96.9 percent in the Borno State to 107.3 percent in Kogi State. Such variations might have been due to differences in the accuracy of target population figures and population dynamics; the extent to which the target population of children were reachable across settings; and differences in the ability of community distributors to correctly determine children's age and SMC eligibility during campaigns. The improved administrative coverage seen in the FCT, which had substantially lower coverage (64.1 percent) in 2022, likely reflects the quality improvement strategies deployed in 2023 to address coverage and quality gaps identified in the previous round.

As with the previous years' estimates, administrative coverage exceeded 100 percent in many instances. This might have been due to several factors. These include inaccuracies in target population estimates or unforeseen population movements such as in nomadic populations or internally displaced populations, such as in South Sudan where the two SMC counties experienced an influx of populations, including SMC age-eligible children, displaced by the humanitarian crisis in neighbouring Sudan. Another reason why administrative coverage might exceed 100 percent is the administration of SMC medicines to ineligible children, which could inflate the numerator (number of children reached in each cycle). We continue to strive to estimate target populations more accurately. Some of the steps we have taken in this regard include digitalisation SMC tally sheet data in Nigeria, and more recent campaign digitalisation in Mozambique enabling more precise enumeration of eligible households and children and more accurate quantification of the SPAQ courses distributed in each cycle. We have also maintained our commitment to using the most accurate population figures obtainable for microplanning and adjusting for anticipated population

changes during the round as much as possible. We are considering further efforts to expand the current scope of SMC campaign digitalisation to enable more accurate determination of target populations, which will require engaging with partners and relevant stakeholders at local, country and global levels to identify use cases for digitalisation as well as the most feasible, effective and sustainable ways of doing so.

SMC programme coverage among eligible children based on household survey data

Estimates from data obtained through EoC and EoR household surveys indicate that SMC campaigns supported by Malaria Consortium attained high levels of programme coverage and adherence to SMC quality standards. 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. Notably, Day 1 SPAQ coverage was lower than 90 percent in the two cycles for which data were available in Mozambique in 2023, falling below 80 percent in the final cycle and relatively lower than the levels seen in 2022. These coverage constraints were most likely a consequence of the programmatic challenges experienced in Mozambique in 2023, much of which was due to the significant scale up of delivery from the four districts covered in 2022 to 23 districts during 2023. Day 1 SPAQ coverage was below 90 percent In South Sudan in the first three cycles, with much of the coverage constraints in the new district supported in 2023.

As seen in 2022, variations in coverage persist cross states in Nigeria, with relatively lower coverage in the FCT where coverage remained below 90 percent in all cycles delivered during 2023. The relatively lower performance in the FCT is perhaps a reflection of the lingering challenges of implementing SMC in a new and complex urbanised setting of the FCT where SMC was delivered for the first time in 2022. We continue to draw learnings from our experiences delivering and adapting SMC in this and similar urban settings. A research article we published recently investigated urban–rural differences in SMC coverage and other programme outcomes in Nigeria during the 2022 SMC round.[16] It found significantly lower levels of key coverage and quality indicators in urban settings relative to rural locations, underscoring the need for continued effort at utilising context-specific strategies to adapt SMC delivery and ensure optimal uptake in urban target populations.

Similar levels of administration to day 1 SPAQ under DOT or supervision by community distributors were seen in 2023 in the previous years, exceeding 90 percent in most cycles and above 80 percent in all cycles across all countries. Remarkable deviations from the 2022 trends were seen in Burkina Faso, where day 1 SPAQ DOT levels were lower than 90% in all cycles in 2023, compared to over 90% achieved in most cycles in the previous round. These might have resulted from the persisting security challenges and the political situation in the country during 2023. In this context, factors such as curfews or movement restrictions might have limited the amount of time community distributors spent to interact with caregivers and ensure day 1 DOT in households visited.

The protective effect of SMC relies on achieving optimal adherence to day 2 and day 3 doses of AQ.[4] Over 90 percent of eligible children reached in 2023 received the full three-day course of SPAQ in all countries and Nigerian states across cycles. These indicate that SMC programmes were delivered to a high standard in terms of ensuring that children received the full course of SMC medicines. Results also suggest that current strategies of administering day 1 SPAQ under DOT, as against administering all three-day doses as DOT, are proving to be effective at maintaining optimal levels of adherence to the full course of SPAQ. In 2022, we piloted strategies for optimising adherence to day 2 and day AQ doses, including the use of lead-mothers and role models as community-level peer-support systems, in some of our implementation settings. A recent study we conducted to evaluate the lead mother approach in Kano state, Nigeria provides evidence on the effectiveness of such approaches with implications for considering their adoption in any setting of suboptimal adherence in future campaigns. The manuscript reporting study findings is currently being peer reviewed and is expected to be published later in 2024.

