SEASONAL MALARIA CHEMOPREVENTION MONITORING & EVALUATION TOOLKIT

Performance Framework

Abstract

In 2019, following the large-scale implementation of seasonal malaria chemoprevention (SMC) in 13 African countries, the Global Malaria Programme of the World Health Organization and the Special Programme for Research and Training in Tropical Diseases (TDR) convened a drafting committee to develop the 2nd edition of the SMC field Guide. In March 2021, the document was shared for inputs with the M&E workstream of the SMC Alliance and the following sections were reviewed as priority: 1) the performance framework, 2) the list of recommended indicators and 3) methods for estimating SMC coverage and adherence to three doses each cycle.

SMC M&E Sub-Group of the SMC Alliance

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Contents:

Acronyms

ADR: Adverse drug reactions
BCC: Behavior Change Communication
CD: Community Distributor
CHW: Community Health Worker
DHS: Demographic and Health Surveys
EOC: End of Cycle
HF: Health Facility
HFW: Health Facility Worker
HMIS: Health Management Information System
IRS: Indoor Residual Spraying
LLIN: Long-Lasting Insecticidal Net
M&E: Monitoring and Evaluation

MICS: Malaria Indicator Cluster Survey
MIS: Malaria Indicator Survey
MOH: Ministry of Health
NMCP: National Malaria Control Program
PPE: Personal Protective Equipment
SBC: Social and Behavior Change
SMC: Seasonal Malaria Chemoprophylaxis
SOP: Standard Operating Procedure
SPAQ: Sulfadoxine/Pyrimethamine (SP) plus Amodiaquine (AQ)
U/O 5: Under/Over Five (referring to age of children)
U/O 10: Under/Over Ten (referring to age of children)

Glossary

▪ **Community Distributor (CD)**: community-based worker recruited and trained to administer SPAQ to eligible children during each SMC distribution period. CDs work in teams of at least two people, under the direction of Field Supervisors.

▪ **Door-to-Door Delivery**: a method of delivering SMC by CDs in the child's household.

▪ **End-of-Cycle (EOC) Report:** a report completed by the HFW 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 drug reconciliation, wastage, and balance of blister packs at the end of each cycle.

▪ **Enumeration:** Determining the number of children 3 to <12 months and 12 to 59 months in SMC targeted areas. Enumeration is part of the planning process and is critical to refine planning assumptions as well as planning accurate SPAQ procurement for the following campaign.

▪ **Fixed-Point Delivery**: a method of delivering SMC at a central location by CD or HFWs, such as a health facility, school, or central community location.

▪ **Health Facility (HF):** SMC participating health facilities in each SMC catchment area. Several CD Teams report to a HF.

- **Health Facility Daily Summary Form:** a form completed each day of the cycle by the HFW to summarize daily data from all the Tally Sheets and Referral Forms in the HF catchment area. Used to inform the EOC Report.

- **Health Facility Worker (HFW):** health workers working in SMC selected health facilities are responsible for 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, HFW are also responsible for supervising CDs.

- **Quantification:** Determining the quantity of SPAQ and SMC commodities required for the SMC round.

- **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 WHO recommends a full 3-day courses of SPAQ administered to children 3 to 59 months, repeated at monthly intervals in areas with highly seasonal malaria transmission.

- **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 of the data has been collected after the last cycle. The SMC campaign begins before the SMC round.

- **SMC Child Record Card:** a card given to the child's caregiver which tracks the total number of SPAQ tablets given each cycle.

- **SMC Course:** a period of 3 days in which a full course of SPAQ is intended to be given. Each eligible child is given 1 course of SPAQ each cycle.

- **SMC Cycle:** a one-month interval between each course of SPAQ.

- **SMC Delivery:** the processes and interventions required to safely administer SPAQ to eligible children each cycle. They include planning, enumeration, procurement of commodities, supply management, training, community engagement, SPAQ administration, case management & pharmacovigilance, supervision, safeguarding, and monitoring and evaluation (M&E).

- **SMC Delivery Method:** The method or scheme used to reach >95% 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.

