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consortium**

disease control, better health

**Malaria Consortium's
seasonal malaria
chemoprevention program:
Philanthropy report 2021**

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Established in 2003, Malaria Consortium is one of the world's leading non-profit organizations specializing in the prevention, control and treatment of malaria and other communicable diseases among vulnerable populations. Our mission is to save lives and improve health in Asia and Africa through evidence-based programs that combat targeted diseases and promote universal health coverage.

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Executive summary

Seasonal malaria chemoprevention (SMC) is a highly effective community-based intervention to prevent malaria infections caused by *Plasmodium falciparum* in areas where malaria morbidity and mortality are high and malaria transmission is seasonal. It involves the intermittent administration of antimalarial medicines to at-risk populations during the peak malaria season. Malaria Consortium has been a leading implementer of SMC since the World Health Organization issued its recommendation to scale up the intervention in 2012. This report summarizes achievements and challenges in areas where Malaria Consortium used philanthropic funding, either exclusively or in combination with other funding sources, to support the implementation of SMC in 2021. It also summarizes operational, technical, and external relations activities, initiatives, and projects carried out under Malaria Consortium's philanthropic SMC program. Finally, the report provides an overview of philanthropic SMC expenditure in 2021.

Malaria Consortium provides technical and logistical support to national malaria programs in SMC-implementing countries spanning all SMC intervention components (**Figure 1**). In 2021, philanthropic funding enabled Malaria Consortium to support the national malaria programs in Burkina Faso, Chad, Mozambique, Nigeria, Togo, and Uganda (**Figure 2**) to deliver SMC to more than 12 million children. This included two million children in Borno state, Nigeria, where Malaria Consortium was able to provide support at short notice in response to an urgent request from the national malaria program and the international SMC community. More than a quarter of the children targeted with philanthropic funding in the six countries supported by Malaria Consortium lived in areas that had never before been reached by SMC. Almost 48 million blister packs of SMC medicines were procured, and 150,000 individuals were involved in the delivery of SMC campaigns in areas supported by Malaria Consortium's philanthropic SMC program (**Table 1**). In 2022, we aim to increase the scale of our program to reach more than 14 million children and to expand our support to at least one additional country.

Figure 1: SMC intervention components

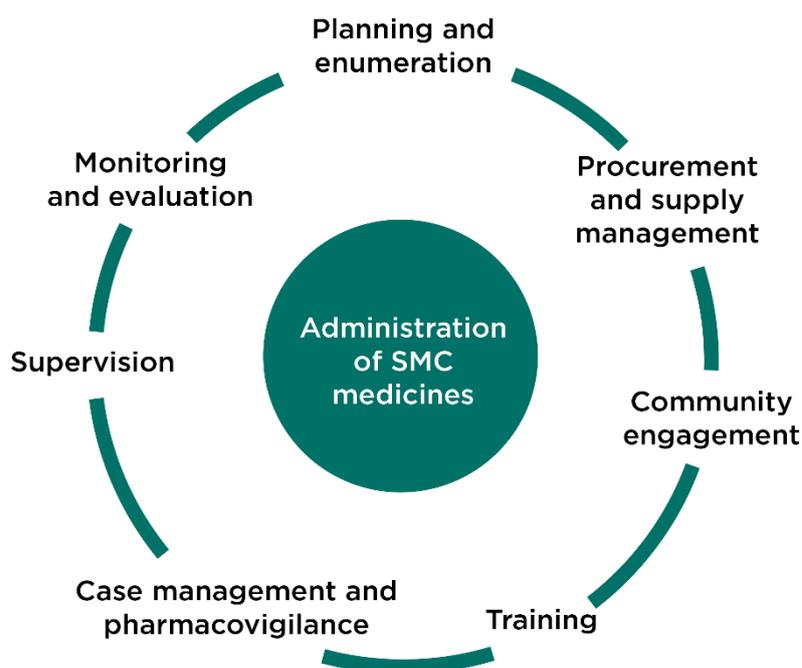


Figure 2: Countries where Malaria Consortium supported SMC delivery with philanthropic funding, 2021



Table 1: Number of children targeted, administrative units covered, blister packs of SMC medicines procured, and SMC implementers trained in areas supported by Malaria Consortium with philanthropic funding (including co-funding arrangements), 2021

Country	Number of children targeted	Number of administrative units covered	Number of blister packs of SMC medicines procured	Number of SMC implementers trained
Burkina Faso	2,020,000	29	8,928,000	31,159
Chad	1,080,000	26	4,134,000	23,987
Mozambique ^a	110,000	4	540,000	1,897
Nigeria	8,390,000	129	33,845,468	84,631
Togo	490,000	19	0	7,125
Uganda	90,000	2	420,000	1,192
TOTAL	12,180,000	209	47,867,468	149,991

^aThe peak transmission season in Mozambique cuts across calendar years (approximately December – March). In this table, we show the numbers for the season that started in the reporting year (2021/22).

In 2021, much of our global operations support was focused on keeping SMC implementers safe during the ongoing COVID-19 pandemic, responding to increasing insecurity in many areas where SMC is implemented and thinking about the role digital tools could play in SMC delivery. We published a learning paper that summarizes our insights from implementing SMC during the COVID-19 pandemic in 2020, developed security adaptation principles that define how SMC needs to be adapted in medium and high-risk areas to minimize security risk, and field tested a digital tool that uses geospatial intelligence to aid SMC planning and distribution.

In addition to being a leading implementer of SMC, we are building on our strong technical expertise, most importantly through our work on research, quality of SMC delivery, and monitoring and evaluation. Highlights of our technical work in 2021 included:

- Our most exciting and ground-breaking research projects explore if SMC can be a viable malaria prevention strategy outside of the Sahel. In 2021, we conducted the first phase of two implementation studies in Mozambique and Uganda — the first time SMC has been implemented in east and southern Africa. In both countries, we found that SMC was safe, feasible, and acceptable in the local context. The intervention also appears to be highly effective in these areas, with children in districts where SMC was distributed around 90 percent less likely to develop clinical malaria than those in non-SMC districts.
- We conducted operational research studies exploring the co-implementation of SMC and vitamin A supplementation in Nigeria; the role model approach to improve administration of SMC medicines in Burkina Faso, Chad and Togo; as well as optimizing the role of lead mothers in Nigeria. Data analysis is ongoing and results will be published in 2022.
- An SMC team member started a Doctor of Philosophy project at Imperial College London exploring the use of malaria prevalence data collected through national household surveys to estimate the expected impact of SMC on prevalence, incidence, and number of malaria cases averted.
- Research findings were published for both academic and non-academic audiences. In 2021, we published two articles in peer-reviewed journals. We also had one symposium and eight presentations accepted at a prestigious international academic conference.
- Comprehensive end-of-round quality assessments were conducted in Burkina Faso, Chad, Nigeria, Togo, and Uganda. The assessments involved national malaria programs and implementing partners scoring a set of quality indicators spanning all SMC intervention components, identifying areas for improvement and developing quality improvement plans for the next annual SMC round.
- We developed and published a technical brief describing a monitoring and evaluation framework for SMC, which helps us understand why the program has, or has not, achieved its intended goal. The framework includes over 60 indicators that will be collected using a variety of data sources and data collection methods.

In 2022, we will conduct phase two of the implementation studies in Mozambique and Uganda, which will gather more robust evidence of the effectiveness of SMC through cluster-randomized controlled trials. The studies also aim to determine the chemoprevention efficacy of the antimalarial medicines used in SMC in the study areas, as well as the extent to which chemoprevention efficacy is affected by drug resistance and drug concentrations. The studies are a central part of Malaria

Consortium's contributions to shaping the future of SMC. A key strategic priority in 2022 will be the development of a road map that outlines Malaria Consortium's approach to ensuring that SMC remains a viable malaria strategy by adapting to different contexts and introducing innovations to maximize its contribution to the global fight against malaria.

Our technical work is complemented by external relations activities, including a wide range of communications and publications, which can be accessed through Malaria Consortium's website and social media. In 2021, we hosted a webinar on Taking SMC to New Geographies, which highlighted findings from the studies in Mozambique and Uganda. We are an active member of the SMC Alliance, a global SMC working group under the Roll Back Malaria Partnership to End Malaria, and its monitoring and evaluation and research subgroups. In 2022, we plan to start a subgroup on communications and advocacy.

The total philanthropic expenditure on SMC was approximately 50.51 million United States dollars in 2021.

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Acronyms and abbreviations

ACCESS-SMC	Achieving Catalytic Expansion of Seasonal Malaria Chemoprevention in the Sahel
AIDS	acquired immunodeficiency syndrome
APES	agentes polivalentes elementares
AQ	amodiaquine
ASTMH	American Society of Tropical Medicine and Hygiene
CI	confidence interval
CISM	Centro de Investigação em Saúde de Manhica
COVID-19	coronavirus disease
DHS	Demographic and Health Survey
DOT	directly observed treatment
DP	dihydroartemisinin-piperaquine
FCT	Federal Capital Territory
FGD	focus group discussion
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HBHI	High Burden to High Impact
HMIS	health management information system
HR	hazard ratio
IDP	internally displaced people
IDRC	Infectious Diseases Research Collaboration
IPC	infection prevention and control
IPTi	intermittent preventive treatment in infants
IPTp	intermittent preventive treatment during pregnancy
KII	key informant interview
KOICA	Korea International Cooperation Agency
LGA	local government area
LQAS	lot quality assurance sampling
M&E	monitoring and evaluation
mg	milligram
MIS	Malaria Indicator Survey
MOU	memorandum of understanding
MSF	Médecins Sans Frontières
NMCD	National Malaria Control Division
NMEP	National Malaria Elimination Programme
nRCT	non-randomized controlled trial
OR	odds ratio
PhD	Doctor of Philosophy

PMI	U.S. President’s Malaria Initiative
PNCM	Programa Nacional de Controlo da Malária
PNLP	Programme National de Lutte contre le Paludisme
PRoS	Project Results System
RBM	Roll Back Malaria
RDT	rapid diagnostic test
RR	rate ratio
SMC	seasonal malaria chemoprevention
SP	sulfadoxine-pyrimethamine
SPAQ	sulfadoxine-pyrimethamine plus amodiaquine
UK	United Kingdom
UNICEF	United Nations International Children’s Emergency Fund
US	United States
USD	United States dollar
VAS	vitamin A supplementation
VHT	village health team
WHO	World Health Organization

1. Background

This report summarizes achievements and challenges in areas where Malaria Consortium used philanthropic funding, either exclusively or in combination with other funding sources, to support the implementation of seasonal malaria chemoprevention (SMC) in 2021. It also summarizes operational, technical and external relations activities, initiatives, and projects carried out under Malaria Consortium’s philanthropic SMC program. Finally, the report provides an overview of philanthropic SMC expenditure in 2021. Our philanthropic funding for SMC includes donations to Malaria Consortium’s entities in the United Kingdom (UK) and the United States (US), primarily as a result of being awarded Top Charity status by GiveWell,^[1,2] a nonprofit dedicated to finding outstanding giving opportunities and publishing the full details of its analysis to help donors decide where to give. Note that detailed 2021 SMC coverage data have been compiled in a separate report and are not reported here.^[3]

1.1 SMC

SMC is a highly effective community-based intervention to prevent malaria infections caused by *Plasmodium falciparum* in areas where malaria morbidity and mortality are high and malaria transmission is seasonal. It involves the intermittent administration of antimalarial medicines to at-risk populations during the peak malaria season. The objective is to maintain therapeutic antimalarial drug concentrations in the blood throughout the period of greatest malarial risk.

The World Health Organization (WHO) has recommended SMC as a malaria prevention strategy for children 3–59 months since 2012.^[4] The policy recommendation calls for the use of a combination of two antimalarials in SMC: sulfadoxine-pyrimethamine (SP) and amodiaquine (AQ). Annual SMC rounds comprising four monthly SMC cycles — beginning at the start of the transmission season — are recommended in areas where more than 60 percent of clinical malaria cases occur during a maximum of four months, and where the clinical attack rate of malaria is greater than 0.1 attack per transmission season among children under five. The peak malaria transmission season typically coincides with the rainy season and SMC-eligible areas are characterized by more than 60 percent of the annual rain falling within a period of three months. The policy recommendation specifies that SMC should not be implemented in areas where the therapeutic efficacy of SP plus AQ (SPAQ) is below 90 percent due to parasite resistance. WHO has announced that new chemoprevention guidelines will be published in 2022, which will provide greater flexibility to malaria-endemic countries to adapt chemoprevention strategies to suit the local epidemiology and context.

The effectiveness of SMC has been well documented. In clinical trials, it has been found to prevent 75 percent of uncomplicated and severe malaria cases in children under five,^[5] with each full course of SPAQ conferring a high degree of protection for approximately 28 days.^[6] It has also been demonstrated that community-based SMC delivery, informed by an SMC field guide published by WHO in 2013,^[7] can be implemented safely at scale. High coverage can be achieved through existing health system structures, typically using health facilities as functional units where the door-to-door distribution of SPAQ by community distributors is coordinated.^[8] Case-control studies in seven countries have shown that SMC implemented under programmatic conditions provides high levels of protection comparable to those found in trial settings, with an average protective effectiveness of 88 percent against clinical malaria over a 28-day period.^[9] The weighted average economic cost of

administering four monthly SMC cycles has been estimated at 3.63 United States dollars (USD) per child.^[10]

In 2020, SMC was implemented in 13 countries in the Sahel region of Africa, targeting around 33.5 million children.^[11] According to unpublished data compiled by the SMC Alliance, a global SMC working group under the Roll Back Malaria (RBM) Partnership to End Malaria, almost 45 million children were targeted in 2021. The main funders supporting SMC are the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), the U.S. President's Malaria Initiative (PMI), the United Nations International Children's Emergency Fund (UNICEF), and philanthropic funding for Malaria Consortium's SMC program.

1.2 Malaria Consortium's SMC portfolio

Malaria Consortium has been a leading implementer of SMC since WHO issued its recommendation to scale up the intervention in 2012. Starting with an early implementation pilot in Nigeria in 2013–2014, we then led the rapid scale-up of SMC through the Achieving Catalytic Expansion of Seasonal Malaria Chemoprevention in the Sahel (ACCESS-SMC) project in 2015–2017, reaching close to seven million children in Burkina Faso, Chad, Guinea, Mali, Niger, Nigeria, and The Gambia. Most of the studies cited above as evidence of SMC effectiveness at scale are based on data generated through ACCESS-SMC. Since 2018, Malaria Consortium has continued to support SMC in Burkina Faso, Chad, and Nigeria. In 2020, we expanded our support to Togo and started a research project investigating the feasibility, acceptability, and impact of SMC in Mozambique. A similar implementation study investigating the use of SMC in Uganda was added to our portfolio in 2021. Despite the challenges posed by the ongoing coronavirus disease (COVID-19) pandemic, as well as rising insecurity across the Sahel, we were able to increase the scale of our SMC portfolio. Across funding streams, Malaria Consortium supported SMC delivery to more than 20 million children in six countries in 2021,^[12] up from 12 million in five countries in 2020.^[13]

The majority of Malaria Consortium's funding for SMC comes from philanthropic sources. We have also been supported by institutional funders such as the Global Fund, the Bill & Melinda Gates Foundation, the Korea International Cooperation Agency (KOICA) and UK aid from the UK government. The *Malaria Consortium Strategy 2021–25*^[14] cites our SMC portfolio as an example of the organization's global leadership in the quality delivery of at-scale programs and emphasizes our commitment to continued leadership in malaria chemoprevention as part of the global effort to accelerate burden reduction to elimination. SMC campaigns are implemented under the leadership of national malaria programs and through countries' existing health system structures. Consequently, Malaria Consortium's role in supporting SMC varies from country to country. However, we generally provide technical and logistical support on all SMC intervention components:

a) Planning and enumeration

An SMC campaign typically begins around five months before the start of the annual SMC round. This involves agreeing campaign dates and modalities at the national and state levels, as well as reflecting on lessons learned in previous years to inform adaptations to the SMC intervention tools and protocols. Micro-planning at the subnational level is conducted about four months before the start of the SMC round, including budgeting based on detailed enumeration of the target population at the subnational level, required personnel, and commodities.

b) Procurement and supply management

Two age-based SPAQ dosing regimens are required for use in SMC: a lower dose for infants 3–<12 months and a higher dose for children 12–59 months. The medicines are packaged in co-formulated blister packs containing one full course of SPAQ. For many years, there was only one manufacturer globally with the capacity to produce quality-assured SPAQ in the required formulation, dosing, and packaging. A second manufacturer achieved WHO pre-qualification status in April 2021.^[15] While manufacturers' production capacity has increased over the years, so has the global demand for SPAQ. The manufacturing lead time can be up to 10 months and, consequently, orders need to be placed around one year before the start of the annual SMC round. The medicines need to be transported from the manufacturers' production plants in China and India to ports in Africa, preferably by sea owing to the lower freight cost, or by air at a higher cost if the consignment is more urgent. Once the medicines have passed country-level customs and quality assurance procedures, they are distributed further using country-level supply chain mechanisms, typically to the state or health district level, the lowest administrative level where suitable storage facilities exist.

In addition to SPAQ, SMC commodities include, for example, branded T-shirts, hijabs, bags, and pens, as well as items required to minimize the risk of COVID-19 infection among SMC implementers and communities, such as face masks and hand sanitizer. Last-mile distribution — the transport of commodities to the health facilities that serve as functional units for the SMC campaign — happens just before the start of SMC distribution. This can be challenging due to poor infrastructure and limited storage facilities. Supply management also involves reverse logistics, which is the process of transporting SMC commodities back to a central warehouse at the end of the cycle or annual round.

c) Community engagement

Community engagement refers to the active participation of people and communities in health campaigns. The aim is to ensure that their voices are heard and their active contribution to decision-making is safe, equitable, and effective. Community engagement is an important component of SMC campaigns to ensure high acceptability of the intervention among communities, as well as to encourage adherence to the SPAQ administration protocol by caregivers. Activities include sensitization meetings with local leaders, radio spots, and town announcers disseminating relevant information before and during the campaign. The process of selecting community distributors is also community led and distributors typically serve the communities in which they live.

d) Training

SMC implementers are trained through a cascade model beginning at the national level about two months before the start of the annual SMC round, with each cadre of trainers subsequently training the next lower level of trainers and learners. Community distributors are typically trained at the health facility level. SMC training includes modules on identifying eligible children, referring sick children to a health facility, administering SPAQ safely, recording SPAQ administration, interpersonal communication, and safeguarding. In some countries, separate trainings are conducted on supply chain management and health education.

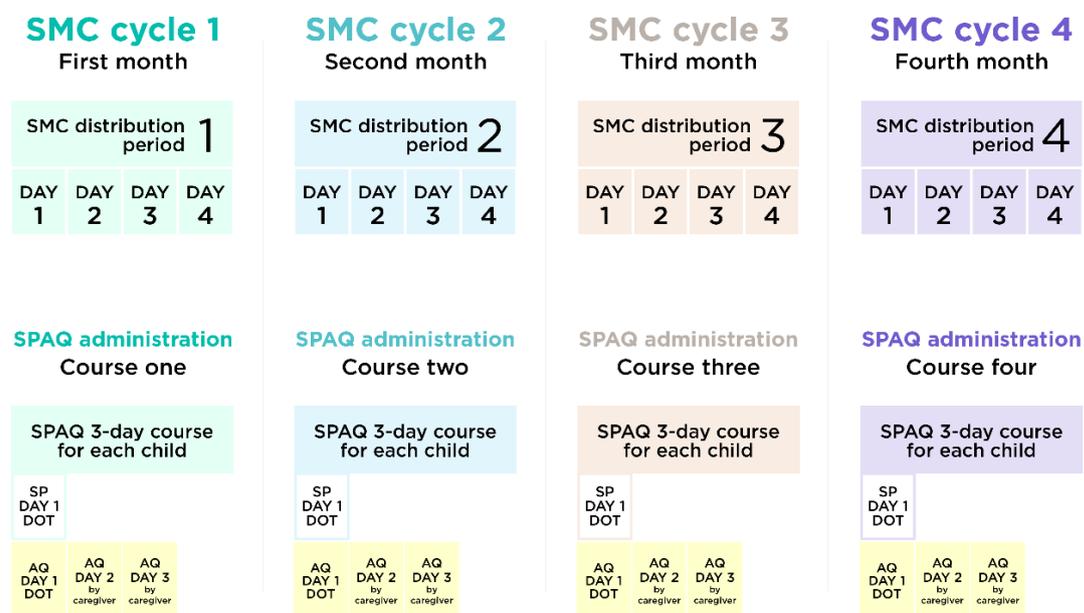
e) SPAQ administration

The door-to-door distribution of SPAQ to eligible children is at the heart of the SMC intervention. Some community distributors are community health workers — a recognized cadre of community-based primary healthcare workers who receive a small stipend from the government and who provide basic health services in their communities. In most countries, the majority of community distributors are volunteers recruited and trained specifically for the SMC campaign. Community distributors typically work in pairs.