Coverage in terms of receipt of SMC in all cycles varied widely between countries and Nigerian states. There were marked improvements in Chad (91.9 percent 2023, compared to 79.8 percent in 2022) and Uganda (89.3 percent in 2023 compared to 71.6 percent in 2022), with little or no substantial differences for other places. Within Nigeria, there were notable improvements seen in the FCT, where the complex urban setting presents a unique challenge to SMC delivery. The proportion of eligible children in the FCT who received SMC in all five monthly cycles increased from 56.5 percent in 2022 to 71.3 percent during 2023. It is likely that these improvements illustrate the effectiveness of ongoing programme adaptations made to improve SMC delivery and coverage in this context.

The proportion of children receiving SMC in all cycles was also notably lower in Nigeria's FCT (71.3 percent), with a tenth of children having not received SMC in any cycle during 2023. This trend is consistent with administrative coverage seen in the FCT (100.3 percent) during 2023. These could be attributed to the challenges of delivering SMC in a new and complex urban setting like the FCT.

Overall, these results imply that SMC programmes supported by Malaria Consortium in 2023 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 seasons. Yet, coverage gaps seen in some cycles in some areas present opportunities for programme 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 programme adaptation efforts to strengthen the resilience of our SMC programmes in reaching communities and children in operationally complex areas. There are important lessons to be learned from the successful adaption of SMC delivery in the FCT, which saw significant improvements in coverage despite the operational constraints of implementing community-based interventions such as SMC in the FCT.

Receipt of SMC outside of home visits by community distributors

Consistent with previous years' trends, the proportions of eligible children who received SPAQ by means other than home visits by community distributors or from legitimate sources such as health facilities were low in all seven countries. 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 providing SPAQ at fixed distribution points to caregivers who were not at home at the time of household visits. These are considered legitimate sources of SPAQ. Outside of these sources, the most common alternative sources of SMC medicines were family or friends. The proportions of children who did not receive SPAQ through door-to-door distribution by community distributors or from other legitimate sources were lower than 2 percent in all areas supported during the final cycles in 2023. Notably, all children sampled in Togo and Uganda received SPAQ through home visits by community distributors or through health facilities during the final cycle in 2023.

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 7.3 percent in Togo to 49.7 percent in South Sudan. 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 generally comparable to those observed in previous years, with a substantial decrease in Uganda, where the proportion was 21.4 percent in the 2023 round compared to 53.4 percent in 2022. Overall, these results indicate that receipt of SMC medicines by ineligible remains a common occurrence with notable between-country variations. A research article we published recently provides empirical evidence on the magnitude of receipt of SMC medicines by older ineligible children and the factors associated with it based 2022 EoR data in the nine supported states in Nigeria.[17] It found that he majority (60.60%) of ineligible children who received SMC medicines were aged 5-6 years, with higher odds among children of caregivers who had poor knowledge of SMC age eligibility and those whose caregivers had higher confidence in the protective effect of SMC. While our findings that older children receiving SMC medicines were typically aged 5 to 6 years suggest that the risks of underdosing and contributing to the development of drug resistance may be lower compared to if the children were predominantly much older than 5 years, the results underscore the importance of strengthening caregiver knowledge and perceptions of the importance of age eligibility to mitigate the exposure of ineligible children to SMC medicine and any risk of underdosing or drug resistance that might pose.

It is important to note that 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 survey results between locations and over time

Results of surveys are, to a large extent, comparable across cycles in the same country, between different countries in the same year and across years, particularly in terms of the general sampling and analysis methods. It is however essential to recognise that comparability is challenged by various factors. First, survey results may not be comparable across multiple years in the same country in some cases due to differences in SMC scale and survey sampling frames used in each year. For instance, unlike in 2022 when surveys were implemented only in four districts in Mozambique, surveys were conducted in a much larger number of distributes due to substantial scale up of SMC to 23 districts during the 2023 round. This resulted in sampling frames for both EoC and EoR surveys in 2023 being different from those conducted in 2022.

Comparisons of survey results are also constrained by between-cycle differences in EoC sampling frames, as was the case in where districts were excluded from the sampling frame due to insecurity or other inaccessibility issues. A case in point was the Kpendjal district in Togo which was not sampled in EoC surveys following cycles 1 and 2. Between-cycle comparisons are complicated further by the delivery of a fifth cycle of SMC in specific areas in Burkina Faso and Nigeria with longer high transmission seasons. In such cases, areas requiring five cycles begin the SMC round a month before those requiring four cycles. Hence, coverage results from cycle 1 EoC survey in Burkina Faso and Nigeria as presented in this report are representative only for areas where five cycles were delivered. On the other hand, coverage estimates for the four subsequent cycles are representative of all areas irrespective of the number of SMC cycles delivered. Moreover, the proportion of children who received SMC in all four or five monthly cycles of the annual round 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 22** and **Table 25**). 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 the potential for recall bias, efforts were made to conduct the EoR surveys in a timelier manner in 2023, with most surveys conducted within a month of completion of the final cycle.