- **SMC delivery period:** the number of days within each SMC cycle when SPAQ is distributed to eligible children in a given area (typically 4-5 days).

- **SMC Implementers:** all individuals involved in delivering SMC, including CDs, supervisors, HFWs, town criers, trainers, health authority, NMCP, and implementing partner staff.

- **SMC Implementation Plan:** a written plan which outlines an estimate of human, logistics and financial resources required to implement all SMC activities. It will also include a plan for procurement and supply management, training, supervision, pharmacovigilance, security, risk preparedness, and M&E.

- **SMC Referral Form:** a form given to the caregiver when a child is referred to the health facility during SMC. The HFW completes the bottom of the Referral Form at the HF with the evaluation and outcome of the child's status.

- **SMC round:** the malaria transmission season covered by SMC, typically consisting of 4 SMC cycles

- **SMC Supervisor:** CD teams are supervised during SMC distribution by SMC supervisors. Each SMC supervisor is responsible for a number of SMC teams, observing the administration of SPAQ and providing constructive feedback, mentoring and support. Each CD should receive supportive supervision at least once each SMC cycle. SMC supervisors and HFWs are supervised by senior supervisors, for example from district or regional health authorities.

- **SMC Tally Sheet**: a daily log sheet used by CDs to track the number of SPAQ doses given, re-dosed and wasted. It is also used by HFWs to track administrative coverage and drug accountability each day of each cycle.

- **SPAQ:** a combination of the antimalarials medicines sulfadoxine/pyrimethamine (SP) plus amodiaquine (AQ) given during SMC to prevent malaria.

- **SPAQ Co-Blister Pack**: one dispersible tablet of sulfadoxine/pyrimethamine (SP) and <u>three </u>dispersible tablets of amodiaquine (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 1 of each course. The other two tablets of AQ are given to the caregiver to disperse and administer daily on day 2 and day 3.

- **SPAQ Dose Range:** There are two child dose ranges of SPAQ:

  - Infant dose for 3 to <12 months: SP 250 mg/12.5 mg and amodiaquine 75 mg
  - Child dose for 12 to 59 months: SP 500 mg/25 mg and amodiaquine 150 mg

- **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.

Introduction

A rigorous monitoring and evaluation (M&E) performance framework for SMC programmes is essential to provide confidence that SMC delivery is effective, target populations are reached, and SMC programmes are having the intended impact. A performance framework also allows identification of programmatic bottlenecks and can inform both logistical and technical decision-making actions.

The proposed framework intends to guide the collection and analysis of data relating to programme inputs, processes, and outputs, with a view to improving quality and use of programme data. It defines how we can demonstrate coverage and quality of programme implementation, and how we assess the impact of SMC.

To assess SMC performance, we should monitor and evaluate quality of delivery, coverage, efficacy, safety, drug resistance, impact, and cost through routine programme data as well as regular post-cycle and end-of-round household surveys. SMC programme M&E data also support governments and partners in decision-making and priority-setting. This performance framework and associated standardized indicators draws together data from across all elements of SMC programmes to facilitate appraisal of the quality of programme delivery and assess the relationships between different aspects of implementation (inputs/processes and outputs) and the expected results (outcomes and impacts). It also points out relevant external factors that could affect programme implementation, results, and collection and interpretation of programme data.

The SMC performance framework supports an overarching SMC programme aim that can be summarized as "To safely prevent malaria cases in eligible children living in areas targeted by SMC campaigns within the intended period of protection".

Based in this goal, objectives were defined to describe aspects of the inputs and processes of SMC programme delivery that facilitate the achievement of this overarching goal. These include:

- **Supply and demand:** Ensure provision of appropriate inputs to meet programme demands in relation to the place, time, and person.
- **Readiness:** Ensure preparedness of SMC activities and resources before program implementation.
- **Timeliness:** Ensure first SMC cycle is able to start on schedule and subsequent cycles take place no later than 28 days after the previous cycle.
- **Acceptability:** Ensure successful uptake of SMC by well-informed decision makers and community members taking into account the knowledge, attitudes, and perceptions of all concerned.
- **Safety:** Ensure safe delivery of SMC and complete reporting and management of adverse events following SPAQ administration.