A full course of SPAQ is given over three consecutive days. On the day of the community distributor’s visit to a household, one tablet of SP and one tablet of AQ are dispersed in water and administered under the supervision of a community distributor. This is called directly observed treatment (DOT). The remaining two doses of AQ are given to the caregiver to disperse and administer once daily over the next two days. Children who spit out or vomit the medicines within 30 minutes of SPAQ administration should be re-dosed once. All healthy children 3–59 months are eligible for SMC, except those who are allergic to SP, AQ, or any other sulfa-containing medicines. Children who received SP or AQ within the past month should also not receive SMC. Those who have a fever or are unable to take oral medication should not receive SPAQ from community distributors, but will be referred to a qualified health worker for further assessment and testing for malaria infection using a rapid diagnostic test (RDT). Children who test negative for malaria should receive SPAQ if deemed safe by a health worker.

Typically, all eligible children in a given area will be reached over a distribution period of four or five days per cycle, which is repeated monthly over the course of the transmission season. **Figure 3** illustrates a typical round of SMC comprising four monthly distribution cycles. Some countries have adopted annual rounds comprising five monthly cycles in areas where the peak transmission season is slightly longer.

Figure 3: A typical annual round of SMC



f) Case management and pharmacovigilance

Children who are referred to a qualified health worker by community distributors and who test positive for malaria infection should not receive SPAQ, but should be treated with effective antimalarial medicines according to country guidelines for the case management of malaria in children. Often, the health workers performing the RDT and deciding on appropriate case management of children who test positive are based at the health facilities that serve as functional units for SMC. In some countries, this function is provided by community health workers. While severe adverse events following administration of SPAQ are rare, mild side effects such as vomiting are more common. All adverse events should be reported via countries' pharmacovigilance systems and followed up according to country guidelines.

g) Supervision

During SMC distribution, community distributors are assisted by field supervisors who receive more in-depth training on supervision and mentoring skills. Each team of community distributors should be observed by, and receive constructive feedback from, a supervisor at least once every cycle. Supervision is coordinated by health workers at the health facilities that serve as functional units for SMC distribution, sometimes with support from community health workers. Malaria Consortium staff and local, regional, and central health authorities also support the supervision of SMC implementers.

h) Monitoring and evaluation

We undertake monitoring and evaluation (M&E) activities to track the performance of the program and to inform decision-making and priority-setting. This includes data on delivery, coverage, efficacy, safety, drug resistance, impact, and cost. Data are collected through a variety of methods, including administrative program data, household surveys, case-control studies, and routine national health system databases, such as the health management information system (HMIS). Administrative program data — including on households visited, SPAQ administered to eligible children, and children referred to health facilities — are collected by community distributors on tally sheets, which are compiled at health facilities at the end of each cycle and reported upwards to the local, regional, and central health authorities. Stock reconciliation data — including physical counts — are collected through the national supply management systems. To identify areas that do not meet certain coverage or quality targets, Malaria Consortium routinely conducts end-of-cycle household surveys using lot quality assurance sampling (LQAS) methodology following all but the final SMC cycle. The objective of those surveys is to identify issues in SMC delivery and provide a starting point to engage with local and national stakeholders to take corrective actions to improve SMC delivery in subsequent cycles. Following the end of the annual SMC round, Malaria Consortium commissions more comprehensive independent end-of-round household surveys to estimate SMC coverage and measure aspects of quality of SMC implementation across all cycles.

1.3 The future of SMC

The scale-up of SMC across west and central Africa is commonly seen as a success story. In recent years, the global discourse among the malaria community is increasingly focusing on how the intervention can be adapted to different contexts, and which innovations can be introduced to maximize its contribution to the global fight against malaria. We are likely to see a paradigm shift

over the coming years, away from a one-size-fits-all approach to SMC, towards much greater flexibility; for example, with regard to targeted age groups, transmission intensity, or therapeutic efficacy thresholds and seasonality criteria. Greater flexibility is likely to result in an expansion of SMC to new geographies, including areas in east and southern Africa where the burden of malaria is high and transmission is seasonal. However, parasite resistance to SP is widespread in those areas, which is why they have not so far been prioritized for SMC. There is currently no agreed decision-making framework for taking SMC to new geographies and no standard methodology to determine if SMC can be a viable malaria prevention strategy in areas where resistance is high.

Many factors influence the effectiveness of SMC when implemented under programmatic conditions, including its acceptability among targeted communities, the coverage that can be achieved among eligible children, and the quality of SMC implementation. The cost-effectiveness of SMC further depends on the cost of implementing SMC at scale, including how well it can be integrated into countries' existing health systems. In addition, the effectiveness of SMC relies on the chemoprevention efficacy of the antimalarials used: that is, their ability to clear existing infections — including those that remain asymptomatic — and prevent new ones. The chemoprevention efficacy of the medicines is likely to be affected by drug dosing, as well as the resistance profile of circulating *Plasmodium falciparum* parasites in the targeted area. The more we understand about the chemoprevention efficacy of SPAQ in different geographies, the more confidently we can predict the future effectiveness of SMC in those areas. There is also a need to explore alternative drug regimens, for example dihydroartemisinin-piperaquine (DP), for use in SMC in areas where SPAQ is less efficacious. Through our research on SMC in east and southern Africa, we play a central role in building the evidence base for the safe and effective expansion of SMC to new geographies.

Another question concerning the future of SMC that has gained momentum in 2021 is how the availability of malaria vaccines will affect SMC delivery. This was triggered by the publication of a landmark study on seasonal vaccination, which found that a combination of SMC and the RTS,S/AS01 malaria vaccine was superior to either intervention alone,^[16] and WHO's recommendation of the widespread use of the vaccine among children in sub-Saharan Africa.^[17] Malaria Consortium welcomed the publication of the paper on seasonal vaccination and SMC, an approach that could increase the public health impact of SMC. We also pointed out that more work will be needed to develop institutionally operational and scalable delivery models in national health systems, and to understand the effectiveness and cost of the approach.^[18]

Box 1 outlines the key questions that need to be answered for SMC to remain a viable malaria prevention strategy in the future. Through our research and learning from SMC implementation, we contribute to answering many of those questions. To help us define Malaria Consortium's approach, we recruited a Senior Technical Advisor with a focus on SMC, who will lead a group of senior colleagues from across our SMC portfolio in developing a road map that sets out priorities, potential partnerships, and timescales. Developing the future of SMC road map will be a strategic priority for Malaria Consortium in 2022.

Box 1: Key questions concerning the future of SMC

1. Can SMC be an effective intervention to reduce malaria cases in areas of east and southern Africa where malaria transmission is seasonal?
2. Does SPAQ retain its chemoprevention efficacy in areas where resistance to SPAQ is high?
3. What alternative drug regimens could be used in SMC?
4. How is SMC affected by the global climate crisis and changing seasonality patterns?
5. Can SMC be an effective malaria prevention strategy in areas where the transmission season is longer?
6. What would be the impact of SMC on malaria cases and malaria transmission if the age range was extended to older children?
7. How does SMC affect naturally acquired immunity to malaria and how does it interact with health issues such as acquired immunodeficiency syndrome (AIDS) or malnutrition?
8. What are the implications of the large-scale deployment of SMC for malaria treatment and other strategies for the prevention of malaria, such as intermittent preventive treatment during pregnancy (IPTp) and intermittent preventive treatment in infants (IPTi)?
9. Can other community-based public health interventions be co-implemented with SMC?
10. How will innovations such as malaria vaccines and monoclonal antibodies affect the role and delivery model of SMC?

2. Philanthropically supported SMC implementation 2021

In 2021, philanthropic funding enabled Malaria Consortium to deliver SMC to more than 12 million children in Burkina Faso, Chad, Mozambique, Nigeria, Togo, and Uganda. This included two million children in Borno state, Nigeria, where Malaria Consortium was able to provide support at short notice in response to an urgent request from the national malaria program and the international SMC community. In 2020, the number of children targeted with philanthropic support was seven million.^[19] Of the 12 million children targeted with philanthropic funding in the six countries supported, more than a quarter lived in areas that had never before been reached by SMC. In 2021, the malaria programs in Burkina Faso, Nigeria, and Uganda introduced five monthly SMC cycles in areas where the transmission season is slightly longer. Just under a quarter of the children targeted with philanthropic funding lived in areas where five SMC cycles were implemented. Almost 48 million blister packs of SPAQ were procured and 150,000 individuals were involved in the delivery of SMC campaigns. Below, we provide a detailed summary of achievements in each of the countries where philanthropic funding was used to support SMC, as well as an overview of support Malaria Consortium expects to provide using philanthropic funding for SMC going forward. We aim to increase the scale of our philanthropic SMC program to reach more than 14 million children and to expand our support to at least one additional country in 2022.

2.1 Burkina Faso

In 2020, Burkina Faso's total population was estimated at 20.90 million.^[20] Malaria is highly endemic in the entire country,^[21] with an estimated 8.15 million cases and 20,000 deaths from malaria in 2020, accounting for three percent of global malaria deaths.^[11] Burkina Faso has been included in the High Burden to High Impact (HBHI) initiative,^[22] which was launched by WHO and the RBM Partnership in 2018 to bring the world's 11 highest-burden countries back on track to achieve the 2025 milestones set out in WHO's *Global Technical Strategy for Malaria 2016–2030*.^[23] Insecurity now affects large parts of the country, with armed groups carrying out attacks and an increasing numbers of internally displaced people (IDP) in urgent need of humanitarian assistance.^[24]

All 70 health districts in Burkina Faso are considered eligible for SMC, which was first implemented in seven health districts in 2014. Funding support for SMC gradually increased over the following years, with 100 percent geographical coverage of SMC achieved in 2019 (**Figure 4**). Full geographical coverage was maintained in 2021, with a total SMC target population of 4.23 million children. Funding for SMC was provided by Malaria Consortium's philanthropic funding, the Global Fund, PMI and UNICEF (**Table 2**).



Figure 4: Number of health districts where SMC was implemented by primary funding source, Burkina Faso 2014–2021

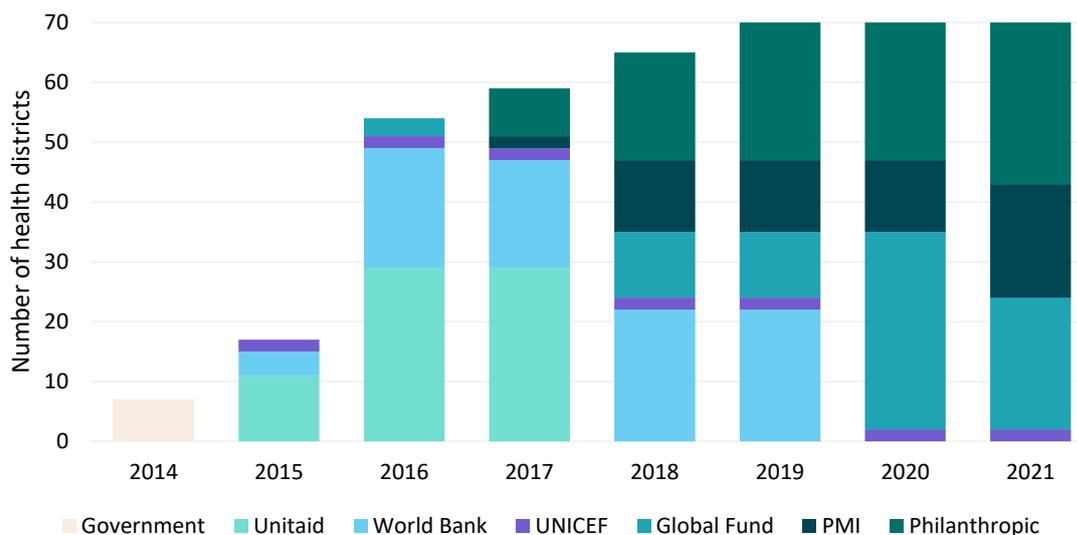
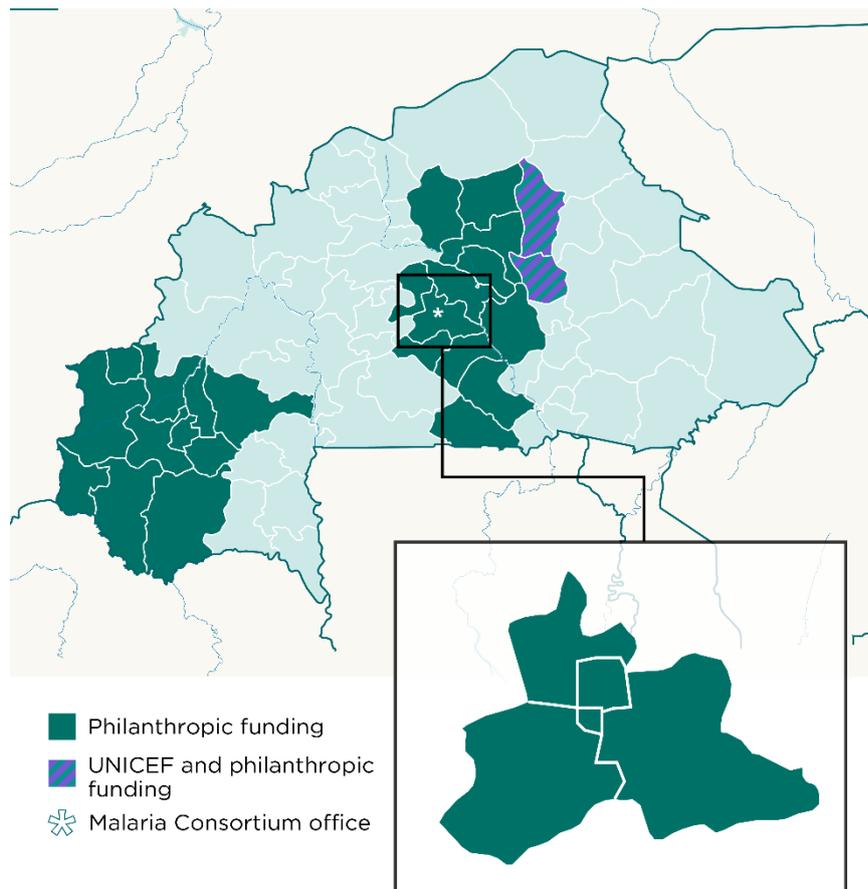


Table 2: SMC target population by funding source, Burkina Faso 2020–2021

Funding source	Number of health districts (2020)	Target population (2020)	Number of health districts (2021)	Target population (2021)
Philanthropic	23	1,620,000	27	1,920,000
Global Fund	33	1,800,000	22	1,400,000
PMI	12	420,000	19	810,000
UNICEF and philanthropic	0	0	2	100,000
UNICEF and Global Fund	2	90,000	0	0
TOTAL	70	3,930,000	70	4,230,000

In preparation for the 2021 SMC campaign, the national malaria program — *Programme National de Lutte contre le Paludisme* (PNLP) — and implementing partners agreed to reallocate health districts to achieve greater geographical coherence of areas supported by the respective partners. In this process, the Global Fund, PMI, and Malaria Consortium also agreed to split health districts supported by the World Bank until 2019 and covered by the Global Fund in 2020. As a result of the changes, Malaria Consortium’s support increased to 1.92 million children in 27 health districts across six regions (**Figure 5**), up from 1.62 million children in 23 districts across nine regions in the previous year. Responding to a request from UNICEF to avoid an anticipated shortage of SPAQ, Malaria Consortium also procured SPAQ for two health districts and 100,000 children, where UNICEF covered all implementation costs. In recognition of our contributions to the fight against malaria in Burkina Faso, Malaria Consortium received an award from the Minister of Health on World Malaria Day. We published a brochure on our website that illustrates how we have supported Burkina Faso since 2014.^[25]

Figure 5: Health districts supported with Malaria Consortium’s philanthropic funding for SMC, Burkina Faso 2021



In 2020, PNLP conducted a stratification exercise with support from WHO, the Institute for Disease Modeling, and Northwestern University to determine the optimal mix of malaria interventions at the health district level. The exercise, which was conducted under the HBHI initiative’s ‘strategic information’ response element,^[22] involved stratifying health districts based on epidemiological characteristics including prevalence, incidence, all-cause mortality among children under five, and combining the epidemiological information with measures of seasonality, urbanization, and access to care. For SMC, the analysis also modeled the impact of varying the number of cycles depending on seasonality patterns. Based on the recommendations from this exercise, the PNLP decided to adopt five annual cycles of SMC from 2021 onwards in 19 of the country’s 70 health districts, primarily in the south, including 11 of the health districts supported by Malaria Consortium. To celebrate the rollout of five SMC cycles across large parts of the country, a national launch event was held, where Mangodara health district was awarded a prize in recognition of the role the district played in testing the feasibility and acceptability of this approach as part of an operational research study conducted by Malaria Consortium in 2019.^[26]

A total of 8,928,000 blister packs of SPAQ was procured and shipped to Burkina Faso by sea. The medicines arrived at the central warehouse in the capital Ouagadougou at the end of May, well before the start of the 2021 SMC round. In November 2021, there was a fire at the warehouse, which destroyed large quantities of commodities, including SPAQ for SMC. While investigations are ongoing, we understand that around 310,000 blister packs procured with philanthropic funding were lost. The 2022 SPAQ consignment will not be affected as alternative warehouses are available.

PNLP set the start of the 2021 SMC round for 8th June in districts implementing five monthly cycles and 7th July in districts implementing four cycles. All 27 health districts supported by Malaria Consortium concluded the round on 5th October. More than 31,000 individuals were trained in SMC distribution with philanthropic support before the start of the annual SMC round (**Table 3**). In Burkina Faso, community distributors screen children for signs of malnutrition, which was part of the training. A dedicated training for supply chain specialists was conducted for the first time in 2021. Community engagement activities included more than 1,000 radio spots and 40 radio shows. Using radio as a means of sharing information about SMC is particularly important in urban areas like Ouagadougou.^[27] In line with our ambition to strengthen transparency and accountability of SMC delivery, Malaria Consortium led the introduction of mobile payments to SMC implementers in 2021. Roles and responsibilities of health authorities were included in memoranda of understanding (MOUs) with health districts. We also developed a manual that describes the payment process, including interactions with the mobile provider, finance checks, and escalation mechanisms. PNLP supported the effort and facilitated meetings with regional health directors and other regional and district stakeholders.

Table 3: SMC implementers trained with philanthropic support, Burkina Faso 2021

Cadre	Number of SMC implementers	Number of days per training	Number of training events
National-level trainers	124	2	3
Supply chain managers	23	3	1
Regional trainers and supervisors	124	1	6
District health staff	225	1	27
Health workers	3,058	1	95
Community distributors	21,884	1	1,092
Town announcers	5,721	1	891
TOTAL	31,159		2,115

In 2022, we expect to continue to fund SMC in the health districts we supported in 2021, with a target population of 2.0 million children. We also aim to further strengthen the cashless payment system and develop capacity among PNLP, implementing partners, and our own staff with regard to safeguarding. To ensure sustainability of SMC funding in the country, we plan to conduct a strategy workshop with PNLP and implementing partners to explore future funding needs and opportunities. This will involve an extensive donor mapping exercise.