Improvements to survey methods in 2023

Further efforts to improvements were made to survey design and implementation in 2023. Refinements were made to standardise survey sampling plans and data collection tools to enhance comparability of results across different country contexts. We continue to strive to conduct surveys in a timely manner to minimise the risk of recall bias in the measurement of programme coverage and quality of delivery. In this regard, efforts were made to complete EoC surveys within one week of the SMC distribution. Timely surveys also enabled ample time for processing data as well as identifying performance gaps before the next SMC cycle.

In 2023, 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 before surveys to enhance their competences in sampling, administering survey questionnaires, and capturing responses in accordance with survey protocols. Use of real-time data quality audit features in SurveyCTO enabled prompt identification and remediation of data quality issues during data collection. These included the use of SurveyCTO relevance or restraint features to avoid instances of incomplete or missing data. Other real-time data quality assurance measures included the use of Global Positioning System (GPS) tracking feature in SurveyCTO to ensure that data collectors adhered to survey sampling plans; hidden variables to ascertain that interviews started and ended in the same households; and use of special variables to track time taken to complete interview segments to ensure sufficient time was allocated specific segments, such as questions on day 2 and day 3 SPAQ doses that often require probing to aid and valid caregivers' recall when not documented on children's SMC cards. Furthermore, standardised survey data analysis plans and Stata codes were created to enhance accuracy and comparability of results across supported countries.

Use of survey results to inform decision-making and programme improvements

Malaria Consortium places great value on the utilisation of programme data to guide decision-making and tailoring programme improvements. In this regard, data-informed decision-making (DIDM) is one of the core objectives of Malaria Consortium's seasonal malaria chemoprevention (SMC) programme. To foster DIDM within the SMC delivery model, the programme's M&E framework defines measurable indicators for tracking the use of data for decision-making.[10]

Monitoring of SMC coverage and quality using EoC household surveys employing the LQAS methodology plays a crucial role in supporting DIDM within the programme. EoC surveys are typically conducted following all but the final monthly SMC cycle, enabling implementing teams to identify areas of low coverage and other issues in SMC delivery, and to rapidly take corrective actions to improve SMC delivery in subsequent cycles. In 2023, we made progress in enhancing the culture of data-driven decision-making across the programme. In most cases, surveys were

conducted within a week following SMC distribution in each cycle. That made it possible for country teams to complete data analyses and obtain LQAS hypothesis test results at least one week before the start of the next cycle. Results and recommendations for programme improvement actions were communicated with health authorities at district, state/regional and national levels, and malaria control programmes. Examples of country-specific use of EoC survey data to drive decision making and improvements in SMC delivery are described below:

Since the introduction of SMC in Mozambique's Nampula province in 2020, the Malaria Consortium country team, in partnership with the NMCP has employed a multi-level approach to DIDM in the country. This approach involves engagement with stakeholders, starting at the sub-district level to the district, provincial and national levels. The main purpose of these meetings is to discuss successes, challenges and lessons learned during SMC distribution and findings from monitoring supervision and EoC survey. An action plan is developed at the end of each meeting to mitigate the issues identified as part of planning for the next cycle. Plans are then reviewed and adjusted as necessary at the higher administrative levels. For example, EoC LQAS survey conducted following the third cycle of the 2023 round helped to identify suboptimal levels of coverage and SMC knowledge in a number of supervision areas. Despite, the high levels of coverage seen when looking at district-level aggregates, LQAS findings helped to unmask sub-district disparities in SMC coverage, helping to localise issues and facilitate sub-district tailoring of programme improvement measures to address the issues identified at the local level in the next cycle.

In Nigeria, DIDM is facilitated through another model of multi-level decision-making with pre-cycle meetings to review findings from the current cycle's EoC survey data and other routine data sources, to inform planning for the next cycle. This involves joint review meetings attended by local and state-level supervisors and managers to review coverage and other SMC performance indicators, enabling the identification of performance gaps in each cycle ahead of the succeeding one. In this meeting, stakeholders carefully consider the coverage and other issues identified and agree on the necessary corrective actions to be taken, persons responsible for coordinating actions and timelines. This is then followed by LGA and sub-LGA adaptations and operationalisation of actions based on agreed timelines. Local-level execution of action plans is led by officers-in-charge except for some hard-to-reach areas where execution may be considered at higher administrative levels.