A number of indicators associated with each of these objectives — all designed to be SMART (specific, measurable, achievable, realistic, and timely) in nature — were identified and categorized as either input, output, outcome, or impact indicators. Specifications for each indicator were made to show what is being measured; how, where, when and at what unit of analysis it is measured; and how data will be utilized. Some of these, listed as "core indicators", should be tracked by all malaria programs implementing SMC. Other are listed for potential use in M&E as appropriate.

It should be noted that the proposed performance framework should be continuously revised based on lessons learned and on contextual needs (e.g.: the global coronavirus pandemic) to inform programme design and implementation.

Input indicators

The input indicators are those that describe the basic needs for an SMC program, e.g.: policy, financing, staffing, infrastructures, medicines, data collection tools.

Objective	Indicator	Operational Definition	Aggregation Level	Frequency	Source	Challenges & Considerations
Supply and demand	Proportion of health facilities with sufficient stocks of SMC medicines **(Core indicator)**	**Numerator:** Number of health facilities with sufficient stocks of SMC medicines at start of SMC round **Denominator**: Number of health facilities expected to stock SMC medicine at start of SMC round	Facility	Annual	SMC campaign report	Requires explicit quantification of SMC medicines in relation to target population per stocks at health facilities. Important but not sufficient to measure supply management capacity for implementation
Supply and demand	Number of SPAQ procured for children of 3-11 months **(Core indicator)**	Total number of SPAQ co-blister packs procured for children of 3-11 months of age to cover the SMC campaign	Country	Annual	Procurement orders	SMC procurement plans of multiple agencies are consolidated at national level
Supply and demand	Number of SPAQ procured for children of 12-59 months **(Core indicator)**	Total number of SPAQ co-blister packs procured for children of 12-59 months of age to cover the full SMC round	Country	Annual	Procurement orders	SMC procurement plans of multiple agencies are consolidated at national level
Readiness	Community distributors enrolled for the SMC campaign **(Core indicator)**	Number of community distributors of SMC medicines enrolled for the full SMC campaign	District	Annual	SMC campaign report	Requires compilation of community distributors enrolled at each SMC cycle considering the attrition of community distributors. Essential but not sufficient to evaluate SMC drug distribution capacity