2.2 Chad

Chad's total population stood at 16.43 million in 2020.^[28] About two-thirds of Chad's population live in areas of high malaria transmission, principally in the southern half of the country.^[29] In 2020, there were an estimated 3.35 million cases of malaria and 12,400 deaths.^[11] 2021 saw an increase of violence in Chad surrounding presidential elections and the subsequent death of President Idriss Déby Itno in a clash with rebel forces. Attacks from armed groups continued, especially in the Lake Chad area, resulting in an increase of IDPs.^[24]



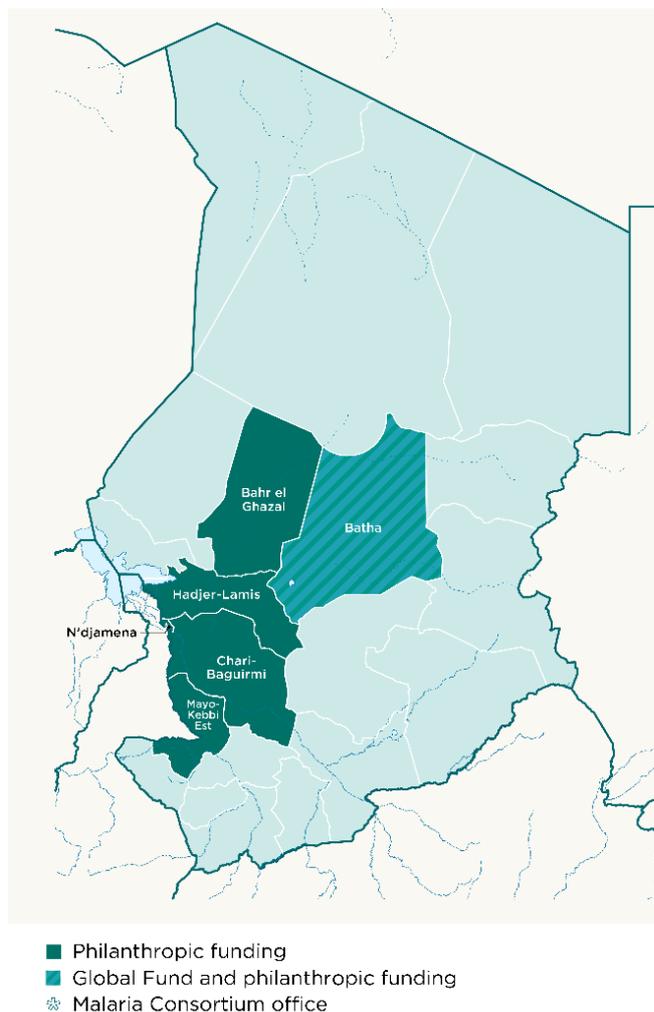
Chad's PNLPC considers 63 health districts eligible for SMC. Starting with four health districts in 2013, SMC was gradually scaled up to reach all eligible health districts for the first time in 2020. Full geographical coverage was maintained in 2021, with a total of 2.18 million children targeted for SMC. The lower total target population compared with 2020 reflects revised target population estimates rather than a genuine population decrease. Funding for SMC was provided by Malaria Consortium's philanthropic funding, the Global Fund, UNICEF, and Médecins Sans Frontières (MSF) (Table 4). Four SMC cycles are implemented in all eligible health districts.

Table 4: SMC target population by funding source, Chad 2020–2021

Funding source	Number of health districts (2020)	Target population (2020)	Number of health districts (2021)	Target population (2021)
Philanthropic	20	960,000	26	1,080,000
Global Fund	38	1,300,000	32	940,000
UNICEF	4	120,000	4	120,000
MSF	1	40,000	1	40,000
TOTAL	63	2,420,000	63	2,180,000

Six of the districts that had been funded by the Global Fund in 2020 were supported by philanthropic funding in 2021, increasing the number of health districts supported by Malaria Consortium to 26 across six regions (Figure 6), compared with 20 health districts across four regions in the previous year. The target population increased from 960,000 in 2020 to 1.08 million in 2021.

Figure 6: Regions supported with Malaria Consortium’s philanthropic funding for SMC, Chad 2021



Six health districts in Batha are supported by the Global Fund, one by philanthropic funding.

A total of 4,134,000 blister packs of SPAQ was shipped to Chad by sea. While the shipment was held up by the closure of Chad’s borders following the death of the President, it arrived at the central warehouse in the capital, N’Djamena, at the end of April, several months ahead of the start of the 2021 SMC round.

PNLP had scheduled the start of cycle 1 for early July, but taking into account campaign readiness across implementing partners, the start date was eventually set for 17th July. A launch ceremony was attended by the Director General of the Ministry of Public Health and National Solidarity. In recognition of Malaria Consortium’s contributions and support for SMC, our Country Director was invited to give one of the keynote speeches and preside over the ceremonial administration of SPAQ to a few selected children, which marked the official start of the 2021 SMC round. The start dates of cycles 2 and 3 varied by a few days between health districts due to a variety of factors, including conflicting health worker trainings. All 26 health districts supported by Malaria Consortium concluded the 2021 round by 22nd October. Philanthropic funding supported the training of almost 24,000 individuals before the start of the annual SMC round (**Table 5**). Community engagement activities included over 100 community meetings. As in Burkina Faso, radio spots were used to share information about the SMC campaign in N’Djamena. Following the successful introduction of mobile payments to SMC implementers in five pilot districts in 2020, we rolled out cashless payments to all

health districts supported by Malaria Consortium in 2021. We used this opportunity to renew the MOU with the Ministry of Health, emphasizing both parties' commitment to transparency and accountability with regard to the use of SMC funding. The payment processes introduced in the pilot districts in the previous year were reviewed and refined, and health authority staff were trained on the use of the digital payment platform. Throughout the campaign, support was provided by the Ministry of Health's compliance unit. A letter from the Minister of Health expressing support was sent to regional health directors, district health authorities, and health facility in-charges.

Table 5: SMC implementers trained with philanthropic support, Chad 2021

Cadre	Number of SMC implementers	Number of days per training	Number of training events
National and province-level trainers and supervisors	22	2	3
District-level trainers and supervisors	117	2	26
Health workers	422	2	26
Field supervisors and community distributors	12,272	1	419
Town announcers	11,154	1	419
TOTAL	23,987		893

In 2022, we will continue to support SMC in the same health districts as in 2021, with a target population of 1.1 million children. We expect continued support from PNLP in strengthening cashless payments to SMC implementers. Programmatic priorities for 2022 include improving access to SMC in hard-to-reach areas and for marginalized populations, such as nomadic groups. We are also discussing with PNLP and implementing partners how digital tools could be used to support SMC delivery.

2.3 Mozambique

Mozambique had a total population of 31.26 million in 2020.^[30] Malaria is highly endemic in the entire country, with the highest prevalence in the north and along the coast.^[31] There were 10.01 million malaria cases and 23,800 deaths in 2020, representing four percent of global deaths.^[11] The security situation worsened in 2021, mainly as a result of increasing violence in the northern Cabo Delgado province, where attacks and kidnappings by armed groups are on the increase, resulting in the internal displacement of large numbers of people.^[24]

A mid-term review of Mozambique's *Malaria Strategic Plan 2017–2022*^[32] recommended SMC as a strategy to accelerate impact in the highest-burden locations. In 2020, the National Malaria Control Program — *Programa Nacional de Controlo da Malária* (PNCM) — approached Malaria Consortium about the possibility of exploring the use of SMC in Nampula province, where under-five mortality is high and malaria transmission is seasonal. The province is not currently affected by the security challenges in neighboring Cabo Delgado province. To test if SMC can be a viable malaria prevention

strategy in Mozambique despite high resistance to SP, ^[33] a two-phase implementation study was designed, with phase 1 focusing on acceptability and feasibility, followed by more rigorous assessments of the effectiveness of the intervention and chemoprevention efficacy of SPAQ in phase 2. The study is described in more detail in the research section below.

Phase 1 of the study involved delivering four monthly SMC cycles to around 70,000 children in two districts of Nampula province (**Figure 7**) during the 2020/21 transmission season. This was the first time SMC was implemented in Mozambique.^[34] In the north of the country, the malaria season typically lasts from November or December until February or March, so does not align with the calendar year. Activities completed in 2020, including procurement of SPAQ, training of SMC implementers, and distribution of the first two monthly SMC cycles were discussed in Malaria Consortium's 2020 SMC philanthropy report.^[19] Cycles 3



and 4 of the 2020/21 round were implemented as scheduled in January and February 2021. Both districts finished SMC distribution on 11th February. While the standard SMC implementation approach that has been tried and tested in the Sahel was used, an important part of the project was to adopt the approach to the local context. For example, in Sahelian countries, community distributors typically come to the health facility at the beginning and end of each distribution day to receive the SPAQ, allocate daily targets, and discuss challenges. Due to the long distances between health facilities and communities in Mozambique, supervisors meet community distributors in their communities instead. Another adaptation was the use of community leaders to help promote acceptability of SMC by visiting people in their homes. A summary of operational lessons learned from implementing SMC for the first time in Mozambique was published on Malaria Consortium's website in early 2022.^[35] We also published two blog post illustrating the importance of community engagement for SMC in Mozambique.^[36,37] **Box 2** contains a quote from a community member whose child had received SMC. Close involvement and leadership from health authorities at the district, province, and national level was seen as another major success factor. Mobile payment was introduced and embedded in the SMC processes early on, reaching 74 percent of SMC implementers by the end of the 2020/21 round.

Figure 7: Provinces supported with Malaria Consortium’s philanthropic funding for SMC, Mozambique 2020/21 and 2021/22



Box 2: Quote by the father of a child who received SMC in Malema district during the 2020–2021 season, Mozambique

“When community mobilisers passed by my house, I was working. On my return from work, I heard my wife talk about a new health project and she said they bring pills for young children to prevent malaria. There was lots of talk around the neighborhood about this new thing called SMC to help our children. In the past years during the rainy season, I always suffered with my children getting malaria. For my daughter, the youngest, it was really bad and that scared me. So, when this new project arrived, I wanted to try it because I couldn’t stand to see my daughter suffering again. Although she suffered a little with diarrhea when she started taking the medication, it didn’t last and until today she hasn’t had malaria. I can say that the pills saved my daughter from more illness —the child is well for the first time in this rainy season.”

In preparation for the 2021/22 SMC round, which involves delivery of four SMC cycles to around 110,000 children in four districts of Nampula province as part of phase 2 of the SMC implementation study, we created new SMC project roles, including a Trial Manager, Data Manager, and Financial Accountant. Applying learning from phase 1 of the project, we strengthened the involvement of a cadre of recognized community health workers, known as *agentes polivalentes elementares* (APEs), in phase 2. While it is not possible for the APEs to serve as community distributors due to their high workload, several APEs in the four districts were trained on SMC and supported community engagement, case management, and supervision during SMC distribution. We procured 540,000

blister packs of SPAQ. The medicines were shipped by sea and arrived in Nampula in October. Due to delays in obtaining ethical approval for phase two of the SMC implementation study, the 2021/22 round, which was scheduled to start in November 2021, did not commence until January 2022. Results and lessons learned will therefore be discussed in next year’s philanthropy SMC report. Training of SMC implementers for the 2021/22 round was concluded in 2021, however, with 1,900 individuals involved (Table 6).

Table 6: SMC implementers trained with philanthropic support, Mozambique 2021/22

Cadre	Number of SMC implementers	Number of days per training	Number of training events
District-level trainers and supervisors	30	3	1
Health workers	51	3	4
Community supervisors, APEs and community distributors	1,366	2	67
Community leaders	450	1	41
TOTAL	1,897		113

To-date, SMC has only been implemented in Mozambique as part of the implementation study conducted by Malaria Consortium and PNCM, supported by philanthropic funding. Based on the promising study results so far, we hope to begin the gradual scale-up of SMC in Mozambique during the 2022/23 season. This could involve expanding SMC to all districts in Nampula province as a first step, with an approximate target population of around 1.2 million children. The 2022/23 round is likely to commence in December 2022.

2.4 Nigeria

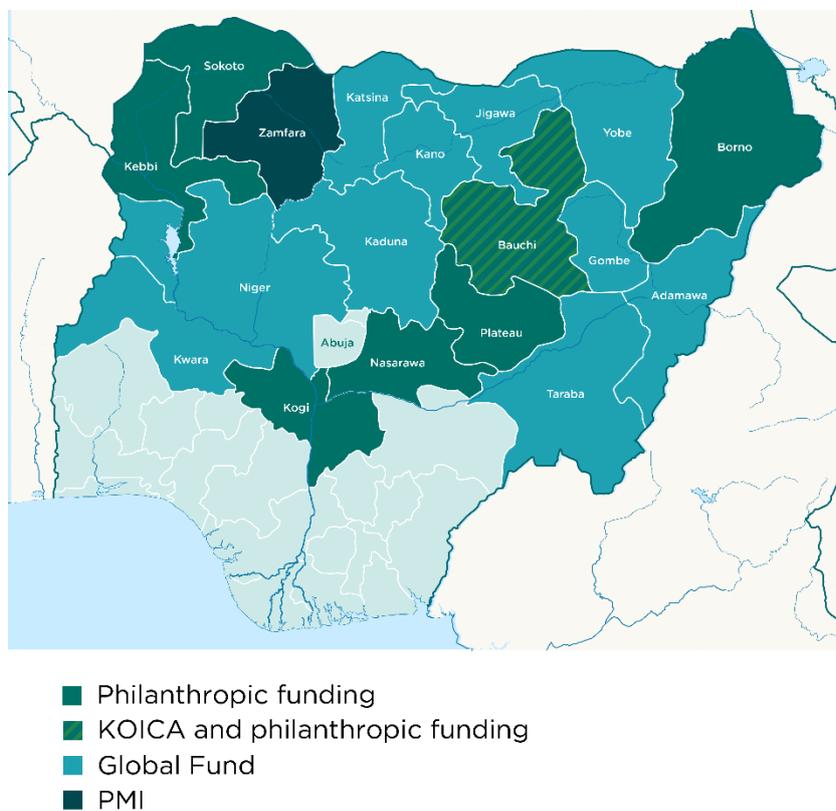
Nigeria has the largest population in Africa, estimated at 206.14 million in 2020.^[38] More than 75 percent of the population lives in areas of high malaria transmission.^[39] Nigeria has the highest malaria burden globally, accounting for 27 percent of malaria deaths. In 2020, there were an estimated 64.68 million malaria cases and 200,000 deaths.^[11] The country has seen a marked deterioration of the security situation in recent years.^[24] In the northeast, the main threat comes from armed groups attacking government facilities, including health centers. In the northwest, armed groups known locally as bandits are responsible for frequent killings and kidnappings for ransom. Several states imposed temporary curfews. The number of IDPs is increasing.

Nigeria started implementing SMC in five local government areas (LGAs) in Katsina state in 2013. The first scale-up



phase targeted nine states in the north of the country. In 2020, all 216 eligible LGAs in those nine states were reached for the first time. As part of the HBHI initiative, the National Malaria Elimination Programme (NMEP) conducted an exercise similar to the one described above for Burkina Faso to stratify geographical areas according to epidemiological, ecological, social, and economic determinants for the purpose of guiding malaria interventions. In Nigeria, this exercise was supported by WHO and Northwestern University. For SMC, the analysis defined eligibility as areas where the *Plasmodium falciparum* parasite rate (standardized to the age group 2–10 years, a commonly used index of malaria transmission intensity) is greater than five percent, and areas where more than 60 percent of rainfall occurs within four consecutive months. As a result of this exercise, NMEP now considers 400 LGAs in 20 states plus the Federal Capital Territory (FCT) eligible for SMC. In 2021, a total of 368 LGAs in 18 states was covered (**Figure 8**), mainly thanks to increased funding from the Global Fund and Malaria Consortium’s philanthropic funding. Additional funding was provided by PMI and KOICA. The total SMC target population in 2021 was 21.70 million (**Table 7**). **Figure 9** illustrates the gradual scale-up of SMC in Nigeria between 2013 and 2021.

Figure 8: States reached by SMC by funding source, Nigeria 2021



Eighteen LGAs in Bauchi are fully supported by philanthropic funding; two are co-funded by KOICA.

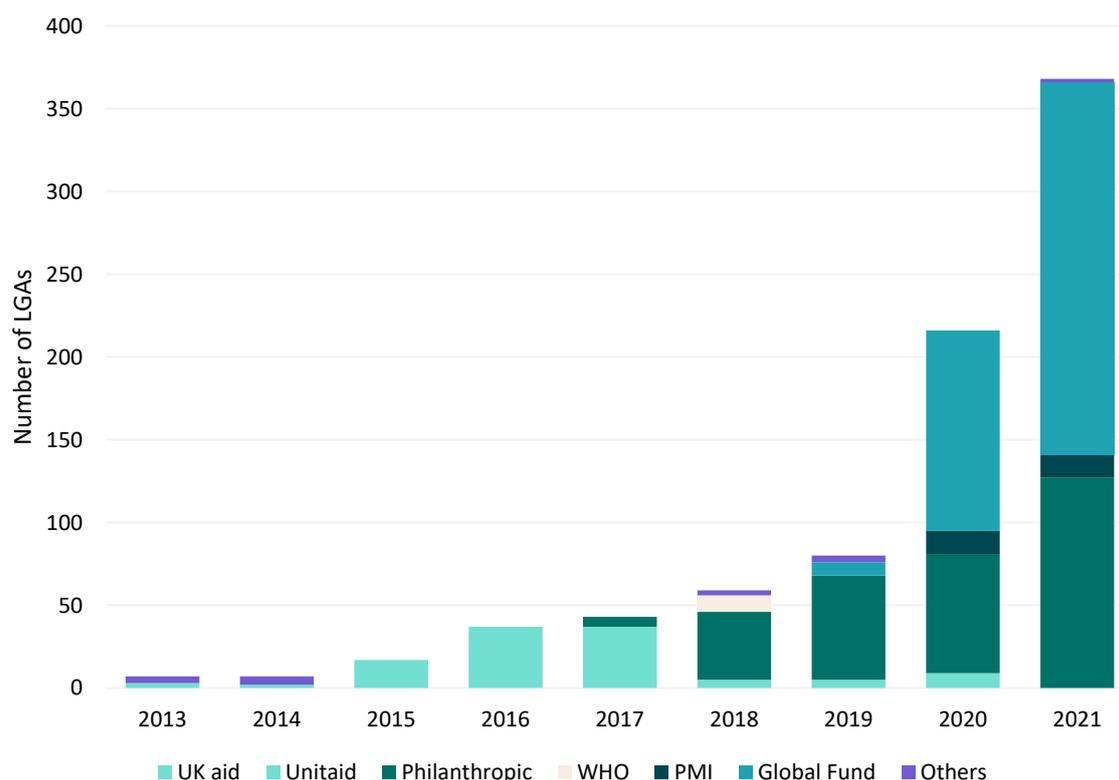
Table 7: SMC target population by funding source, Nigeria 2020–2021

Funding source	Number of LGAs (2020)	Target population (2020)	Number of LGAs (2021)	Target population (2021)
Global Fund	122	6,450,000	225	12,320,000
Philanthropic	72	3,910,000	127	8,130,000
PMI	14	960,000	14	990,000
UK aid and philanthropic ^a	9	410,000	0	0
KOICA and philanthropic ^b	0	0	2	260,000
TOTAL	217	11,730,000	368	21,700,000

^aIn 2020, UK aid funding covered SPAQ, COVID-19-related commodities, and some operational costs for cycles 1 and 2 in nine LGAs in Jigawa. Philanthropic funding was used for all other costs.

^bIn 2021, KOICA covered the cost of SPAQ for two LGAs in Bauchi, as well as the majority of implementation costs. Philanthropic funding was used to cover international freight and some implementation costs.