In Uganda, a multi-stakeholder engagement process is used to review EoC survey results to determine the priority aspects and locations for intensifying SMC improvement efforts. Following each EoC survey, key issues identified in survey and other M&E data are disseminated to stakeholders at parish, district and regional levels. Survey findings are complemented by reviewing routine surveillance data at the health facility level in affected SAs. From the review of routine data after the first cycle in June 2023, villages with substantial numbers of malaria cases were also found to have suboptimal SMC coverage levels during the preceding cycle. Using this information, SMC supervisors from the parish and district levels, with support from Malaria Consortium and Ministry

of Health reviewed community engagement plans to intensify messaging through various communication channels and village health teams in the affected communities.

A paper describing the adaptation of the LQAS methodology to Malaria Consortium's SMC programme is currently under peer-review and is expected to be published later in 2024. We also aim to share progress made with enhancing DIDM and lessons learned across the programme in a peer-reviewed journal, at a relevant conference and stakeholder engagements over the coming months.

4.1 Methodological strengths and limitations

Our survey design and methods have several notable strengths. A key strength was the improved standardisation and comparability EoC surveys in 2023, 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 standardised hypothesis tests based on realistic targets and decision criteria during 2023. Efforts were also made to conduct EoC surveys in a timelier manner during 2023, with EoC surveys completed within two weeks of the preceding cycle in virtually all cases in 2023. This provided a two-week window before the subsequent cycle for processing and analyse EoC survey data, as well as identifying, communicating and addressing programme improvement needs in partnership with stakeholders at all levels. In addition, the timely implementation of EoC surveys helped to minimise the risk of recall bias in the estimation of programme 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 2023 helped to promote objectivity and reduce bias. In addition, it allowed for the mobilisation 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 2023 than in 2022 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 programme 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 2023 (generally <2 percent across indicators, surveys and countries).

Our methods are not without limitations. First, target populations used for calculation of administrative coverage often rely on official population estimates which may not be accurate. Estimates of population sizes may not adequately reflect population growths or dynamics such as migration. While results of surveys are comparable to a large extent due to recent standardisation efforts, the extent to which they are comparable is constrained by several factors as acknowledged

earlier, including between- and within-country differences in sampling frame, scale and number of cycles with. Another notable limitation of our surveys is their reliance on self-reporting. The use of SMC child record cards for estimation of coverage is not feasible due to limited retention and completion of cards by caregivers, limiting the reliability of the cards as a source of data for determining SMC coverage or validating caregiver responses. Consequently, survey findings may be prone to social desirability. We are however of the view that the risk of social desirability bias is minimal, considering that coverage as determined by SMC cards tends to be comparable to the high levels seen in caregiver-reported survey data. The risk of recall bias is minimised with timely conduct of surveys. Lastly, there is potential for recall bias occurring in EoR surveys which are typically conducted one month following the final cycles, unlike EoC surveys which are usually conducted within a week following each of the earlier cycles. This might explain the relatively lower levels of day 1 SPAQ coverage seen in the final cycles based on EoR survey data compared to estimates seen in earlier cycles' EoC survey data, as was the case in Burkina Faso, Mozambique, and Uganda (**Table 0**).

4.2 Conclusions, recommendations, and future directions

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 2023. Data from EoC and EoR household surveys also show that SMC campaigns supported by Malaria Consortium generally achieved high levels of programme 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 2023. Results also demonstrate the sustainability of high coverage and quality standards in newer SMC geographies in East and southern Africa. 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 programme 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 programme improvement and adaptations for optimising SMC delivery, coverage and quality in 2023.

While there have been improvements to administrative coverage estimation methods, including the use of SMC tally sheets in all locations and recent efforts at digitalising enumeration and recording of SMC medicines distributed, further consideration will be given to expanding campaign digitalisation with the aim of improving data accuracy process, process efficiency and timeliness of

reporting. Going forward, we aim to strengthen household survey data quality assurance by operationalising data quality assurance more routinely and systematically. We expect to use additional data validation features on SurveyCTO and 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 remain committed to enhancing the capacity of data collectors and M&E staff at all levels through training, re-training and improved supervision to consolidate progress in terms of standardising survey sampling and methods. To enhance the use of routine programme data to inform decision making, we held a programme-wide DIDM capacity development workshop before the 2024 round commenced to consolidate progress. We aim to share progress made and lessons learned in this regard in a peer-reviewed journal and relevant stakeholder engagements over the coming months.

Finally, as in the past years, household surveys will continue to be utilised 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 at preventing malaria in eligible children using routine programme data, as well as analyses aimed at bolstering our understanding of the factors associated with receipt of SMC medicines, adherence to DOT, completion of the full three-day course of SPAQ, occurrence of adverse events as well as caregivers' SMC awareness, knowledge and perceptions. Our surveys can also be useful for determining the coverage of interventions such as insecticide-treated nets, vitamin A supplementation and routine vaccination in locations where we implement SMC. That can enable us to understand the interaction between SMC and other interventions, particularly as our SMC programme is increasingly being considered as a platform for co-delivering other community-based interventions such as vitamin A and identification of sub-optimally vaccinated children.

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