Objective	Indicator	Operational Definition	Aggregation Level	Frequency	Source	Challenges & Considerations
Readiness	Community distributors enrolled for the SMC campaign **(Core indicator)**	Number of community distributors of SMC medicines enrolled for the full SMC campaign	District	Annual	SMC campaign report	Requires compilation of community distributors enrolled at each SMC cycle considering the attrition of community distributors. Essential but not sufficient to evaluate SMC drug distribution capacity
Readiness	Proportion of health facilities with adequate SMC reporting tools	**Numerator:** Number of health facilities supplied with adequate SMC reporting tools at start of SMC round **Denominator**: Number of health facilities expected to submit SMC reports	Facility	Annual	SMC campaign report	Requires definition of adequate number of SMC reporting tools at health facilities. Important but not sufficient to measure SMC reporting capacity from health facilities
Readiness	Proportion of health facilities with SMC supervision tools	**Numerator:** Number of health facilities supplied with adequate supervision tools at start of SMC round **Denominator**: Number of health facilities expected to submit SMC supervision reports	Facility District	Annual	SMC campaign report	Requires definition of adequate number of SMC supervision tools. Important but not sufficient to measure SMC supervision capacity
Readiness	Proportion of health facilities with logistics management information system to track SMC medicines	**Numerator:** Number of health facilities supplied with logistics management information system to track SMC medicines **Denominator**: Number of health facilities expected to track SMC medicines	Facility District	Annual	SMC campaign report	Requires explicit quantification of SMC medicines in relation to target population per stocks at health facilities. Important but not sufficient to measure SMC medicines tracking capacity
Readiness	Number of field supervisors recruited active during the whole SMC campaign	Number of field supervisors recruited and active during the whole campaign	District	Annual	SMC campaign report	Requires compilation of field supervisors enrolled in the SMC round
Readiness	Proportion of final microplans that include data quality plan (including SOP)	**Numerator**: Number of microplans that include a well-defined data quality plan or strategy **Denominator**: Number of microplans developed	Country	Annual	SMC campaign report	Need clear guidance on minimum elements to be included in a well-defined data quality plan or strategy; may vary depending on capacity
Readiness	Number of field supervisors per community distributor	**Numerator**: Total field supervisors recruited **Denominator**: Total community distributors recruited	District	Annual	SMC campaign report	Requires compilation of field supervisors. Requires and community distributors enrolled at each SMC cycle considering the attrition of community distributors.
Readiness	Ratio of female to male community distributors	Number of female community distributors: Number of male community distributors	District	Annual	SMC campaign report	Requires compilation of community distributors enrolled at each SMC cycle considering the attrition of community distributors.
Readiness	Ratio of community distributors to targeted children	**Numerator**: Number of community distributors of SMC medicines enrolled for the full SMC campaign **Denominator**: Number of targeted children	District	Annual	SMC campaign report	Requires compilation of community distributors enrolled at each SMC cycle considering the attrition of community distributors. Essential but not sufficient to evaluate SMC drug distribution capacity
Readiness	Financial resources mobilized for SMC campaigns	Total funds and budget breakdown provided by all stakeholders to supporting the planning, procurement, implementation, and monitoring & evaluation of the entire SMC campaign	Country	Annual	SMC campaign reports of multiple stakeholders	Requires coordination and trust to access this information from all agencies which have provided financial support to SMC campaigns in the country

Objective	Indicator	Operational Definition	Aggregation Level	Frequency	Source	Challenges & Considerations
Supply and demand	Number of SPAQ procured for children of 5-10 years	Total number of SPAQ treatment courses procured for children of 5-10 years of age to cover the full SMC round	Country	Annual	Procurement orders	SMC procurement plans of multiple agencies are consolidated at national level
Supply and demand	Proportion of the unit cost per course delivered	**Numerator**: Total costs of SMC programme **Denominator**: Number of courses delivered	Country Implementing partner	Monthly	Budget SMC campaign report	Likely to vary from partner to partner
Timeliness	End-of-round survey started at planned time	End-of-round survey started at planned time	Country	Annual	Survey assessment report	

Notes on Readiness:

It is recommended that countries assess system readiness prior to start to the SMC campaign. For health facility readiness, it is recommended a standardized checklist (suitable for the country context) is used to determine if the health facilities are prepared. This exercise should occur during the planning phase of implementation.

For health facility readiness, the following key elements are important to assess ahead of the commencement of SMC campaign:
- SMC stocks
- Supervision tools
- Reporting forms
- Human resource readiness
- PPE
- Pharmacovigilance forms
- IT/Comms – Power packs, data credits

At subnational level, it is recommended readiness should be assessed examining the following components:
- Availability and completeness of micro plans
- Well-defined data quality strategy or SOPs in place
- Human resource coverage and readiness
- Updated/current Training materials
- Supervision tools

Output indicators

The output indicators are indicators that help describe what was generated as a result of the planned activities.

