

Exploring the implementation of seasonal malaria chemoprevention in Mozambique

Results from an end-of-round coverage survey in Nampula
province, 2020–2021

Key messages

- Seasonal malaria chemoprevention (SMC) was delivered for the first time in Mozambique in 2020–2021, achieving very high coverage of households and eligible children (>85 percent).
- Results were comparable to those in west African settings where SMC has been delivered for several years.
- Caregivers' adherence to administration of medication after children were visited by community distributors was higher than in any other country where SMC was delivered in 2020.

Introduction

SMC is a highly effective community-based intervention to prevent malaria infections in areas where the malaria burden is high and transmission is highly seasonal.^[1-3] It is currently delivered in a number of Sahelian countries of west and central Africa and involves administering sulfadoxine-pyrimethamine (SP) and amodiaquine (AQ), or 'SPAQ', to children 3–59 months. To date, SMC has not been delivered at scale in east and southern Africa due to concerns over widespread resistance to SP. Resistance (either to SP or AQ) may reduce the efficacy of SMC in protecting children against clinical malaria.^[4] It has been suggested, however, that SP may retain its protective effect even in areas where resistance is high.

SMC is typically delivered in yearly rounds of four cycles during the peak of the rainy season, with distribution periods approximately 28 days apart.^[5] After community sensitisation activities, SMC is distributed door-to-door by volunteer community distributors, over three to four days per cycle.

Each monthly SPAQ course consists of one single dispersible tablet of SP and three daily dispersible tablets of AQ. Children 3–<12 months receive a lower SPAQ dose than children 12–59 months. A dose of SP and the first dose of AQ (day 1 SPAQ) are administered by or under the supervision of community distributors to ensure that the tablets are correctly dispersed in water and that the child fully ingests the medication. This is referred to as directly observed treatment (DOT). Community distributors then leave a blister pack for caregivers that contains the two remaining AQ tablets, providing instructions on how to administer and record the dose using an SMC child record card. Caregivers administer the remaining AQ over the following two days (day 2 AQ and day 3 AQ).

The Mozambican National Malaria Control Programme's (NMCP) strategic plan for 2017–2022 focuses on reducing the malaria burden in areas with high endemicity (where the disease is widespread) and sustaining gains in low transmission areas.^[6] SMC may have a role to play in the realisation of this plan.

In 2020, the NMCP and Malaria Consortium initiated a phased implementation project in Nampula province to assess the feasibility and effectiveness of SMC in the Mozambican context.^[7]

The project's six objectives were to:

1. determine baseline prevalences of SP and AQ resistance and any increase in resistance after one annual round of SMC
2. establish whether receiving SPAQ is associated with a reduction in the odds of clinically significant malaria outcomes
3. assess the change in reported malaria morbidity indicators through routine data
4. document the adaptation of SMC implementation to the Mozambican context
5. explore the feasibility and acceptability of SMC among stakeholders
6. evaluate the process of SMC implementation in terms of distribution quality and coverage.



Blister pack containing SPAQ medication: a tablet of SP and three tablets of AQ

Methods

Project location and design

Between November 2020 and February 2021, we delivered SMC to a target population of around 72,000 children under five in the districts of Malema and Mecubúri. As part of the sixth objective of the project, we conducted an end-of-round (EoR) coverage survey in these two districts between 15th and 29th March 2021 after the final cycle of the annual SMC round. The Centro de Investigação em Saúde de Manhiça (CISM) coordinated the survey, which covered 1,800 households.

The EoR survey employed a similar protocol to that of EoR surveys in other countries where we support SMC delivery.^[8] Across both districts, we selected settlements (*comunidades*) with probability proportional to their population size to give a self-weighting sample that was representative of the overall population of the two districts. We sampled constant number of households (15) in each settlement, randomly selecting residential structures (comprising either single-family residences or multi-family compounds) from lists of structures in each settlement.

Data collection and analysis

Trained research teams (typically working in pairs) administered survey questionnaires using SurveyCTO, an electronic data collection platform for smartphones. Data were uploaded to a remote server after each day of data collection. Teams conducted interviews in local languages, translating from the Portuguese questionnaire on the spot.

Once teams obtained consent from residents for participation in the survey, a roster of all children 3–119 months was made in SurveyCTO recording their first name, age and sex. One child was automatically selected at random from the roster by SurveyCTO — all subsequent questions related to that child, and their primary caregiver and household.

Older children outside the eligible age range may inadvertently receive SMC, and there have been challenges in estimating the proportion of children in this age range that receives day 1 SPAQ in other settings. The EoR survey we conducted in Mozambique differs from previous, similar surveys in one key respect: it was designed to be powered to give an estimate of SMC coverage for eligible children (3–59 months) with a margin of error of 5 percent, while also providing a representative sample of ineligible children (60–119 months).



Remote administration of SMC

The resulting dataset included data on the following key indicator variables:

- caregiver had heard about date of SMC cycle
- caregiver knowledge of age eligibility for SMC
- household coverage
- eligible child coverage (with day 1 SPAQ from any source) in cycle four
- eligible child coverage, by number of cycles during the 2020–2021 round
- day 1 SPAQ received by DOT
- day 2 and day 3 AQ adherence (both days)
- SMC child record card retention
- child coverage (SMC child record card)
- ineligible child coverage.