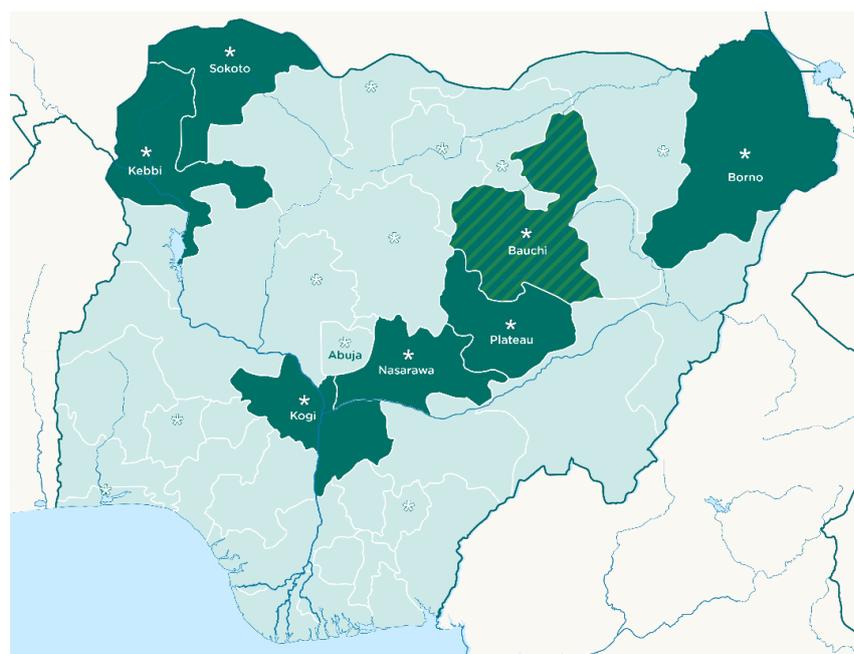
Figure 9: Number of LGAs where SMC was implemented by primary funding source, Nigeria 2013–2021



The number of LGAs supported by Malaria Consortium with philanthropic funding grew from 72 across four states in 2020 to 129 LGAs across seven states in 2021 (Figure 10). We continued to support SMC in eight LGAs of Bauchi, as well as all LGAs in Kebbi and Sokoto. Philanthropic funding was used to expand SMC to around 2.98 million children living in areas that had not previously been

reached by SMC: 10 additional LGAs in Bauchi and nine new LGAs in Kogi, as well as all LGAs in Nasarawa and Plateau. Among the additional LGAs in Bauchi, two were part-funded by KOICA through the SMC-Impact project, which was launched in 2021.^[40] This multi-country and multi-partner project supported the cost of SPAQ and the majority of SMC implementation costs in those LGAs, while philanthropic funding was used to cover international freight and a few SMC implementation activities. Jigawa, which had been supported with philanthropic funding in previous years, received support from the Global Fund in 2021. Conversely, Borno, which had been funded by the Global Fund, WHO, and other partners in previous years, reported a funding gap a few months before the scheduled start of the SMC campaign. In consultation with GiveWell,^[41] Malaria Consortium was able to extend support to this state at short notice using philanthropic funding, ensuring that 2.05 million children did not miss out on protection from malaria through SMC (**Box 3**).^[42] The total SMC target population covered with philanthropic funding in Nigeria increased from 3.91 million in 2020 to 8.13 million in 2021. If co-funding arrangements are taken into account, philanthropic funding contributed to SMC delivery targeting 4.32 million children in 2020. In 2021, this figure was 8.39 million (**Table 8**). Following the recommendations from the stratification exercise, five monthly SMC cycles were implemented in Kogi, Nasarawa, and Plateau, with a combined target population of 2.12 million.

Figure 10: States supported with Malaria Consortium’s philanthropic funding for SMC, Nigeria 2021



- Philanthropic funding
- KOICA and philanthropic funding
- ✳ Malaria Consortium office

Eighteen LGAs in Bauchi are fully supported by philanthropic funding, two are co-funded by KOICA.

Box 3: Case study SMC implementation in Borno, 2021

Borno has long been affected by the insecurity and violence in the Lake Chad region, with large numbers of people living in IDP camps. In previous years, SMC had been implemented as a humanitarian program with support from the Global Fund, WHO, and other partners. In 2021, it was expected that financing for SMC in Borno would become available under a World Bank loan. However, as the start date of the 2021 campaign approached, it became evident that the loan was not going to be approved on time. A few months before the scheduled start of the SMC campaign, NMEP approached the SMC Alliance for support in exploring alternative funding options. The SMC Alliance facilitated discussions with GiveWell and Malaria Consortium about the possibility of using philanthropic funding at short notice to ensure that two million children under five in Borno continued to benefit from SMC. Agreement to support the state was reached in June 2021, around six weeks before the campaign was scheduled to start in neighboring states.

Given the long lead time for manufacturing SPAQ, Malaria Consortium placed an order based on liberal population estimates to ensure availability of SMC medicines at the earliest possible time even before the details of our support had been confirmed. We then engaged with the state malaria program and other stakeholders to agree on the implementation approach, roles, and responsibilities. At this point, we also opened a small office in the state capital, Maiduguri, and recruited an SMC team to coordinate SMC delivery. Micro-planning resulted in a more accurate target population estimate, which allowed us to air freight only the amount of SPAQ needed in 2021 to Borno. The remaining quantities ordered when the philanthropic support for the state was confirmed were sea freighted for use elsewhere in 2022.

We anticipated that a large proportion of the target population would live in areas with high levels of insecurity and in IDP camps. For this reason, we expected that the SMC delivery model would need to be adapted to a humanitarian context and that we would need to partner with humanitarian organizations. However, a detailed security assessment of each LGA determined that only around five percent of the target population lives in high-risk areas, with another 40 percent living in areas that are considered medium-risk. Around 10 percent of the targeted children lives in IDP camps, but those are spread across the state and considered relatively safe. Based on this assessment, we determined that Malaria Consortium's standard SMC delivery approach would be used for the majority of targeted children, including those in IDP camps. We applied Malaria Consortium's SMC security adaptation principles (see chapter on security below) in medium-risk areas. In high-risk areas, SMC was implemented by the state malaria program, with Malaria Consortium providing support remotely. Commodity deliveries to a few high-risk LGAs was done by helicopter or protected by military escorts coordinated by the state authorities.

The air-freighted SPAQ for Borno arrived in September. All planning, community engagement, and training activities had been concluded by early August 2021. To avoid further delays to the start of the SMC campaign, we repositioned commodities from other philanthropically supported states. The effort was supported by SPAQ donations from PMI and MSF. Cycle 1 in almost all LGAs in Borno started in mid-August. While there were some delays caused by insecurity, a conflicting health campaign, and the complex supply chain situation, the annual SMC round was completed in December. This was only about one month later than in other philanthropically supported states, where SMC campaign planning had started several months earlier. While the security situation remained volatile, with violence flaring up in several areas throughout the year, no incidents relating to SMC were reported. Administrative coverage rates were high and comparable with other Nigerian states.

Malaria Consortium's rapid response to filling the funding gap was made possible because philanthropic funding gives us the operational flexibility to direct resources to the areas of greatest need. In 2022, we plan to publish a learning brief summarizing what we learned from implementing SMC in this challenging environment.

Table 8: Target population in states supported with Malaria Consortium’s philanthropic funding for SMC, Nigeria 2021

State	Number of LGAs	Target population	Changes compared with 2020
Bauchi	20	1,790,000	Two LGAs supported by KOICA-funded SMC-Impact project 10 LGAs not previously reached by SMC, resulting in all of Bauchi state covered for the first time
Borno	26	2,050,000	Previously funded by Global Fund, WHO, and others Originally earmarked for funding through a World Bank loan
Kebbi	21	1,230,000	No change compared with 2020
Kogi	9	380,000	Not previously reached by SMC Five SMC cycles implemented
Nasarawa	13	950,000	Not previously reached by SMC Five SMC cycles implemented
Plateau	17	790,000	Not previously reached by SMC Five SMC cycles implemented
Sokoto	23	1,200,000	No change compared with 2020
TOTAL	129	8,390,000	

A total of 26,447,468 blister packs of SPAQ was procured for the six states Malaria Consortium initially planned to support with philanthropic funding in 2021. The medicines were shipped to Nigeria by sea in two consignments. The shipments were delayed by COVID-19-related global supply chain shortages and an administrative error that meant the import duty waiver for the second consignment needed to be revalidated. The consignments arrived at a central warehouse in July and September, respectively. When the philanthropic support for Borno was confirmed at short notice, a top-up order was placed and an additional 7,398,000 blister packs were air-freighted, arriving in October.

The late arrival of SPAQ consignments and the short-notice request to support Borno required reallocation of stock between states both before and during the 2021 SMC round. PMI supported the effort by donating a total of 1,114,400 blister packs. We also received a donation of 1,100 blister packs from MSF France. PMI subsequently advised that they had miscalculated the quantities that could be spared in the PMI-supported state and Malaria Consortium subsequently agreed to loan 700,000 blister packs to PMI in return. The supply chain challenges and delays resulted in a complex timetable for SMC delivery. **Table 9** presents an overview of implementation dates and delays in each of the states supported with philanthropic funding.

Table 9: SMC distribution dates in philanthropically supported states, Nigeria 2021

State	Implementation dates	Delays
Bauchi	Cycle 1 started on 16 th July and cycle 4 concluded on 17 th October in all LGAs	<p>Cycle 1 started around one week later than planned due to simultaneous COVID-19 vaccination and immunization campaigns</p> <p>Cycle 2 started two days later than planned due to redistribution of SPAQ to Borno</p> <p>Cycle 4 was delayed by a few days due to competing health campaigns</p>
Borno	Most LGAs started cycle 1 around 15 th August. A few LGAs only commenced the campaign on 25 th August. All LGAs concluded cycle 4 between 3 rd and 6 th December	<p>Cycle 1 start date was initially planned for early August, but was delayed by around two weeks due to a competing health campaign and public holidays</p> <p>Two high-risk LGAs experienced further delays of around 10 days since SPAQ needed to be helicoptered in due to poor road conditions and a postponed military escort</p> <p>Cycle 3 was generally late due to delayed arrival and customs clearance of SPAQ commodities</p>
Kebbi	Cycle 1 commenced on 16 th July and cycle 4 was concluded on 24 th October in all LGAs	<p>Start of cycle 1 happened around one week later than planned due to delayed commodity transport</p> <p>Cycle 2 started two days later than planned due to redistribution of SPAQ to Borno</p> <p>Cycle 4 was delayed by five days due to competing health campaigns</p>
Kogi	Cycle 1 started on 11 th July and cycle 5 finished on 9 th November in all LGAs	Start of cycle 1 was delayed by about two weeks due to interruptions in the delivery of SMC implementation tools
Nasarawa	Cycle 1 started on 9 th July and cycle 5 finished on 20 th November in all LGAs	<p>The start of cycle 1 was delayed by about two weeks due to delays in the delivery of SMC implementation tools</p> <p>Cycle 4 was delayed by six days due to competing health campaigns</p>
Plateau	Cycle 1 commenced on 16 th July and cycle 5 concluded on 14 th November in all LGAs	<p>Cycle 1 started around three weeks later than planned due to the death of the state's Permanent Secretary and delays in agreeing an MOU with the state malaria program</p> <p>In two LGAs, cycle 2 was delayed by three days due to a security-related 24-hour curfew</p>

Sokoto	All LGAs commenced cycle 1 on 16 th July and finished cycle 4 on 2 nd November	<p>Cycle 1 started about one week later than planned due to delayed commodity transport</p> <p>Cycle 2 started two days later than planned due to redistribution of SPAQ to Borno</p> <p>Cycle 4 was delayed due to delayed commodity transport</p>
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Just under 85,000 individuals were trained on SMC with philanthropic support before the start of the annual SMC round (**Table 10**). In Nigeria, SMC distribution is supported by health educators, who coordinate and lead SMC-related community engagement activities at the LGA level. SMC distribution is also supported by lead mothers: this cadre of female volunteers is tasked with sharing information about SMC within their communities and visiting households over the two days following community distributors' visits, to remind caregivers to administer AQ on days two and three. Because of the challenging security situation in Borno, ward focal persons and community leaders support the campaign by liaising with target communities instead of lead mothers in that state. Community engagement activities included holding more than 5,000 community meetings, as well as broadcasting 720 radio spots to share messages about SMC and inform communities about the campaign dates. A key achievement in 2021 was the establishment of a close collaboration with the National Agency for Food and Drug Administration and Control to strengthen the pharmacovigilance component of SMC. To strengthen our ability to engage with stakeholders at the country and state level, build partnerships, and maximize influencing opportunities, Malaria Consortium's Nigeria SMC team, with support from our Advocacy Manager, conducted a series of advocacy capacity development workshops over the course of the year.

Table 10: SMC implementers trained with philanthropic support,^a Nigeria 2021

Cadre	Number of SMC implementers	Number of days per training	Number of training events
National- and state-level master trainers	16	2	2
National supply chain specialists	9	2	2
National health educators	6	2	2
State-level trainers and supervisors	478	2	14
State-level supply chain specialists	103	2	9
State-level health educators	103	2	9
LGA-level trainers and supervisors	645	2	23
Ward focal persons	238	2	8
Health workers	11,261	2	459
Community distributors	56,965	2	2,069

Town announcers and community leaders	8,657	1	292
Lead mothers	6,150	1	228
TOTAL	84,631		3,117

^aAs KOICA funding was used for training in the two SMC-Impact LGAs, SMC implementers trained in those LGAs have not been included in the figures presented here.

In 2022, we expect to continue to use philanthropic funding to support all seven states we supported in 2021, including Borno. While we had initially intended the funding for Borno as a one-year stopgap, alternative SMC funding arrangements are not yet in place at the time of writing this report. It appears highly likely that waiting for the funding arrangements to be confirmed risks missing the 2022 round in Borno. As Malaria Consortium still has a presence in Borno, including an office and SMC staff, we have proposed that philanthropic funding be used for another year to ensure that children are not left unprotected because of this funding gap. The co-funding arrangement with KOICA in two LGAs in Bauchi through the SMC-Impact project will also continue. With support from GiveWell,^[43] we plan to extend our support to two of the areas that were identified as eligible for SMC through the HBHI stratification exercise, but that have not yet benefited from SMC: Oyo and FCT. In Kogi, we will expand to all 21 LGAs, including 12 that had not so far been reached by SMC. To comply with the recommendations from the stratification exercise, five SMC cycles will be implemented in FCT, Kogi, Nasarawa, Oyo, and Plateau, as well as 10 LGAs in Bauchi. The total target population that will be reached with philanthropic support will be around 9.8 million.

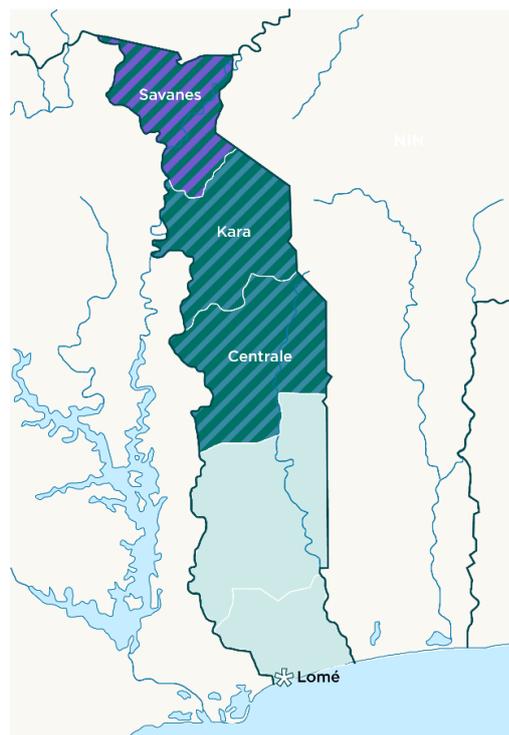
While many of the delays and challenges experienced in 2021 were security and supply chain related, another common cause was that other health campaigns clashed with SMC. A key area of improvement for next year's SMC campaign will, therefore, be to minimize such disruptions by getting high-level commitment to agreed timelines and coordinating more closely with relevant state-level agencies, such as the National Primary Health Care Development Agency. As we are expanding SMC to FCT, which includes the capital, Abuja, another priority will be to refine the SMC delivery model in urban areas. We also want to further strengthen community engagement and improve the processes needed to ensure timely payment of SMC implementers.

2.5 Togo

In 2020, Togo had a total population of 8.28 million.^[44] Malaria is highly endemic in the entire country.^[45] There were an estimated 1.89 million malaria cases and 3,600 deaths in 2020.^[11] Togo is not affected by the same levels of violence and insecurity as many of its Sahelian neighbors. However, sporadic outbreaks of violence, particularly in the north near the border with Burkina Faso, have been reported.^[46]

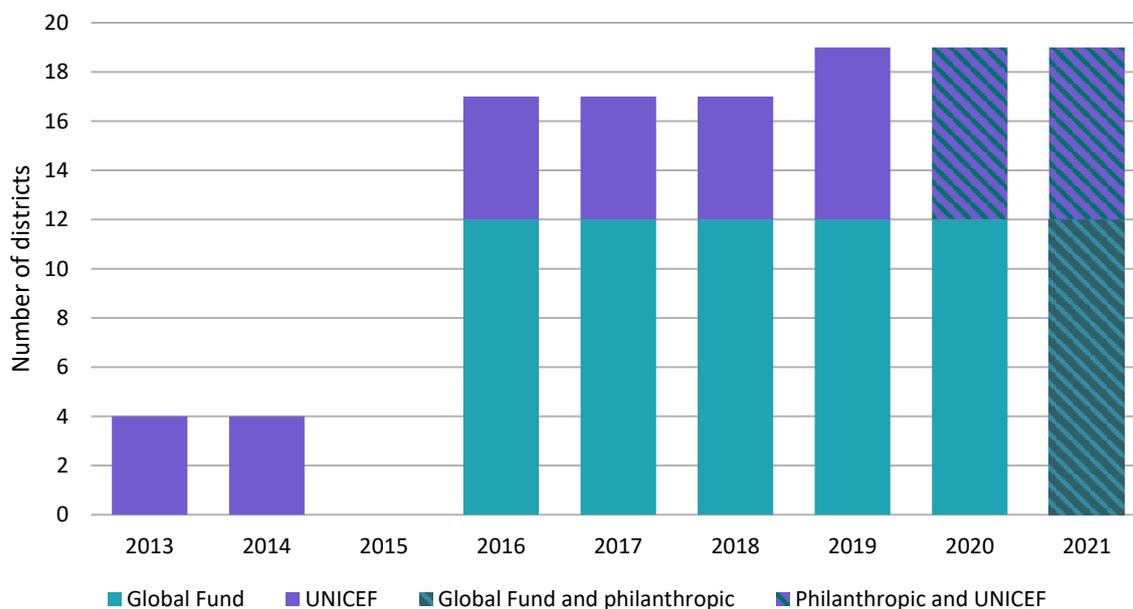
SMC has been implemented since 2013. Currently, the three northernmost regions of Centrale, Kara, and Savanes are targeted (**Figure 11**). Geographical coverage increased from five districts initially to all districts in the eligible regions from 2016 onwards (**Figure 12**). Full geographic coverage was maintained in 2021 with funding from the Global Fund, Malaria Consortium's philanthropic funding, and UNICEF, with a total target population of 490,000 (**Table 11**). Four monthly SMC cycles should be implemented in all eligible districts.

Figure 11: Regions supported with Malaria Consortium’s philanthropic funding for SMC, Togo 2021



- ✳ Malaria Consortium office
- Global Fund and philanthropic funding
- Philanthropic funding and UNICEF

Figure 12: Number of districts^a where SMC was implemented by primary funding source, Togo 2013–2021^b



^aThe number of eligible districts changed as a result of administrative changes in 2019. However, the area targeted remained unchanged.

^bWhile all eligible districts have been reached since 2016, only two or three SMC cycles were implemented between 2016 and 2019 due to insufficient funding.