Objective	Indicator	Operational Definition	Aggregation Level	Frequency	Source	Challenges & Considerations
Readiness	Proportion of community distributors received training on SMC **(Core indicator)**	**Numerator:** Number of community distributors that have been trained on SMC **Denominator**: Total number of community distributors enrolled in the SMC campaign	District	Annual	Training Report	Requires compilation of training reports performed at multiple times during the SMC campaign considering the attrition of drug dispensers and need for retraining
Readiness	Proportion of health workers/ persons trained to supervise SMC campaign **(Core indicator)**	**Numerator:** Number of health workers/ persons trained on SMC supervision **Denominator**: Total number of supervisors enrolled in the SMC campaign	District	Annual	Training Report	Requires compilation of training completed before the SMC round. Limited use of monitoring this also considering low attrition of community supervisors.
Readiness	Proportion of health staff trained as focal data entry/management persons **(Core indicator)**	**Numerator:** Number of health staff trained as data entry/management persons for SMC **Denominator:** Total number of health staff enrolled in the SMC Campaign for data entry/ management	District or Regional	Annual	Training Report	Requires compilation of training completed before the SMC round.
Supply and demand	Number of co-blisters SPAQ distributed at 1st cycle **(Core indicator)**	Total number of co-blisters distributed at 1st cycle to target communities	Facility	Monthly	SMC campaign Report	Essential but not sufficient to evaluate SMC drug distribution capacity. The number of eligible children at each cycle is difficult to calculate
Supply and demand	Number of co-blisters SPAQ distributed at 2nd cycle **(Core indicator)**	Total number of co-blisters distributed at 2nd cycle to target communities	Facility	Monthly	SMC campaign Report	Essential but not sufficient to evaluate SMC drug distribution capacity. The number of eligible children at each cycle is difficult to calculate
Supply and demand	Number of co-blisters SPAQ distributed at 3rd cycle **(Core indicator)**	Total number of co-blisters distributed at 3rd cycle to target communities	Facility	Monthly	SMC campaign Report	Essential but not sufficient to evaluate SMC drug distribution capacity. The number of eligible children at each cycle is difficult to calculate
Supply and demand	Number of co-blisters SPAQ distributed at 4th cycle **(Core indicator)**	Total number of co-blisters distributed at 4th cycle to target communities	Facility	Monthly	SMC campaign Report	Essential but not sufficient to evaluate SMC drug distribution capacity. The number of eligible children at each cycle is difficult to calculate
Supply and demand	Proportion of health facilities reporting stock out of SMC medicines (SPAQ) during SMC implementation period. **(Core indicator)**	**Numerator**: Number of health facilities storing SMC medicines that reported stockouts **Denominator**: Number of health facilities storing SMC medicines	District	Monthly	SMC campaign report	Requires all health facilities storing SMC medicines to regularly report on SPAQ stockouts

Objective	Indicator	Operational Definition	Aggregation Level	Frequency	Source	Challenges & Considerations
Readiness	Proportion of health staff trained on SMC	**Numerator:** Number of health staff trained on SMC **Denominator**: Total number of health staff enrolled in the SMC campaign	District	Annual	Training Report	Requires compilation of training completed before the SMC round. Limited use of monitoring this also considering low attrition of community supervisors.
Readiness	Proportion of sampled households sensitized prior to each SMC cycle	**Numerator**: Number of sampled households sensitized on SMC prior to each campaign cycle **Denominator**: Number of sampled households in target SMC areas	District or Regional	Monthly	Survey assessment report	Information essential but not sufficient to assess capacity for community SBC
Readiness	Number of SMC sensitization materials distributed to health facilities prior to start of SMC campaign	Total number of printed or electronic SBC materials by type and target audience distributed to health facilities	Facility	Annual	SMC campaign report	Need description of SBC products by type and target audience
Readiness	Proportion of community distributors who received supervision visits during the SMC campaign	**Numerator:** Number of community distributors who received a supervision visit during the SMC campaign **Denominator:** Number of community distributors engaged in SMC implementation	District	Monthly	SMC campaign reports	Data consolidation and central reporting does not always include this indicator
Readiness	Proportion of eligible children registered at each SMC cycle	**Numerator:** Number of eligible children registered at each SMC cycle **Denominator**: Number of eligible children living in the households visited at each SMC cycle	District	Monthly	SMC campaign report	Requires accurate reporting by community distributors of eligible children absent at the time of the visit
Timeliness	Proportion of complete SMC reports received on time	**Numerator**: Number of complete SMC reports received on time at each SMC cycle **Denominator**: Number of SMC reports expected at each SMC cycle	Facility District Regional National	Monthly	SMC campaign report	Requires clear definitions of completeness and timeliness of reporting clearly communicated to all levels of data flow
Timeliness	SMC started at planned time	SMC campaign started on date MOH planned	District	Annual	SMC campaign Report	Requires clear documentation of proposed start date and documentation of final start date.
Acceptability	Proportion of health workers/personnel trained in social behaviour change (SBC)	**Numerator**: Number of health workers/personnel trained in SBC for the SMC campaign **Denominator**: Number of health workers/personnel involved in SBC activities during the SMC campaign	Regional	Annual	SMC training reports SMC campaign reports	Relevant but not sufficient to monitor the effectiveness of SBC activities implemented before and during the SMC campaigns