We analysed the data using Stata 16, calculating results as proportions with 95 percent confidence intervals (CI) adjusted for survey design effect. Results are shown for data from Malema and Mecubúri combined.

Results

Table 1 shows the results for each key indicator for cycle four, with denominators and 95 percent CIs. Results indicate that, according to caregiver reports, community

distributors visited nearly 90 percent of households in areas targeted for SMC, and over 85 percent of eligible children received day 1 SPAQ.

Table 1: End-of-round survey results (cycle four, Malema and Mecubúri)

Indicator	Denominator	Proportion (percentage)	95 percent CI
Caregiver heard date of SMC cycle	Households with eligible children (3–59 months)	84.4	79.7–88.2
Caregiver knowledge age eligibility	Households with eligible children	88.3	84.9–91.0
Household coverage	Households with eligible children	89.3	85.8–92.0
Eligible child coverage of day1 SPAQ, all sources (caregiver report)	Eligible children	85.8	82.1–88.9
SMC received by DOT	Eligible children received Day 1 SPAQ	96.1	93.7–97.6
Day 2 and 3 adherence (both days)	Eligible children received day 1 SPAQ	98.3	98.5–99.7
SMC record card retention	Eligible children	87.7	83.9–90.8
Child coverage (SMC record card)	Eligible children with available SMC record card	94.0	91.2–95.9
Ineligible child coverage (caregiver report)	Ineligible children (60–119 months, in household with children <10 years)	15.3	11.5–20.1

Findings were similar across the two districts when analysed individually. For example, eligible child coverage of day 1 SPAQ was 84 percent (95 percent CI: 77.8–88.7) in Malema and approximately 88 percent (95 percent CI: 82.7–91.3) in Mecubúri.

Results for coverage of eligible children in other cycles based on retrospective caregiver reports after cycle four are shown in Table 2. The results show that nearly 80 percent of eligible children received day 1 SPAQ in all four cycles.

Table 2: End-of-round survey results (cycle four, Malema and Mecubúri)

Indicator	Denominator	Proportion (percentage)	95 percent CI
Eligible child coverage, received no day 1 SPAQ in 2020/21 round (caregiver report)	Eligible children (3–59 months)	4.9	2.9–8.1
Eligible child coverage, received four cycles of day 1 SPAQ in 2020/21 round (caregiver report)	Eligible children	77.0	69.7–82.9



SPAQ administration during the first SMC cycle in Mecubúri, Nampula, 2020

Discussion

The 2020 SMC phased project in Nampula province achieved high coverage of eligible children with day 1 SPAQ. Sensitisation activities — which took place before, during and after SMC delivery — were also effective, as evidenced by the high levels of caregiver knowledge of the dates of SMC cycles and the eligible age range for SPAQ administration. Despite the fact that 2020–2021 was only the first time SMC was delivered in Mozambique, results were comparable to those from Sahelian countries where SMC has already been delivered for several years. The proportions of children who received SPAQ as DOT — and who received both day 2 AQ and day 3 AQ — were higher than those achieved in areas supported by Malaria Consortium in Burkina Faso, Chad, Nigeria and Togo, respectively, during 2020.^[8]

Coverage of eligible children with day 1 SPAQ, determined using SMC child record cards, was higher than that calculated based on caregiver reports. It is likely that, despite retention of cards by 94 percent of caregivers in cycle four, bias may have arisen as eligible children without cards may have had a lower probability of receiving day 1 SPAQ than those with cards.

This survey represents Malaria Consortium's first attempt to obtain a representative sample of older, ineligible children outside the standard age range for SMC. An interesting survey outcome was evidence of SPAQ administration to this. Administration to older children may reflect difficulties faced by SMC community distributors in determining children's ages, inconsistencies in caregivers' reports of children's ages, or, in some cases, caregivers' desire for older children to receive protection from malaria. Administering SPAQ doses to children over 59 months not only increases the risk of stock-outs, but also risks contributing to SP resistance by under-dosing among children over 59 months (as the dosing of SMC medicines is intended for younger age groups).

Together, the results of the EoR survey suggest that we successfully delivered SMC to nearly 90 percent of the target population of eligible children, and that the quality of programme delivery was generally high. This was achieved despite the programme's very recent establishment in Mozambique and the potential for disruption due to the global COVID-19 pandemic.

We anticipate that data obtained from this coverage survey will also facilitate further studies to investigate the determinants of receipt of day 1 SPAQ by children over 60 months. Such determinants may include a child's age, measures of a household's socioeconomic position, persons responsible for making healthcare decisions for children, and caregiver knowledge of SMC.

A second phase of this project is currently in planning and is expected to commence in November 2021. In addition to expanding SMC delivery to two new districts, this phase will involve a cluster randomised trial of nearly 3,000 eligible children to estimate the effectiveness of SMC at preventing clinically significant malaria cases. It will also include a chemoprevention efficacy component, as well as a cohort study that will measure change in markers of resistance to SP and AQ over the SMC round using quantitative polymerase chain reaction (qPCR) assay with dried blood spots collected from eligible children, followed up over four months.

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