Table 11: SMC target population by funding source, Togo 2020–2021

Funding source	Number of districts (2020)	Target population (2020)	Number of districts (2021)	Target population (2021)
Global Fund	12	290,000	0	0
Global Fund and philanthropic ^a	0	0	12	300,000
Philanthropic and UNICEF ^b	7	180,000	7	190,000
TOTAL	19	470,000	19	490,000

^aThe Global Fund covered SPAQ and the majority of SMC implementation costs. Some activities were supported with philanthropic funding.

^bUNICEF procured SPAQ and covered operational costs of one SMC cycle in 2020. Malaria Consortium provided a grant to cover operational costs for the remaining three SMC cycles that year. In 2021, UNICEF covered SPAQ, while philanthropic funding was used for all SMC implementation costs.

While full geographic coverage was reached in 2016, SMC implementation had been consistently hampered by a lack of funding. In 2015, SMC could not be implemented. Between 2016 and 2019, only two or three SMC cycles were implemented. There was also limited funding for intervention components associated with quality SMC implementation, such as training, supervision, and M&E. Togo’s PNLP approached Malaria Consortium in 2019 to explore the possibility of using philanthropic funding to complement funding from the Global Fund and UNICEF to ensure consistent, high-quality implementation of four SMC cycles. In 2020, we opened an office in Togo and started the process of registering as a non-governmental organization. We supported the cost of three SMC cycles in Savanes, while UNICEF procured the SPAQ and covered the cost of one cycle. We also supported procurement of COVID-19-related commodities for all three regions. In 2021, we continued to support Savanes by covering all SMC implementation costs, while UNICEF procured SPAQ. In Centrale and Kara, the Global Fund procures SPAQ and covers most implementation costs, with philanthropic funding used to support planning, training, and M&E. Malaria Consortium continued the process of establishing a firm presence in Togo. We now have a fully functioning country team, including a Country Director, Country Technical Coordinator, and M&E, research, and finance staff.

PNLP decided to bring the 2021 SMC round forward by about one month compared with previous years, aiming to start in June rather than July. However, cycle 1 had to be postponed, resulting in a delay to the initial schedule of about one week due to delays in transporting commodities in the regions supported by the Global Fund. Cycle 1 started on 23rd June in all regions and cycle 4 ended on 26th September. Over 7,000 individuals were trained on SMC before the start of the campaign in the three regions (**Table 12**). Training for SMC implementers was conducted for the first time since 2017. A key part of Malaria Consortium’s role in Togo is to provide technical advice on high-quality implementation of SMC. In 2021, this involved a revision of SMC training tools, the introduction of an end-of-round household survey in all three regions, and establishing systems for using data from end-of-cycle LQAS surveys to inform improvements in subsequent cycles in selected districts.

Table 12: SMC implementers trained with philanthropic support, Togo 2021

Cadre	Number of SMC implementers	Number of days per training	Number of training events
National- and province-level trainers	19	2	1
Regional- and district-level trainers	88	2	3
Field supervisors	680	2	19
Community distributors	6,338	2	226
TOTAL	7,125		249

In 2022, we intend to continue our support for SMC along the same lines as in 2021, supporting SMC delivery to around 500,000 children. We aim to expand the processes we established in 2021 for using end-of-cycle survey data to improve SMC in subsequent cycles to all regions in 2022. Cashless payment to health campaign implementers has been used in Togo as a matter of policy for some time, but payments have often been slow. We will support PNLN in improving efficiency and accountability in collaboration with other implementing partners. Another programmatic priority will be to further refine SMC training, targeting specific learning needs identified in 2021 to strengthen the quality of SPAQ administration and supervision at the community level.

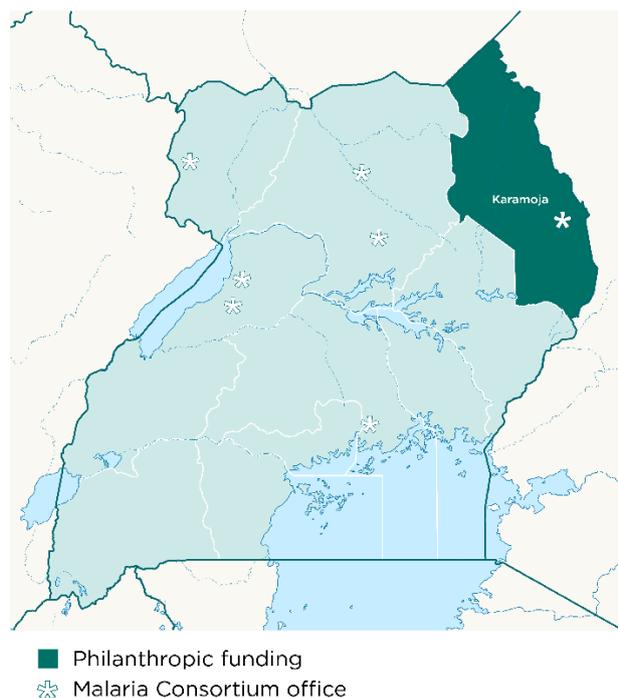
2.6 Uganda

Uganda’s population was estimated at 45.74 million in 2020.^[47] Malaria is highly endemic in the entire country.^[48] In 2020, there were 12.98 million cases and 21,700 deaths. Uganda accounts for five percent of global deaths from malaria.^[11] There was a wave of unrest surrounding the presidential elections in January 2021.^[24]

The *Uganda Malaria Reduction and Elimination Strategic Plan 2021–2025*^[49] aims to move the country into the malaria pre-elimination stage and proposes new, innovative chemoprevention approaches to combat malaria, especially in children. Modeling conducted by the Swiss Tropical and Public Health Institute suggests that SMC could be a viable malaria prevention strategy in the northeastern Karamoja region,^[50] where malaria transmission is seasonal and the highest prevalence rates in the country are consistently reported. However, as in Mozambique, SP resistance is presumed to be high in Uganda.^[51] In 2020, the National Malaria Control Division (NMCD) approached Malaria Consortium with a request to support an SMC implementation study in Karamoja (**Figure 13**) to investigate the feasibility, acceptability, and impact of SMC. The study employs a similar two-phase design as the study Malaria Consortium is conducting in Mozambique and is described in more detail in the research section below.

The first project phase involved SMC delivery to around 90,000 children in two districts. Taking into account local malaria transmission patterns, five SMC cycles were implemented between May and September 2021. This was the first time SMC was implemented in the country.^[52]

Figure 13: Regions supported with Malaria Consortium’s philanthropic funding for SMC, Uganda 2021



Following approval for the implementation project from the relevant ethical review boards, Malaria Consortium recruited a project team and, in close collaboration with national, regional, and district health authorities, reviewed the SMC tools and materials used in other countries supported by Malaria Consortium. The intervention tools and procedures were adapted to the local context, including a new training flipbook that included COVID-19 infection prevention and control (IPC) measures. It was agreed that village health teams (VHTs), a trained and recognized cadre of community health workers who deliver basic health services and health promotion, will act as community distributors in Uganda. Since VHTs have a continuous presence in the communities in which they work, they can share information about SMC and malaria throughout the year during their routine household visits, which strengthens community engagement and the acceptability of SMC among target communities. As VHTs deliver integrated community case management of malaria, pneumonia, and diarrhea in children under five in their communities, they have prior knowledge of malaria and experience of the community-based delivery of health services, which supports high-quality implementation of SMC. Other adaptations to embed SMC in the national health system included the integration of SPAQ distribution to health facilities in Uganda’s essential medicines supply chain, and the development of a surveillance tool for use by VHTs to help monitor breakthrough cases among eligible children.

A total of 420,000 blister packs was procured and shipped to Uganda in two consignments. The first consignment was shipped by sea and arrived in Karamoja in February, several months before the start of the annual round. Stock consumption data from cycle 1 strongly suggested that the target population had been underestimated and a small top-up order was air-freighted to Uganda, arriving in July.

Cycle 1 distribution started on 6th May in both study districts. In one of the districts, the start of cycle 3 was delayed by one week while we were waiting for the top-up SPAQ consignment to arrive in Uganda. The 28-day cycle was maintained in both districts. Consequently, one district finished cycle

5 on 11th September, while the other concluded the 2021 round on 18th September. Over 1,000 individuals were trained on SMC delivery (**Table 13**). To ensure support from local communities and increase awareness of SMC, a series of engagement meetings reaching over 2,600 individuals was held prior to the start of the annual SMC round. Participants included district leaders, health workers, and community and religious leaders. In addition, announcements about SMC were made in urban centers, mosques, churches and markets, and radio spots and talk shows. There was committed leadership from NMCD throughout the project, as well as strong involvement of national, regional, and district health authorities in planning and supervision, which together with intensive community engagement, contributed to high acceptability and coverage. Building on lessons from other SMC countries, a mobile payment system was introduced at the start of the annual round. Processes were refined over the course of the campaign, with 100 percent of payments to implementers made through the mobile platform in cycle 5. A photo story illustrating how SMC was implemented in Uganda in 2021 was published on Malaria Consortium’s website.^[53]

Table 13: SMC implementers trained with philanthropic support, Uganda 2021

Cadre	Number of SMC implementers	Number of days per training	Number of training events
National trainers and supervisors	7	5	1
Regional- and district-level trainers and supervisors	11	3	1
Health workers	88	2	2
VHTs	1,086	2	35
TOTAL	1,192		39

Phase 2 of the SMC implementation study will involve SMC delivery in five districts of Karamoja. The study will explore both the use of SPAQ and DP in SMC. Around 125,000 children will receive SP, while 10,000 will receive DP.

3. Global operations

Colleagues from across Malaria Consortium's SMC team work together on operational challenges affecting SMC implementation. In 2021, much of our global operations support was focused on keeping SMC implementers safe during the ongoing COVID-19 pandemic, responding to increasing insecurity in many areas where SMC is implemented and thinking about the role digital tools could play in SMC delivery.

3.1 COVID-19

Since 2020, the COVID-19 pandemic has presented novel challenges to implementing community-based malaria control interventions. The pandemic poses a significant risk of transmission to SMC implementers and communities. To minimize the risk and maintain essential malaria services, SMC campaigns in 2020 and 2021 were implemented using strict IPC measures. In line with WHO recommendations,^[54] Malaria Consortium took the position early on that SMC is an essential health service that should be continued during the pandemic.^[55] Discontinuing SMC would risk a substantial increase in malaria cases and deaths among children under five, which would put additional strain on health systems already under pressure because of COVID-19. However, we also recognized that minimizing risk would require adaptations to the SMC delivery model. Malaria Consortium led the development of global operational guidance for the safe implementation of SMC, which was published by the RBM Partnership.^[56] We also developed more concrete internal guidelines that would apply to areas where Malaria Consortium supports SMC implementation. At the country level, we engaged with national COVID-19 task forces and supported advocacy efforts to ensure the full cooperation of implementing partners and governments in implementing SMC safely.



As planning for the 2020 SMC campaign in most of the implementing countries was already underway when the pandemic began, decision-making on what constituted safe IPC measures was fraught with uncertainty, due to limited evidence on the severity of COVID-19 at the time. We generally adopted a conservative approach to mitigate risk, erring on the side of caution if in doubt. The guidance was based on the following IPC principles: limiting in-person contact; physical distancing of at least two meters; use of face masks and respiratory hygiene; regular hand hygiene; disinfection of surfaces and frequently touched items; assessment of SMC implementers' temperature and symptoms; and preventing implementers with symptoms of COVID-19 from participating in the campaign. Adaptations to the SMC delivery model included, for example, scheduling more training events to respect the rules of the maximum number of participants. To facilitate physical distancing during the distribution of SMC medicines, caregivers were encouraged to administer the medicines to their children, with community distributors supervising from a safe distance. In addition, large quantities of COVID-19-related commodities, such as face masks and

hand sanitizer, had to be procured and guidance on how and when to use them had to be written into SMC delivery protocols. We also utilized SMC as a platform to share COVID-19-related health messages, which was shown to contribute to increased caregiver knowledge of COVID-19 IPC behaviors.^[57] In early 2021, based on a comprehensive consultation exercise involving colleagues from across Malaria Consortium's SMC portfolio and external partners, we published our insights from implementing SMC during the COVID-19 pandemic in a learning paper.^[58] The key learnings are summarized in **Box 4**. At the annual meeting of the American Society of Tropical Medicine and Hygiene (ASTMH), Malaria Consortium hosted a symposium on Implementing Malaria Chemoprevention Campaigns during the COVID-19 Pandemic, which included presentations on how different types of chemoprevention campaigns in Nigeria, Niger, Senegal, and Mozambique had responded to the challenges posed by COVID-19.



Box 4: Key learnings from implementing SMC during the COVID-19 pandemic in 2020

1. Sound IPC measures are central to the safe implementation of SMC. They need to be based on scientific evidence, as well as national and international guidelines and IPC protocols.
2. Minimizing risk for everyone involved in SMC requires adaptations to all SMC activities, especially planning, procurement, community engagement, training, SPAQ administration, and supervision.
3. SMC implementers require COVID-19-related commodities, such as face masks, hand sanitizer, and disinfectant, which are necessary for adherence to the IPC guidelines.
4. Early agreement on IPC guidelines for SMC, quality standards of COVID-19-related commodities, and usage protocols helps inform SMC planning and procurement.
5. Strong commitment to enforcing IPC guidelines from national malaria programs, along with an inclusive approach involving government and implementing partners, is crucial.
6. Low risk perception and exposure to misinformation among SMC stakeholders, implementers, and communities pose a challenge. It is essential to clearly and consistently provide the rationale for IPC guidelines and promote adherence. Different target audiences will require different communication and engagement strategies.
7. IPC measures are most effective when explained clearly to SMC implementers, practiced during training sessions, and reinforced through supervision.
8. SMC can be a useful community platform to share public health information among target populations. Community distributors should be trained on communicating basic information on COVID-19 prevention and transmission to communities.

Although there were positive signs when we started to prepare for the 2021 SMC campaign, and the global community had made significant strides in the fight against COVID-19, the pandemic was still a threat to SMC in 2021, especially since vaccination rates have remained low across Africa. We saw partial lockdowns, border closings, staff absence, supply chain delays, and restrictions on the ability to hold community engagement meetings. However, unlike in 2020, we had ample time to prepare and implement mitigating measures. In addition, much more was known about COVID-19 and how it is transmitted. However, we felt very strongly that there was no room for complacency and that efforts to minimize risk for everyone involved in SMC needed to be maintained. We published an advocacy statement on our website arguing that continued investment in IPC measures was needed in 2021 to ensure that campaigns are implemented safely, with the full support of the global SMC community.^[59] Malaria Consortium also chaired a session on SMC and COVID-19 at the annual meeting of the SMC Alliance in March 2021, where malaria programs from SMC-implementing countries discussed lessons learned in 2020 and their plans for addressing the continued threat posed by COVID-19 in 2021.

Applying lessons learned in 2020, we revised our IPC guidance for SMC in 2021, taking into account the emerging scientific evidence. We also considered national and international COVID-19-related legislation and guidelines, as well as findings from an operational research study exploring community distributors' adherence to COVID-19 IPC measures, which Malaria Consortium had conducted in Burkina Faso, Chad, and Nigeria in 2020 (see below). The revised guidance left more flexibility to country teams to negotiate the COVID-19 approach with national SMC stakeholders, especially national malaria programs. While systematic monitoring of COVID-19 cases in areas where SMC is implemented is beyond the scope of our SMC portfolio, country teams tracked governments' COVID-19 data, as well as anecdotal reports from health facilities and SMC implementers. There is no indication that SMC may have contributed to increased transmission of COVID-19 in 2020 and 2021.

3.2 Security

Over the last few years, security threats in many of the areas where Malaria Consortium supports SMC implementation have increased substantially, including from armed groups and criminals, as well as intercommunal violence. It is generally accepted that insecurity is likely to increase further across the Sahel, and also in some areas in east and southern Africa. To manage the risk, Malaria Consortium's teams have put in place safety and security plans, staff movement protocols, and standard operating procedures. We have invested in enabling team communication, security awareness, and training. We also enhanced our capacity to manage security risks by recruiting staff with a security focus in many of our SMC countries. With support from the global operations team, country teams continuously assess the security situation in the areas where we operate. This involves security mapping and assigning areas to different levels of risk.

In preparation for the 2021 campaigns, a task force led by Malaria Consortium's Global Operations Manager was tasked with developing guidance on how SMC needs to be adapted in medium- and high-risk areas to minimize risk to communities, SMC implementers, and Malaria Consortium staff, while ensuring maximum accountability, coverage, and quality of SMC implementation. Recognizing that security risks can never be mitigated against completely and that some residual risk will always remain, the task force defined security adaptation principles for each SMC intervention component. To a large extent, the principles were built on measures that were already being implemented by our country teams. They drew on learning from all SMC countries with the aim of defining a

comprehensive and harmonized approach that can inform our work across the program. The principles stipulate that Malaria Consortium staff can operate in medium-risk areas if approved by senior country management. Malaria Consortium staff cannot enter high-risk areas. In those areas, we work with our partners to identify how we can continue to deliver SMC within acceptable risk thresholds, for example by making use of government structures, with support and oversight provided by Malaria Consortium remotely.

Towards the end of the year, program and security colleagues from all SMC countries reflected on the security adaptation principles and made recommendations for improvement. It was noted that despite the many security challenges faced by most of the countries we support, there were no major security incidents affecting Malaria Consortium staff in 2021. While some health workers and health facilities taking part in SMC implementation were affected by insecurity and violence, no incident was directly linked to SMC. It was pointed out that, while we tend to think of cashless payments as strengthening transparency and accountability, reducing movement of cash also contributes substantially to minimizing security risks. There was a consensus that continuous internal communication, and communication with partners, on security issues is essential. In line with our efforts to integrate SMC into national health systems as much as possible, the security principles need to be discussed and negotiated with malaria programs and implementing partners, recognizing that there may be different levels of risk tolerance among SMC stakeholders. Specific recommendations for improvements included that content on security protocols should be incorporated into the SMC training and that risk mappings should be discussed regularly with malaria programs and implementing partners. Our operations will continue to be guided by the security adaptation principles in 2022.

3.3 Digital tools

Digital tools have the potential to transform how public health interventions are implemented by increasing efficiency, accountability, and equity. Though there is a range of possible use cases within SMC, the adoption of digital tools has so far been slow. Since 2020, Malaria Consortium has been piloting Reveal, a geospatial intelligence platform, for use in SMC in Nigeria. We also have experience of using mobile solutions to transfer payments to SMC implementers in Burkina Faso, Chad, Mozambique, Togo, and Uganda. We use different digital data collection tools for a range of purposes, most notably SurveyCTO for household surveys and research. In addition to the cost of developing digital platforms and tools, and procuring and maintaining the necessary mobile devices, a challenge that has so far slowed down the rollout of digital tools in SMC is the need to define scalable and sustainable implementation models, ideally enabling multi-use across different health campaigns and routine surveillance. There are also concerns over data protection and ownership, as well as challenges in ensuring the interoperability with routine health system data platforms, such as the widely used District Health Information Software.

Following a successful usability pilot of the Reveal tool for SMC in Sokoto in 2020,^[60] Malaria Consortium continued its collaboration with Akros, the Zambia-based organization that developed the Reveal platform, to further refine the tool for use in SMC in 2021. Reveal uses spatial intelligence and satellite imagery to assist the enumeration of households, enabling more accurate target population estimates. Moreover, the tool guides field movement of SMC implementers and monitors delivery in real time. Compared with 2020, the refined tool offered improved syncing functionality, performance metrics, 'on-app' indicators, and dashboards that were used by both implementers and supervisors. A field test during cycle 4 in Sokoto involved SMC delivery to around

10,000 children aided by the Reveal tool. At the 2021 meeting of the SMC Alliance, the National Coordinator of Nigeria's NMEP presented the country's experience of using Reveal in SMC during a session on digitalizing SMC. Our learning from the field test was presented at the Global Digital Health Forum in December 2021.

Scaling up the use of Reveal will require the development of a refined data model for the core platform, which will substantially improve the process of identifying residential structures on satellite images, making it less dependent on human input. It is unlikely that the data model will be available in time for the 2022 SMC season. However, we are currently planning a small pilot in Nigeria to field test an improved version of the enumeration feature. We continue to believe that a tool that offers geospatial functionalities and automated enumeration has the potential to add substantial value by transforming campaign planning and coordination. We are also excited about the role a geospatial tool could play in ensuring that hard-to-reach, mobile, and vulnerable populations can benefit from SMC.

To help Malaria Consortium develop a comprehensive approach to SMC digitalization, a task force led by Malaria Consortium's Senior Digital Strategy Specialist mapped out our priorities against existing tools and platforms in 2021. The group engaged with external partners, especially the malaria programs of the countries we support, to gather their views and requirements. We recently recruited a consultant who will consolidate the information into a digital road map for SMC, reflecting on the role Malaria Consortium can play in scaling up digital tools and considering their potential for supporting other mass campaigns, routine health services, and health security. We are also discussing the possibility of supporting small-scale pilots of different digital tools in 2022 with the malaria programs in several of our SMC countries.

4. Technical focus areas

In addition to being a leading implementer of SMC, we build on our strong technical expertise, most importantly through our work on research, quality of SMC delivery, and M&E. Unless otherwise stated, philanthropic funding was used to support the activities reported below.

4.1 Research

Malaria Consortium is committed to contributing to the evidence base on SMC through conducting research that addresses knowledge gaps relating to SMC delivery, quality, and impact. This helps our program and our international and country partners to make informed decisions on SMC policy and practice. In 2021, Malaria Consortium was awarded independent research organization status, making it one of only two international non-governmental organizations to hold this status in the UK.^[61]

In 2019, we formed an SMC research task force to coordinate the development of a research strategy for the philanthropic SMC program. The research strategy was launched in 2020 and identifies operational research, impact analyses, and implementation research as the types of research we prioritize.^[62] In 2021, we created a research working group as a standing platform for colleagues from across our philanthropic SMC program to discuss future study ideas and concepts, exchange learning and good practice, and continuously review the emerging research evidence on SMC. Several subgroups have been formed, including on research capacity development, partnerships, and research uptake. The working group also supports team members in publishing and disseminating research results at academic conferences and in peer-reviewed journals. Academic publications with contributions from Malaria Consortium's philanthropic SMC program in 2021 are referenced throughout this report. A news article summarizing SMC-related content at the annual meeting of the ASTMH, one of the most prestigious academic conferences for malaria researchers, was published on Malaria Consortium's website.^[63] Below, we describe the research projects our team worked on in 2021.

Operational research

Malaria Consortium's operational research aims to identify existing operational problems and test solutions to improve the delivery of SMC.

a) Feasibility and acceptability of extending the delivery of SMC to older children in Chad

Household survey data suggest that administration of SPAQ to children over the age of five is not uncommon. This study explored perceptions of the feasibility and acceptability of extending SMC to older children, as well as the barriers to the correct delivery of SMC to children under five. The study was conducted in 2019. It involved a series of key-informant interviews (KIIs) and focus group discussions (FGDs) with policy makers, SMC implementers, and community members, as well as collecting quantitative data through end-of-cycle and end-of-round household surveys. Data were analyzed and preliminary findings presented at the 2020 ASTMH meeting.^[64] Analysis and write-up of results was completed in 2021, with findings published in a research brief^[65] and, early in 2022, in *Global Health: Science and Practice*.^[66]

The study found that respondents were broadly supportive of expanding SMC to older children. However, many felt that closing existing coverage gaps among children under five was a higher

priority. Pressure from caregivers who want SMC medicines for their older children was reported as the main reason for administration of SPAQ to children above five. Respondents also speculated that community distributors might inadvertently administer the medicines to older children because they find it difficult to determine a child's age.

b) Assessing adherence to IPC measures for SMC during COVID-19

Since much of the research originally planned for 2020 had to be canceled because of COVID-19, Malaria Consortium's research team shifted the focus to assessing how the IPC standards developed for SMC were applied and perceived that year. A mixed-methods multi-country study spanning Burkina Faso, Chad, and Nigeria was conducted in partnership with the national malaria programs in those countries, and three national co-implementers: Institut de Recherche en Sciences de la Santé in Burkina Faso, Université de N'Djamena in Chad, and Oxford Policy Management in Nigeria. The study aimed to assess adherence of the SMC community to IPC guidelines during SMC distribution. It also measured caregivers' satisfaction with SMC distribution during COVID-19 and explored community distributors' views on the IPC measures. The research involved structured observations of over 1,000 community distributors, more than 30 FGDs with community distributors, and a survey with around 130 caregivers. Data analysis was concluded in 2021. Results from Nigeria were presented at the abovementioned ASTMH symposium on Implementing Malaria Chemoprevention Campaigns during the COVID-19 Pandemic,^[67] a study report was published on Malaria Consortium's website,^[68] and, early in 2022, in the *Malaria Journal*.^[69]

The study found that not all community distributors had received the commodities that were required to adhere to IPC guidance, such as face masks and hand sanitizer. Even where commodities were available, adherence to the guidance was generally low. For example, wearing of face masks when leaving the health facility for the community ranged from 62 percent in Kano state, Nigeria, to 86 percent in Burkina Faso. Physical distancing of two meters at all times was followed in five percent of all instances observed in Kano and 16 percent in Sokoto state. Qualitative data suggest that cultural norms may have contributed to low adherence. For example, there is an expectation that community distributors physically greet household heads, which is in contradiction to the IPC guidance to maintain a physical distance between distributors and caregivers. While it is not uncommon for observational studies to find low adherence to clinical guidelines,^[70] the research findings prompted us to increase our efforts to communicate the IPC guidance and the importance of following them to SMC implementers in 2021.

c) Co-implementing vitamin A supplementation with SMC, Nigeria

In 2019, Malaria Consortium conducted a mixed-methods study to explore if delivering vitamin A supplementation (VAS) to children 6–59 months via SMC is feasible and acceptable. It involved co-implementation of both interventions, targeting 60,000 children during the fourth SMC cycle in one LGA in Sokoto. Household coverage surveys with around 180 respondents were conducted before and after co-implementation. VAS coverage increased significantly between baseline and endline, rising from two to 59 percent. SMC coverage and community distributors' adherence to DOT were not affected. KIIs and FGDs revealed that caregivers' acceptance of co-implementing the two interventions was generally high. However, SMC implementers cautioned that co-implementation is time-consuming and results in extra work for community distributors. There were also concerns that community distributors could be confused over the different SMC

and VAS dosage regimens for different age groups. Study results were published in a research brief^[71] and presented at the 2020 ASTMH meeting.^[72]

In 2021, Malaria Consortium conducted further research to test the co-implementation of SMC and VAS at a larger scale and in both rural and urban settings in two LGAs of Bauchi state. Findings from the 2019 study were applied and a number of adaptations were made to the implementation strategy. Adaptations included a reduction in the daily target of children to be covered by community distributors and integrating the reporting of SMC and VAS indicators into the HMIS. The study aimed to explore the feasibility and acceptability of integrating VAS with SMC among caregivers, community distributors, health workers, and policymakers, as well as assess the effectiveness and safety of the approach. It used a convergent mixed-methods design, including KIIs and FGDs, and baseline and endline household surveys. The study also included a cost analysis. A project brief describing the study methods can be found on Malaria Consortium's website.^[73]

Preliminary findings from the baseline and endline household surveys showed that VAS coverage increased from 1.2 percent at baseline to 82.3 percent at endline ($p=0.015$), while SMC coverage remained unchanged. Those findings were presented at the 2021 ASTMH meeting.^[74] Full results will be published in 2022. The study was primarily funded through a grant from the Health Campaign Effectiveness program at the Task Force for Global Health. Philanthropic funding was used to support SMC implementation in the study LGAs, including more community engagement to sensitize communities about the study and more intensive supervision to ensure SMC protocols were followed in the study area.

d) Using the role model approach to improve administration of SPAQ in Burkina Faso, Chad, and Togo

The role model approach is a community-driven behavior change strategy that identifies existing strengths and solutions among individuals in a community, which are then shared with other community members to bring about positive behavior change. Malaria Consortium has previously used the approach successfully as a novel tool in malaria control and elimination in other projects,^[75] and we were interested in exploring if it could be used to strengthen SMC implementation, especially with regard to improving caregivers' adherence to the three-day SPAQ administration regimen. The study was conducted in Burkina Faso, Chad, and Togo. It involved FGDs with community distributors and caregivers of children who received SMC to determine normative behaviors around SPAQ administration and to identify existing positive behaviors among the participants. Potential role models who reported positive behaviors were invited to participate in in-depth interviews to further explore these behaviors. Role models were trained to deliver interactive monthly sessions within their communities, with the goal of sharing behaviors and reinforcing key messages. At the end of the SMC campaign, community seminars were held to hand the project over to the communities. FGDs were conducted with caregivers to explore perceptions of the feasibility and acceptability of the role model approach. Questions were added to the end-of-round surveys to assess the proportion of caregivers who had heard of and participated in the role model sessions. Study methods were published in a synopsis on Malaria Consortium's website.^[76]

A wide range of beneficial behaviors were identified among caregivers, with similarities observed across the three countries. Role model behaviors included involving fathers to calm

children prior to administering SPAQ, keeping the medicines in a memorable location, and incorporating the administration of day two and day three AQ into the household's daily routine. Preliminary results were presented at the 2021 meeting of the ASTMH.^[77] Data analysis is ongoing and full results will be published in 2022.

e) Optimizing the role of lead mothers in SMC, Nigeria

Lead mothers are female members of the community who conduct health promotion activities during the SMC campaign in Nigeria, including reminding caregivers to administer day 2 AQ and day 3 AQ. Although lead mothers have been involved in SMC for several years, the impact of their role on SMC delivery has so far not been evaluated. In 2021, Malaria Consortium and NMEP conducted a study in Kano that aimed to develop, implement, and evaluate an intervention to optimize the role of lead mothers in SMC. The study comprised three phases. During the formative stage, a literature review and KIIs with community leaders and national, state, and local government health officials provided insights that were used during the development phase to define the role of lead mothers and enhance their capacity to strengthen high-quality SMC delivery. The development phase included a co-design workshop with key stakeholders. The evaluation phase involves baseline and endline household surveys to assess the impact of lead mothers on SMC outcomes, as well KIIs and FGDs with key stakeholders. The study methods are described in more detail in a synopsis that was published on Malaria Consortium's website.^[78] Data collection and analysis are ongoing and results will be published in 2022.

Impact analyses

Evidence of the impact of SMC has been growing over recent years, including through the studies conducted as part of ACCESS-SMC.^[8-10] Through our research, Malaria Consortium aims to contribute to the establishment of standardized methodologies for monitoring impact over time and the assessment of the extent to which SMC impacts estimates of the burden of malaria.

a) Ecological impact analysis

This project explores how the impact of SMC could be measured by using multiple available data sources, which may be a more sustainable approach than conducting primary research, especially in areas where the effectiveness of SMC has been established in principle. In 2019 and 2020, we looked at routine HMIS data from Burkina Faso for the years 2014–2018. At first glance, HMIS data are difficult to interpret. Data quality varies over time, for example as a result of changes in the availability of funding, training, or number of staff. This can cause misreporting of values, missing values, and changes in reporting rates. The HMIS is also sensitive to changes in treatment-seeking behavior over time. For example, when Burkina Faso introduced free primary healthcare for children, malaria cases reported through the HMIS increased. Although this upward trend could be interpreted as an increase in malaria cases, it was most likely due to increased treatment-seeking. Various statistical methods can be used to isolate trends from HMIS data. Prevalence data from nationally representative household surveys, such as the Demographic and Health Surveys (DHS) and Malaria Indicator Surveys (MIS), which are routinely and regularly conducted in many countries, provide reliable representative estimates of malaria prevalence at a specific time and place. An ecological study based on analysis of secondary data from Burkina Faso spanning 2010–2017 was undertaken to estimate the odds of having malaria in health districts where SMC had been implemented, compared to those that had not yet been reached by SMC. The results, presented at the 2020 ASTMH meeting, indicated that children

living in a district with SMC had lower odds of having malaria confirmed by RDT compared to those living in a district without SMC.^[79]

In 2021, further analysis accounted for the timing of surveys and the decaying effect of SMC, and linked DHS and MIS data with other data sources, including SMC program, rainfall, and geographic data. A mixed-effects logistic regression model was conducted with random intercepts for health districts to predict the presence of malaria infection in children 6–59 months. After covariate adjustment, there was a substantial decrease in odds of RDT-positive malaria infection in children living in areas where SMC was implemented during the months when SMC is delivered (odds ratio [OR]: 0.28, 95 percent confidence interval [CI] 0.21–0.37, $p < 0.001$). This protective effect persisted two months post SMC. The project also performed an analysis of data from three surveys that had been conducted in Nigeria between 2010 and 2018 and found similar results, with children living in areas where SMC was implemented having significantly lower odds of malaria infection during the SMC season (OR: 0.40, 95 percent CI 0.30–0.55, $p < 0.001$). The results were presented at the 2021 annual meeting of the ASTMH^[80] and have been submitted for publication in a peer-reviewed journal.

The analysis demonstrates that the impact of SMC can be seen in malaria prevalence data collected through DHS and MIS. These surveys provide representative and standardized data previously overlooked for SMC impact. Results can be used to parameterize a malaria transmission model to estimate the expected impact of SMC on prevalence, incidence, and number of malaria cases averted. Malaria Consortium’s Results Measurement Analyst started a Doctor of Philosophy (PhD) project at Imperial College London in 2021 to explore this further.

b) Impact of SMC on district-level suspected and confirmed malaria cases in Chad based on routine clinical data

Using HMIS data from Chad, this analysis explored the association between SMC implementation during July–October, and monthly district-level malaria incidence among children 0–59 months at health facilities in 23 health districts with SMC implementation during 2013–2018. Generalized additive models were fitted with random intercepts and separate cyclic cubic spline terms for each district to adjust for seasonality in cases. Compared with no implementation, SMC implementation in Chad was associated with lower monthly counts of both suspected (rate ratio [RR]: 0.82, 95 percent CI: 0.72–0.94, $p = 0.006$) and confirmed malaria cases (RR: 0.81, 95 percent CI: 0.71–0.93, $p = 0.003$). This represents a reduction in malaria incidence of around 20 percent. Sensitivity analyses showed effect sizes of up to 28 percent after modifying model assumptions. The findings may not be comparable with other studies and may over- or underestimate impact of SMC, as not all malaria cases present at health facilities, not all suspected cases are tested, and not all facilities report cases consistently. This study’s approach presents a solution for employing readily available routine data to evaluate the impact of health interventions at scale without extensive covariate data. However, further efforts are needed to improve the quality of routine data in Chad and elsewhere. Study findings were presented at the 2020 ASTMH meeting^[81] and published in the *American Journal of Tropical Medicine and Hygiene* in 2021.^[82]

c) Adaptation of end-of-cycle LQAS surveys in Burkina Faso, Chad, Nigeria, Mozambique, and Togo to drive improvements in SMC delivery

Malaria Consortium routinely conducts end-of-cycle household surveys using the LQAS method to measure SMC coverage and quality of delivery across 16 indicators. The aim of conducting the surveys is to promote the rapid use of data to inform ongoing improvements in SMC delivery in subsequent cycles at the supervision-area level. This analysis included data from surveys conducted in Burkina Faso, Chad, Nigeria, and Togo in 2020 and 2021, and in Mozambique in 2021. It used hypothesis tests to determine whether indicator standards had been met.

Program coverage was high overall, with coverage in only a few supervision areas below the 80 percent target in each cycle. Results contributed to continuous improvement of SMC delivery. The mechanisms for sharing results and identifying actions for improvement differed from country to country. For example, in Burkina Faso, survey results were presented to PNLN ahead of the next cycle in preparatory meetings, highlighting guidance relating to issues identified. In Togo, briefings were delivered at health facilities that had been identified as performing poorly. In Nigeria, meetings were held with state health ministries and findings were shared with health facility managers and followed-up to remedy specific issues. This experience has demonstrated that multi-objective LQAS surveys can be successfully implemented to identify SMC delivery issues and guide corrective measures before the next SMC cycle. The approach encouraged collaboration between Malaria Consortium and local stakeholders and general uptake of survey evidence. Survey completion time decreased compared to previous years, where conventional cluster surveys were used. The findings were presented at the 2021 meeting of the ASTMH.^[83]

d) Factors predicting adherence to day 2 and day 3 administration of AQ by caregivers in four Sahelian countries

Non-adherence to administration of day 2 and day 3 AQ may make children susceptible to infection and contribute to SP and AQ resistance in circulating parasites. This analysis explored predictors of adherence to day 2 and day 3 AQ administration among caregivers of eligible children in Burkina Faso, Chad, Nigeria, and Togo during the last cycle of the 2020 SMC round. Data were extracted from representative end-of-round household surveys conducted by Malaria Consortium. We analyzed the pooled data from 12,746 respondents and implemented multilevel logistic regression models for binary outcomes to identify factors associated with caregiver adherence.

Overall, 95.4 percent of respondents reported administering AQ to their child on days two and three. This proportion was highest in Burkina Faso (98.7 percent) and lowest in Chad (93.6 percent). Positive predictors of adherence included a visit from a lead mother (Nigeria only) after day 1 administration of SPAQ (OR: 2.5, 95 percent CI: 1.89–3.23, $p < 0.001$), caregivers' awareness of the start date of the SMC cycle (OR: 1.4, 95 percent CI: 1.13–1.78, $p < 0.001$), and knowledge of the importance of AQ administration (OR: 2.1, 95 percent CI: 1.64–2.78, $p < 0.001$). A previous adverse reaction to SPAQ was a negative predictor (OR: 0.32, 95 percent CI: 0.24–0.41, $p < 0.001$). Sociodemographic factors such as household wealth, age, education, and occupation of caregivers were not significantly associated with adherence. These findings indicate that approaches such as home visits by lead mothers are effective in improving caregivers' adherence to the SMC protocol. They were presented at the 2021 meeting of the ASTMH.^[84]

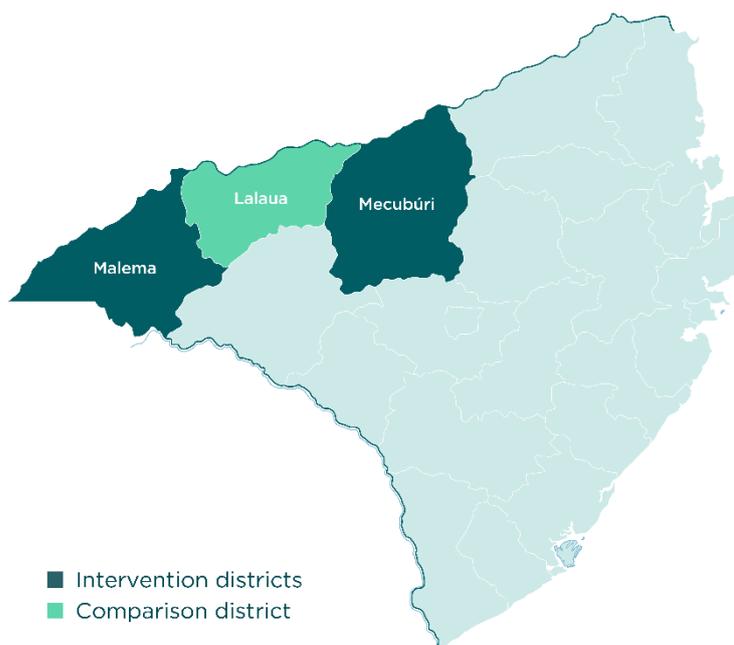
Implementation research

Implementation research aims to develop and test new strategies or innovations for SMC that have the potential to be deployed at scale. Some of Malaria Consortium's most exciting and groundbreaking research projects explore if SMC can be a viable malaria prevention strategy in east and southern Africa and developing a framework for decision-making regarding the scale-up of SMC in new geographies. This involves assessing if SMC in new contexts is feasible and acceptable. Crucially, it also involves assessing the effectiveness of SMC and the chemoprevention efficacy of SPAQ in the context of high parasite resistance.

a) Assessing the feasibility, acceptability, and impact of SMC in Nampula, Mozambique

As discussed in the section above on SMC implementation in Mozambique, the project was designed as a two-phase implementation study, with the first phase focusing on acceptability and feasibility, followed by more rigorous assessments of the effectiveness of the intervention and chemoprevention efficacy of SPAQ in phase 2. Phase 1 of the study was implemented alongside SMC implementation during the 2020/21 season in two districts of Nampula: Malema and Mecubúri. A third district, Lalaua, served as a control for some of the study components (**Figure 14**).

Figure 14: Phase one implementation study intervention and control districts in Nampula, Mozambique 2020–2021



In phase 1, the study aimed to document the process of adapting SMC to the local context, explore its acceptability among local stakeholders, and evaluate the process of SMC implementation in terms of coverage and quality. It also aimed to determine whether receipt of SPAQ is associated with a reduction in the odds of clinically significant malaria outcomes and assess the change in reported malaria morbidity indicators. Finally, because resistance to SPAQ in the study area was assumed to be high, the study aimed to determine the baseline prevalence of *Plasmodium falciparum* parasites with common markers of resistance to SP and AQ, as well as any increase in resistance after one annual round of SMC. A hybrid effectiveness-implementation design was adopted, which involved the following components:

- documentation of the process of SMC implementation and adaptations compared to the model used in west and central Africa
- a representative end-of-round household survey with more than 1,800 respondents
- KIIs and FGDs with policy makers, SMC implementers, and community members
- analysis of HMIS data on malaria indicators reported at the health facility and district levels
- a non-randomized controlled trial (nRCT) involving around 800 children in an intervention and a control arm to determine the odds of clinically significant malaria outcomes among SMC-eligible children
- a molecular resistance markers study to determine prevalence of *Plasmodium falciparum* parasites with common markers of resistance to SP and AQ.

The study was conducted in collaboration with PNCM and the Centro de Investigação em Saúde de Manhica (CISM). It was co-funded by the Bill & Melinda Gates Foundation. The study rationale and methods were published in the *JMIR (Journal of Medical Internet Research) Research Protocols*.^[85] A scientific advisory committee comprising malaria experts, the donor community, and national stakeholders guides the study to ensure scientific rigor and support research uptake.

The results from phase 1 of the Mozambique implementation study demonstrate that SMC with SPAQ is safe, feasible, and acceptable in the local context. The intervention was successfully delivered according to schedule and at the anticipated scale. No serious adverse events were reported. The end-of-round household survey found high coverage of households (89.3 percent, 95 percent CI 85.8–92.0) and eligible children (85.2 percent, 95 percent CI 82.1–88.9). Caregivers' adherence to administration of SPAQ on days two and three (98.3 percent, 95 percent CI 98.5–99.7) was higher than in any other country where SMC was delivered in 2020.^[86] Acceptability of the intervention among the population was high, with no negative rumors reported. The intervention was widely perceived to help prevent malaria infection. Good coordination between local authorities and Malaria Consortium, as well as close involvement of local and religious leaders in community engagement, were seen as key facilitators. Fear and mistrust were reported from a small number of community members, especially as the campaign was implemented in the context of COVID-19.

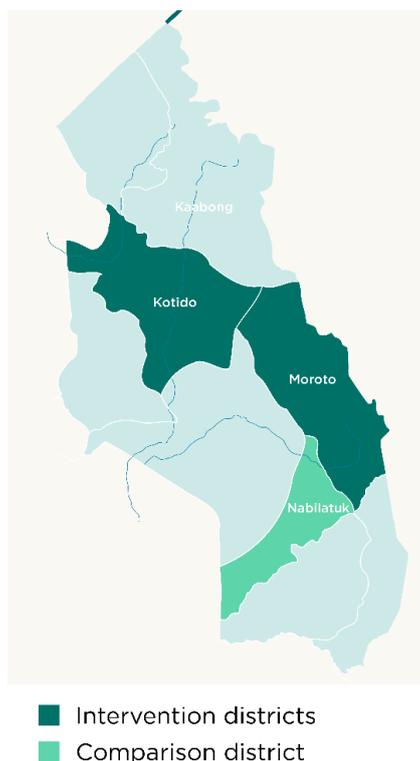
The intervention appeared to be highly effective. Of the 812 children recruited into the nRCT, 268 developed a confirmed case of clinical malaria during the study period, 57 in the intervention arm and 358 in the control arm. Analyses using Chi-square tests found that eligible children followed up in the intervention district were significantly less likely to have experienced a confirmed case of malaria over the follow-up period ($\chi^2=142.55$, $p<0.001$). We calculated an exact OR of 0.14 (95 percent CI: 0.10–0.20), indicating an estimated protective effect of receipt of SMC of 86 percent. Based on the random-effects Cox proportional hazards regression model for recurrent events, we found a hazard ratio (HR) of 0.17 (95 percent CI: 0.12–0.22, $p<0.001$), corresponding to a protective effect of 83 percent. While there was high prevalence of SP resistance, one annual round of SMC did not appear to have had a negative impact on the resistance profile.

The PNCM Director presented the study design at the annual meeting of the SMC Alliance in February and the phase 1 results as an oral presentation at the 2021 ASTMH meeting in November.^[87] At the national level, results were presented at the National Scientific Meeting and the National Malaria Meeting. The Minister of Health congratulated Malaria Consortium for our work and expressed a strong interest in scaling up SMC if it is found to be effective. A paper summarizing phase 1 results is in preparation and will be submitted to a high-profile peer-reviewed journal in 2022. Phase 2 research activities commenced in early 2022, with co-funding provided by a new grant from the Bill & Melinda Gates Foundation. A paper summarizing the phase 2 study design has been submitted for publication in a high-impact peer-reviewed journal.

b) Evaluating the feasibility, acceptability, and protective efficacy of SMC in two districts in Karamoja, Uganda

In May 2021, Malaria Consortium started an SMC implementation study in Uganda. The study was conducted in collaboration with NMCD and the Infectious Diseases Research Collaboration (IDRC) in two intervention districts of Karamoja: Kotido and Moroto. Nabilatuk served as a control (**Figure 15**). The study closely mirrors the design of the Mozambique study described above. An additional study element, which was only conducted in Uganda, was the use of malariometric surveys conducted before and after SMC distribution to estimate its effect on malaria prevalence. The study design was summarized in a synopsis published on Malaria Consortium’s website.^[88]

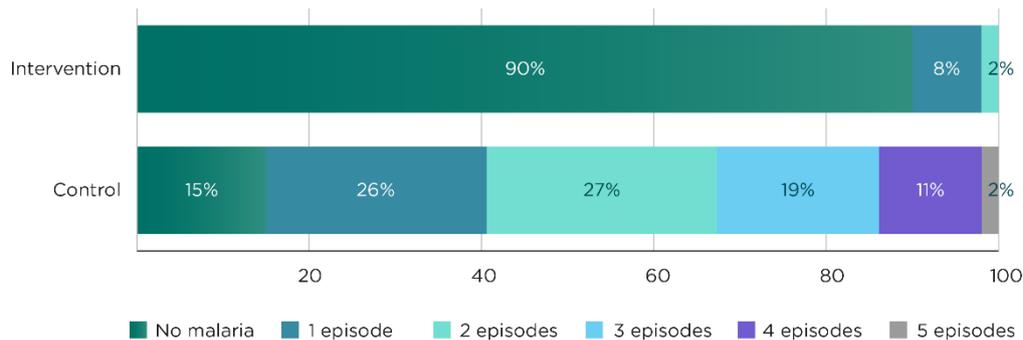
Figure 15: Phase 1 implementation study intervention and control districts in Karamoja, Uganda 2021



As in Mozambique, phase 1 of the Uganda implementation study showed that SMC in the local context is safe, feasible, and acceptable. Results from an end-of-cycle survey with 800 caregivers of eligible children showed 97.7 percent (95 percent CI: 97.1–98.2) of eligible children received day 1 SPAQ by DOT in cycle 3. Children in the nRCT intervention districts had a

92.2 percent (95 percent CI: 1–0.078) lower risk of developing confirmed malaria in the five-month follow-up versus those in the control (incidence rate ratio: 0.078, 95 percent CI: 0.063–0.096, $p < 0.0001$). The HR for malaria infection among children in intervention districts was six times less than in the control district, after controlling for gender, bed net ownership, and net use (HR 0.06; 95 percent CI: 0.04–0.09, $p < 0.001$). In the intervention districts, 90 percent of children never experienced a malaria episode during the five months of SMC implementation. In the control district, 85 percent of children developed at least one episode and 60 percent had at least two over the follow-up period (**Figure 16**).

Figure 16: Confirmed malaria episodes among children 3–59 months enrolled in an nRCT during five months of follow-up, Uganda 2021



Phase 1 study results available at the time were presented at the 2021 meeting of the ASTMH.^[89] Data analysis, including for the resistance markers study and the malariometric surveys, is ongoing and full results will be published in a peer-reviewed journal in 2022. A protocol for phase 2 of the study has received ethical approval. Field work will begin in May 2022, co-funded by a grant from the Bill & Melinda Gates Foundation.

c) Phase 2 SMC implementation research in Mozambique and Uganda

In November 2021, Malaria Consortium hosted a webinar on Taking SMC to New Geographies, where the directors of the malaria programs in Mozambique and Uganda shared the promising results from phase 1 of the SMC implementation studies in both countries, as well as plans for phase 2 and our reflections on what those studies can tell us about the potential scale-up of SMC outside the Sahel. The webinar was attended by 120 participants. A recording can be found on YouTube.^[90] On our website, we also published a blog post^[91] and an infographic^[92] illustrating the key messages.

Phase 2 of the implementation studies in both countries in 2022 will gather more robust evidence of the effectiveness of SMC through cluster-randomized controlled trials in support of a potential policy change. The studies also aim to estimate the chemoprevention efficacy of SPAQ when used for SMC in the study areas, as well as the extent to which chemoprevention efficacy is affected by drug resistance and drug concentrations. There is currently no standard protocol for assessing chemoprevention efficacy. The protocol that we will use to determine the ability of SPAQ to clear existing infections and prevent new ones builds on a draft protocol developed by WHO. This will involve taking blood samples from children receiving directly observed SPAQ at different times during the 28-day period during which SPAQ is assumed to confer protection from malaria. The presence of malaria parasites, resistance markers, and drug concentrations in the blood will be determined through microscopy, quantitative polymerase chain reaction, and pharmacometric analyses at different time points. This approach will allow us to explore not only

if SPAQ is efficacious in clearing existing infections and preventing new ones, but also, where breakthrough infections occur, whether this is a result of parasite resistance or under-dosing. In Uganda, we will assess the effectiveness and chemoprevention efficacy of SMC with DP as well as SPAQ. We will continue to collaborate closely with PNCM, NMCD, CISM, and IDRC.

In the longer term, this work will be relevant for SMC in the Sahel, as monitoring the chemoprevention efficacy of SPAQ in areas where SMC has been implemented at scale for many years and exploring alternative drug regimens will be crucial to ensure that the intervention retains its effectiveness in the future. We will make use of multiple platforms and formats to share and discuss results from the implementation studies in Mozambique and Uganda over the course of 2022 with the global malaria community.

SMC Alliance research subgroup

At the annual meeting of the SMC Alliance in February 2021, Malaria Consortium initiated the creation of a subgroup dedicated to research. The subgroup aims to provide a platform for national malaria programs, implementing partners, and researchers to present study protocols and research findings, discuss evidence gaps and research priorities, and promote the use of evidence to inform SMC implementation. Malaria Consortium serves as the subgroup's secretariat. Subgroup membership has grown over the course of the year. Currently, the list of subgroup members comprises 57 individuals representing 26 organizations. Monthly subgroup calls have been held since June 2021, with different group members presenting their work every month. The efforts of many of the subgroup's founding members to coordinate the submission of ASTMH abstracts led to the acceptance of the symposium on Implementing Malaria Chemoprevention Campaigns during the COVID-19 Pandemic mentioned above. For 2022, the sub-group has identified two priorities: creating a database of SMC-related research projects and conducting a research priority-setting exercise using the eDelphi method.

4.2 Quality of SMC delivery

In the context of public health campaigns, quality is conceptualized in terms of the degree to which they are safe, efficacious, timely, efficient, equitable, and people centered.^[93,94] In 2019, we formed a task force to discuss and define what high-quality SMC implementation means in relation to each of the SMC intervention components. Recognizing the importance of high-quality SMC implementation, the task force has since transitioned into a quality working group, which, led by Malaria Consortium's Case Management Specialist, regularly brings together program, operational, and technical colleagues from across the philanthropic SMC program to discuss quality issues, exchange good practice, and gain commitment for continuous performance improvement across Malaria Consortium's philanthropic SMC program.

Quality framework for SMC delivery

In 2021, the working group finalized a quality framework for SMC delivery, which defines 10 quality standards (**Box 5**) relating to different SMC intervention components, including descriptions of expected quality outcomes and indicators. The standards serve as benchmarks that, if followed well and consistently, ensure that the correct quantity of SPAQ is available and administered safely and correctly to eligible children in each cycle, and is accurately recorded to measure whether malaria cases have been prevented in areas targeted by SMC within the intended period of protection. The quality framework also includes a glossary of common terms used in SMC (**Appendix 1**).

Box 5: Malaria Consortium's quality standards for SMC delivery

1. Complete an SMC plan four months prior to each SMC campaign detailing the enumeration of targeted children, human resource capacity needs (including training and supervision), quantification of commodities, and expected operational costs.
2. Procure sufficient quality-assured SPAQ in time for it to be available before the start of the SMC round and ensure its continued availability until the end of the SMC round.
3. Procure and manage the supply and accountability of all SMC commodities and tools before, during, and after each cycle.
4. Sensitize and engage with communities before and during each SMC cycle.
5. Provide quality SMC training to trainers, supervisors, health facility workers, and community distributors within one month of each SMC campaign.
6. Deliver a full three-day course of SPAQ to eligible children in each cycle of the SMC round during the period of highest malaria transmission.
7. Fully assess, treat, and record all children referred to the health facility during SMC.
8. Supervise, monitor, and report on the performance of each team of community distributors once per cycle.
9. Conduct routine M&E of SMC inputs, processes, outputs, outcomes, and impact throughout the SMC round.
10. Ensure the safeguarding of children, caregivers, community members, and community distributors during SMC delivery.

Continuous quality improvement requires that quality be measured, and lessons learned be documented and shared. In 2021, the quality working group worked on two initiatives — an internal quality self-assessment and external end-of-round quality assessment.

Quality self-assessment

In early 2021, we piloted a participatory subjective quality self-assessment in Burkina Faso and Nigeria, which was intended to enable program, operational, and technical colleagues to collectively reflect on strengths and areas of improvement. A series of virtual sessions was conducted with the SMC teams in both countries to identify areas of SMC delivery that can be improved, articulate challenges and opportunities for performance improvement, and prioritize the most critical areas for change. Each session focused on assessing the level of quality achieved in 2020 with regard to one quality standard, applying a four-step process that comprised individual reflection, and facilitated group discussion, risk assessment, and prioritization, as well as the development of a written quality improvement plan for the following round. The quality standard identified as most needing improvement in both countries was community engagement. In Nigeria, aspects of planning and enumeration and SPAQ administration were also highlighted as requiring improvement, while in Burkina Faso, training and supervision were identified as priorities.

The participatory self-assessment enabled our SMC teams to arrive at an internal viewpoint concerning the quality of SMC delivery in their respective countries and to articulate a collective vision of what the desired quality improvement outcomes would be. It also provided a space for colleagues to openly share concerns and identify problems, which can often be challenging when there are differences in opinion. Participants recommended that this exercise should be conducted routinely, soon after the end of each SMC round, and suggested including external stakeholders to get a broader perspective on quality issues.

End-of-round quality assessment

In response to the recommendations from the self-assessment pilot, an end-of-round quality assessment tool was developed. It was used at the end of 2021 to facilitate one- or two-day workshops in Burkina Faso, Chad, Nigeria, Togo, and Uganda. The workshops were attended by national malaria program staff, representatives from subnational health authorities, and implementing partners. Participants were invited to individually score a set of quality indicators for each of the 10 quality standards based on their observations during the 2021 SMC round. In total, the quality assessment tool included 65 indicators, which participants scored on a five-point Likert scale ranging from ‘never met’ to ‘completely met’. Participants then shared and discussed their scores with the goal of reaching a group consensus on an average score for each standard. This was followed by a group discussion to identify the top three priority areas requiring improvement. The workshops resulted in quality improvement plans that will be used during the SMC campaign in 2022. **Table 14** summarizes the indicators that were prioritized for quality improvement in each of the five countries. A similar exercise is planned in Mozambique after the end of the 2021/22 SMC round.

Table 14: Priority areas identified through end-of-round SMC quality assessments in Burkina Faso, Chad, Nigeria, Togo, and Uganda, 2021

Country	Quality improvement priorities identified
Burkina Faso	<ul style="list-style-type: none"> Strengthen selection of distributors and supervisors to ensure greater gender equity Equip local SPAQ storage facilities with thermometers and humidity monitors to measure and record temperature and humidity Develop a written formative assessment for community engagement
Chad	<ul style="list-style-type: none"> Involve more community leaders in the recruitment of community distributors to ensure greater gender equity Develop a written formative assessment for community engagement Reinforce training on age eligibility criteria for SMC
Nigeria	<ul style="list-style-type: none"> Improve enumeration of target population in new states by strengthening micro-planning Monitor and record the temperature and humidity of storage facilities in health facilities Translate training tools into local languages Reinforce training on referring children to health facilities, especially in case of adverse drug reactions

	Ensure first SMC cycle starts before or at the start of the rainy season
Togo	<p>Ensure sufficient supply of commodities before, during, and after each cycle</p> <p>Provide SMC tools for all cycles to districts before the start of the campaign</p> <p>Include budget for training and deploying town criers</p> <p>Reinforce key messages to parents and community members during SPAQ administration, for example on adherence to the three-day SPAQ course</p> <p>Reinforce training and supervision with regard to pharmacovigilance</p> <p>Ensure completion of all M&E forms and reports</p>
Uganda	<p>Improve enumeration of children by engaging local stakeholders</p> <p>Monitor and record temperature, humidity, and condition of SPAQ storage facilities</p> <p>Train sufficient numbers of VHTs to account for those who are unable to deliver SMC, for example, because of age or mobility</p> <p>Translate job aids and training tools into local languages</p> <p>Train VHTs on determining children's age</p>

Plans for 2022

While the end-of-round-self assessment was a very helpful country-level platform for discussing the quality of SMC delivery, it relies on the subjective assessment of quality indicators by stakeholders involved in SMC. To measure quality of SMC delivery more objectively, Malaria Consortium plans to pilot a comprehensive third-party quality audit. This will involve developing an audit tool based on the 10 quality standards, which an independent consultant will then use to assess quality of SMC delivery in eight LGAs in four Nigerian states between February and October 2022. Key outputs at the end of the audit period will include a detailed evidence-focused report that discusses how far quality indicators were met and outlines recommendations for quality improvement, as well as a field-tested quality audit tool that can be adapted and translated for use in other SMC implementing countries.

As community engagement has consistently been identified as an area that requires more attention, especially in the countries that have adopted SMC at scale, we have been working on a community engagement framework for SMC with support from Malaria Consortium's Social and Behavior Change Specialist to better define and strengthen quality delivery of this intervention component. The framework outlines the values on which our community engagement work is based, the processes we use, and the practices that enable effective community engagement. In 2022, we will finalize the framework and develop tools to help us apply the framework in practice.

Given the technical focus of much of our work on SMC, a component that can be overlooked at times, but which is nevertheless crucial for successful SMC delivery, is procurement and supply chain management. A task force led by Malaria Consortium's Supply Chain Coordinator was formed at the end of 2021 to develop a framework that outlines procurement and supply chain management

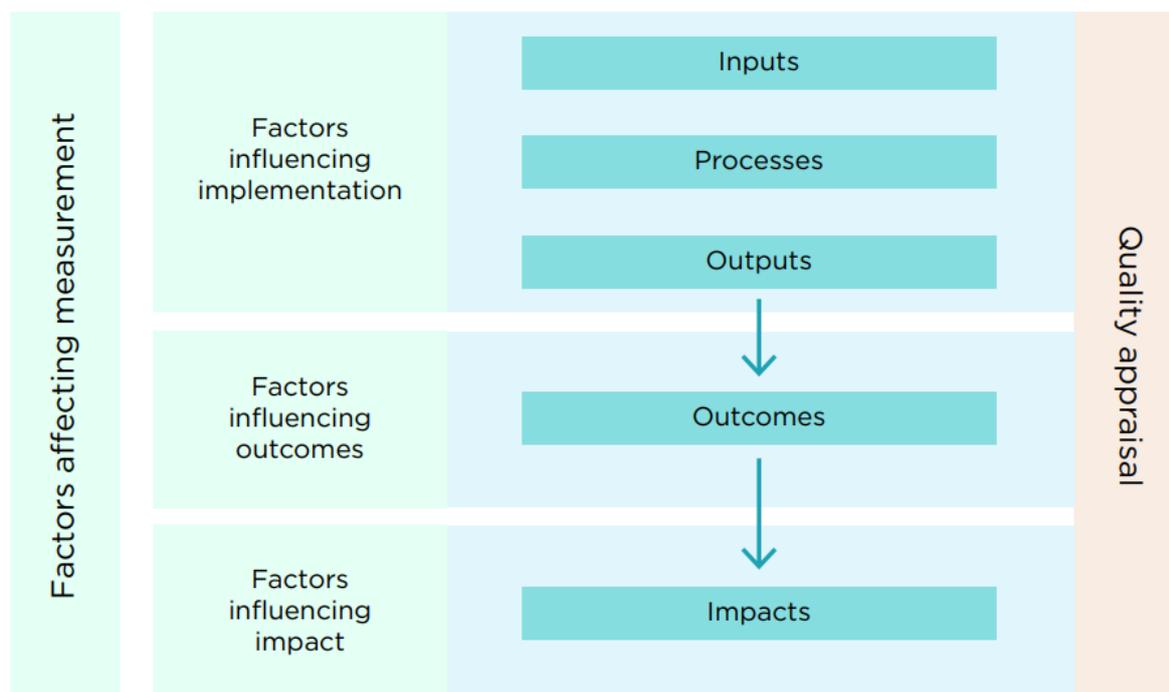
processes, roles, responsibilities, and timelines. The framework is expected to be linked to the quality standards and inform procurement and supply chain management across our philanthropic SMC program in 2022.

4.3 Monitoring and evaluation

Colleagues working on M&E from across Malaria Consortium’s philanthropic SMC program convened in 2019 to develop a comprehensive M&E framework for SMC to facilitate the assessment of program outcomes and the effectiveness of our processes. Using a logical framework approach, the framework helps us to better understand why the program has, or has not, achieved its intended goal of safely preventing malaria cases in eligible children living in areas targeted by the program within the intended period of protection. The framework assesses the relationship between different aspects of program implementation (inputs, processes, and outputs) and the expected results (outcomes and impacts) of the program, while also accounting for external factors (**Figure 17**). It identifies seven program objectives: program coverage; fidelity; quality of SMC delivery; knowledge, attitudes, and perceptions of caregivers of eligible children; supply and demand of key program commodities; use of program and survey data for decision-making; and safety. To date, we have defined over 60 indicators and included these in the refined indicator grid, grouped by level of program implementation and objective. A description of the approach we used to develop the framework was published in a technical brief in early 2022.^[95]



Figure 17: Malaria Consortium’s framework for monitoring and evaluating the philanthropic SMC program



To guide the operationalization of the framework, we created an M&E working group, led by Malaria Consortium’s Results Measurement Analyst, which meets regularly to refine the framework and indicator grid, exchange best practices, and discuss challenges. In 2021, the working group focused on clearly defining the methods for collecting and reporting framework indicators. Another priority was to set up the framework indicators in the new online Project Results System (PRoS), which Malaria Consortium launched in 2021 to collect and compile data from all its programs and projects. We initially piloted the system with data from end-of-cycle surveys in Kebbi state and have since gradually populated the platform with more indicators from the M&E framework, and data from all SMC countries. We have also experimented with building dashboards to visualize program outcomes. A publication in a peer-reviewed paper describing how the framework has been applied is planned for 2022.

In early 2021, Malaria Consortium was among the founding members of an SMC Alliance subgroup dedicated to M&E. The subgroup comprises representatives from national malaria programs, implementing partners, and researchers. It aims to serve as a platform where the SMC community can share challenges and best practices in measuring and tracking SMC indicators. An initial focus area will be to agree a minimum set of core standardized SMC metrics across countries and implementers. Over the course of the year, the subgroup published four chapters of an M&E toolkit for SMC^[96] as a resource for national malaria programs in SMC-implementing countries. Malaria Consortium’s M&E framework and SMC glossary informed much of the content of the toolkit, including the definition of specific M&E indicators. Our Senior Epidemiologist presented on how Malaria Consortium uses household surveys to collect M&E data at a webinar organized by the SMC Alliance M&E subgroup to introduce the toolkit to the SMC community.^[97] The M&E subgroup is planning a feedback process with the malaria programs of SMC implementing countries and implementing partners in 2022 to refine and improve the toolkit, including the development of reporting tools. New chapters will be added over the course of the year.

5. External relations

In 2020, we developed a global external relations strategy for our philanthropic SMC program, which outlines the goals and objectives we aim to achieve through our external relations work, including communications, publications, and advocacy. The strategy emphasizes Malaria Consortium's position as a leading implementer and how we contribute to raising global awareness of SMC. In 2021, we stepped up our external relations efforts with the recruitment of a dedicated External Relations Manager for our philanthropic SMC program. We produced a high volume of communication outputs and publications, which are referenced throughout this report. Many of these resources were translated into French and Portuguese to increase their reach and impact. All our publications can be found in the publications library on Malaria Consortium's website.^[98] We also maintained the SMC pages on our website^[99] and kept approximately 1,500 subscribers up-to-date with four e-newsletters for philanthropic donors, in addition to two e-newsletters sent to contacts who had registered for the webinar on Taking SMC to New Geographies. To engage directly with our philanthropic donors, our SMC Program Director presented Malaria Consortium's SMC portfolio and answered questions at three webinars, hosted by GiveWell, Effective Altruism Poland, and Effective Altruism Hong Kong. A recording of the GiveWell webinar can be found on YouTube.^[100] We plan to update Malaria Consortium's SMC external relations strategy in 2021, reflecting the growth of the program and our increased capacity for communications, publications, and advocacy.

In May, Malaria Consortium co-hosted a webinar on Domestic and Sustainable Financing for SMC together with other SMC Alliance member organizations. It included a presentation from the National NMEP Coordinator about Nigeria's approach to SMC financing. Malaria Consortium also co-hosted the annual global SMC planning and review meeting in February 2021. The three-day meeting was conducted remotely and brought together over 100 participants, including from the malaria programs of all SMC-implementing countries, WHO, and the RBM Partnership, as well as the major implementers, donors, and academics with an interest in SMC. While similar meetings had been held in previous years, this meeting saw the formal launch of the SMC Alliance under the RBM Partnership's Country/Regional Support Partner Committee. The SMC Alliance provides a platform for the global SMC community to compile information and learning about SMC and to discuss developments in SMC policy and practice.

The SMC Alliance holds monthly calls to discuss emerging issues. In 2021, this has included discussions about resolving supply chain issues and the potential role of malaria vaccines in SMC. A website to host content and resources relating to the SMC Alliance's work has been set up.^[101] Malaria Consortium will continue to participate actively in the SMC Alliance and its subgroups in 2022. Together with other partners, we are currently leading efforts to create a subgroup dedicated to communications and advocacy.

6. Philanthropic SMC expenditure

Excluding the cost of implementing SMC in Borno, the total expenditure of philanthropic funding used for SMC in 2021 was approximately 45.72 million USD, around 10 percent less than the forecast submitted to GiveWell in June 2021 (**Table 15**). The philanthropic expenditure includes 3,715,620 USD received from Malaria Consortium’s U.S. entity to support the procurement of SPAQ for the health districts where we supported SMC in Burkina Faso and Chad in 2021, with a combined target population of 3.06 million children.

Table 15: Philanthropic expenditure for SMC 2021 (excluding Borno)

Budget line	Forecast (USD)	Expenditure (USD)	Variance (USD)	Variance (percent)
Burkina Faso	8,795,932	8,463,362	-332,570	-4
Chad	4,983,966	4,653,219	-330,747	-7
Mozambique	1,955,738	996,493	-959,245	-49
Nigeria	24,830,900	22,241,693	-2,589,207	-10
Togo	1,187,202	1,225,175	37,973	3
Uganda	1,061,126	1,068,971	7,845	1
Above-country ^a	940,113	855,024	-85,089	-9
Research	1,427,733	1,145,772	-281,961	-20
External relations	294,930	171,237	-123,693	-42
Management fee (12 percent)	5,457,317	4,898,513	-558,803	-10
TOTAL	50,934,957	45,719,459	-5,215,498	-10

^aIn previous reports, we showed international freight costs on the above-country budget line. In this report, they are included in the budget line of the country to which the cost relates.

The Nigeria budget accounts for much of the underspend. This is partly due to cost savings made in the procurement of COVID-19 related commodities compared with the previous year, as well as state governments covering some stock management and community engagement costs. Staff costs had also been overestimated, primarily due to recruitment delays in the new SMC states. Other factors contributing to the underspend include:

- We were able to sea freight a larger proportion of SPAQ to all the countries we support than expected at the time of forecasting, when we cautiously assumed that more commodities would need to be air freighted at a higher cost.
- For Burkina Faso and Chad, 2020 unit costs were used to estimate the 2021 budget. However, cost savings were made in both countries compared with the previous year. In Burkina Faso, this included renegotiating the contract with the local warehouse and supply chain service provider, as well as savings on office costs due to maintaining working-from-home arrangements for much of the year. In Chad, revisions to the formula for determining the number of community distributors resulted in lower costs for training and SPAQ

administration. In both countries, one routine M&E survey could not be implemented and, hence, the costs budgeted for those activities were not incurred.

- For Mozambique, the forecast had assumed that the 2021/22 campaign would start in November 21; hence, the cost of two SMC cycles had been included. As ethical approval for the project was not obtained until December 2021 and SMC distribution started in January 2022, the majority of the costs relating to the 2021/22 campaign will now be incurred in 2022.
- The above-country forecast included the costs of a pilot project to test an additional digital tool. However, we eventually decided against the pilot, preferring to give ourselves more time to develop a more strategic approach to the use of digital tools in SMC instead. The international travel budget was also overestimated as COVID-19 continued to affect our ability to travel.
- Research costs in Nigeria had been overestimated as non-research staff costs had erroneously been included in the research budget and costs for some activities on the lead mothers study will only be incurred in 2022. This accounts for most of the underspend on the research line.
- External relations activities were also affected by COVID-19, as it was not possible to organize face-to-face stakeholder advocacy meetings.

Malaria Consortium’s support for Borno had not been fully confirmed at the time of forecasting. An estimated budget of 8.42 million USD was provided to GiveWell. The total expenditure in 2021 was 4.79 million USD (**Table 16**). At the time of budgeting, it was expected that much of the SPAQ administration was to be implemented in a humanitarian context by implementing partners with expertise in humanitarian program delivery. However, following a detailed assessment of the security situation, it was decided that the standard SMC model could be applied in the majority of LGAs without the need for implementing partners. Micro-planning data suggested that the target population was lower than assumed at the time of budgeting. We therefore decided to sea-freight a portion of the SPAQ initially ordered for Borno, so it can be used elsewhere in Nigeria in 2022. This saved expensive air freight and resulted in some SPAQ costs included in the 2021 Borno budget being moved to the 2022 Nigeria budget. Further savings were made by reducing the number of Malaria Consortium staff and SMC implementers, taking into account the security assessment and lower-than-expected target population. In recognition of Malaria Consortium’s efforts to provide short-notice support, the government of Borno agreed to cover some SMC costs that had been included in the forecast, including costs relating to stock management, as well as some planning and community engagement activities. Due to the complex and short-notice arrangements put in place to support Borno in 2021, a few costs relating to 2021 activities were not incurred until 2022, so will be shown in next year’s financial report.

Table 16: Philanthropic expenditure for SMC, Borno 2021

Budget line	Expenditure (USD)
Borno	4,280,018
Management fee (12 percent)	513,602
TOTAL	4,793,620

In addition to philanthropic funding for SMC, Malaria Consortium received contributions from the Bill & Melinda Gates Foundation, KOICA, and the Health Campaign Effectiveness program at the Task Force for Global Health. In-kind donations of SPAQ were received from PMI and MSF (**Table 17**).

Table 17: Third-party contributions to Malaria Consortium’s philanthropically supported SMC program, 2021

Funding source	Value of contribution (USD)	Notes
KOICA	670,133	SMC-Impact project In 2021, Malaria Consortium used the funding to support the cost of SPAQ and most implementation costs for SMC delivery to around 260,000 children in two LGAs in Bauchi
PMI	313,783	In-kind donation of 1,114,000 blister packs of SPAQ for use in Nigeria Value according to donation certificate
MSF France	504	In-kind donation of 1,100 blister packs of SPAQ for use in Borno Value according to donation certificate, converted from euros according to exchange rate on 10 th August 2021
Bill & Melinda Gates Foundation	338,402	Grant for an end-of-round household survey, nRCT, resistance markers study, and research uptake activities as part of phase 1 of the SMC implementation study in Mozambique (INV-024023) Grant ended in November 2021
Bill & Melinda Gates Foundation	43,022	Grant for an end-of-round household survey, chemoprevention efficacy cohort study, resistance markers study, and modeling the protective effect of SPAQ as part of phase 2 of the SMC implementation study in Mozambique (INV-033337) Grant started in September 2021, with the majority of related expenditure to be incurred in 2022
Task Force for Global Health	86,125	Grant for implementation of an operational research study exploring the co-implementation of SMC and VAS in Nigeria Grant covered all research costs, with philanthropic funding used to support SMC implementation in the study area

Malaria Consortium also received funding from the Global Fund to implement SMC in four states in Nigeria, targeting 7.87 million children in 2021. This is not reported here, as Global Fund funding was used exclusively in those states. We also do not report SMC funding from the Global Fund and UNICEF in Togo, as those funders' contributions to SMC are provided directly to PNLP. The same principle applies to two health districts in Burkina Faso for which Malaria Consortium procured SPAQ, while UNICEF covered all implementation costs.

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Appendix 1: SMC glossary

SMC terminology

- **Seasonal malaria chemoprevention (SMC):** The intermittent administration of full treatment courses of an antimalarial medicine during the malaria season to prevent malarial illness with the objective of maintaining therapeutic antimalarial drug concentrations in the blood throughout the period of greatest malarial risk.

Currently, the antimalarial medicine is full three-day courses of SPAQ administered to children 3–59 months. The type of antimalarial medicine and age range could change in the future.
- **SPAQ:** A combination of the antimalarial medicines sulfadoxine-pyrimethamine (SP) plus amodiaquine (AQ) given during SMC to prevent malaria.
- **SPAQ dose range:** There are two child dose ranges of SPAQ:
 - infant dose for 3–<12 months: SP 250 milligrams (mg)/12.5mg and AQ 75mg
 - child dose for 12–59 months: SP 500mg/25mg and AQ 150 mg.
- **SPAQ course:** A period of three days in which a full course of SPAQ is given. Each eligible child is given one course of SPAQ each cycle.
- **SPAQ co-blister pack:** One dispersible tablet of SP and three dispersible tablets of AQ in one co-blistered packet. Each blister pack contains one full course of SPAQ. One tablet of SP and one tablet of AQ are dispersed together in water and administered on day one of each course. The other two tablets of AQ are given to the caregiver to disperse and administer daily on day two and day three.
- **SMC cycle:** A one-month interval between each course of SPAQ.
- **SMC distribution period:** The number of days within each cycle when SPAQ is administered to eligible children.
- **SMC round:** The total number of SMC cycles in one year, which corresponds with the high transmission season for malaria.
- **SMC delivery:** The processes and interventions required to safely administer SPAQ to eligible children each cycle. They include planning, enumeration, procurement of commodities and supply management, training, community engagement, SPAQ administration, case management and pharmacovigilance, supervision, safeguarding and M&E.
- **Enumeration:** Determining the number of children 3–<12 months and 12–59 months in SMC targeted areas. Enumeration is part of the planning process.
- **Quantification:** Determining the quantity of SPAQ and SMC commodities required for the SMC round.
- **SMC implementation plan:** A written plan which outlines an estimate of human, logistics and financial resources required to implement all SMC activities. It also includes a plan for procurement and supply management, training, supervision, pharmacovigilance, security, risk preparedness, and M&E.
- **SMC delivery method:** The method or scheme used to reach >95 percent of eligible children and administer SPAQ at monthly intervals. The delivery method can be door-to-door, at fixed

locations in the community or health facility, or coupled with other community health interventions.

- **Door-to-door delivery:** A method of delivering SMC by community distributors in the child's household.
- **Fixed-point delivery:** A method of delivering SMC at a central location by community distributors or health facility workers, such as a health facility, school, or central community location.
- **SMC campaign:** The period when all SMC activities are implemented in a given year and location. It begins with annual planning for SMC and ends when all data have been collected after the last cycle. The SMC campaign begins before the SMC round.

SMC roles

- **Community distributor:** Community-based worker recruited and trained to administer SPAQ to eligible children during each SMC distribution period. Community distributors work in teams of at least two people.
- **Health facility:** Participating health facilities in each SMC catchment area. Several teams of community distributors report to a health facility.
- **Health facility worker:** Health workers working in SMC-selected health facilities are responsible for the stock management of SPAQ, case management of referred children, treatment of children with confirmed malaria, and administration of SPAQ to children who test negative for malaria. They are also responsible for completing the SMC tally sheet, SMC referral form, SMC daily summary form, and SMC end-of-cycle report. In some cases, health facility workers are also responsible for supervising community distributors.
- **SMC supervisor:** Teams of community distributors are supervised during SMC distribution by SMC supervisors. Each SMC supervisor is responsible for a number of teams, observing the administration of SPAQ and providing constructive feedback, mentoring, and support. Each community distributor should receive supportive supervision at least once every SMC cycle. SMC supervisors and health facility workers are supervised by senior supervisors, for example from district or regional health authorities.
- **Town crier:** Individuals capacitated to mobilize and engage with communities before and during each SMC cycle to communicate the dates of the campaign and key messages about SMC.
- **SMC implementers:** All individuals involved in delivering SMC, including community distributors, supervisors, health facility workers, town criers, trainers, health authority, and Malaria Consortium staff.

SMC forms

- **SMC tally sheet:** A daily log sheet used by community distributors to track the number of SPAQ doses given, re-dosed, and wasted. It is also used by health facility workers to track administrative coverage and drug accountability each day of each cycle.

- **SMC referral form:** A form given to the caregiver when a child is referred to the health facility during SMC. The health facility worker completes the bottom of the referral form at the health facility with the evaluation and outcome of the child's status.
- **SMC child record card:** A card given to the child's caregiver which tracks the total number of SPAQ tablets given each cycle.
- **Health facility daily summary form:** A form completed each day of the cycle by the health facility worker to summarize daily data from all tally sheets and referral forms in the health facility catchment area. Used to inform the end-of-cycle report.
- **End-of-cycle report:** A report completed by the health facility worker at the end of each cycle which summarizes the total number of children administered SPAQ by age group, re-dosed, and referred to the health facility SMC catchment area. Used to provide a summary of SPAQ stock reconciliation, wastage, and stock balance of blister packs at the end of each cycle.

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