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Objective	Indicator	Operational Definition	Aggregation Level	Frequency	Source	Challenges & Considerations
Acceptability	Proportion of caregivers who remember key SBC message about SMC	**Numerator**: Number of sampled caregivers who remember key SBC messages about SMC **Denominator**: Number of sampled caregivers interviewed on key SBC messages on SMC	District	Annual	SMC assessment report	Requires definition of "key SBC messages" to obtain reliable data Key messages include: 1) Knowing that SMC is implemented in the rainy season 2) Knowing that SMC is given at monthly intervals 3) Knowing SMC is given over three days during one cycle 4) Knowing the purpose of SMC 5) Knowing that SMC is giving to children 3-59 months or 3 months - 10 years 6) Knowing that there are different dosage formulations depending on the age of the child 7) Can mention at least one ADR to look out for 8) Can describe what action to take in the event of an ADR
Acceptability	Number of SBC activities implemented during SMC campaign	Number of SBC activities (advocacy visits, public meetings and/or presentations, radio and tv adverts, community events, social media, home visits etc) implemented during the SMC campaigns by type and target audience	District	Annual	SMC campaign report	Essential but not sufficient to monitor the effectiveness of SBC activities implemented before and during the SMC campaigns activities. Examples may include advocacy visits, public meetings and/or presentations, radio and tv adverts, community events, social media, home visits etc)
Communications	Number of Health Areas with documented communication plan with a timeline and budget in place before implementation		Health area	Annual	SMC campaign report	
Communications	Number of Health Areas where social mobilization activities were initiated before the start of SMC delivery, per cycle		Health area	Annual	SMC campaign report	
Communications	Proportion of budget utilized for social mobilization and BCC		National	Annual	SMC campaign report	
Supply and demand	Number of courses administered per distributor team per day	**Numerator**: Number of courses delivered **Denominator**: Number of distributor pairs	Facility	Monthly	SMC campaign Report	Important to gauge to closely monitor in order, to help gauge if teams followed protocol. Too many or too few could indicate SMC not being delivered according to protocol

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Outcome indicators

Outcome indicators are a measure of whether a program or activity is resulting in the anticipated effect or changes (short or medium term). There are two key indicators for the quality of an SMC campaign: 1) the proportion of targeted children who were treated in all four cycles; and 2) the proportion of targeted children who took their medicines unobserved on days two and three. Often the NMCPs derives these from routine administrative data, generated by the community distributors. This is supplemented in some countries by household surveys.

During the SMC campaign, community distributors note how many children they treat daily during each cycle in a standard register. They check the children's SMC Child Record Cards, when available, but still treat a child even if the SMC card cannot be found. In principle data on adherence are collected by community distributors checking SMC cards during the later cycles for doses given on day two and day three during earlier cycles . In practice, community distributors do not always fill in those columns in the registers. Few countries in the Sahel track each individual child from one cycle to the next. Most NMCPs rely on administrative program data, aggregated from the community distributors' records. Administrative data do not give valid estimates of coverage due to uncertainty about the size of the target population. Coverage estimated from the number of doses administered generally over-estimates the actual coverage because of the inclusion of treatments administered to children outside the eligible age range.

There are several reasons why a child might be treated in one month and not the next. The child may not be home during a subsequent cycle or might have had a fever during one cycle, and therefore be excluded until the next one. Infants age into the eligible target between cycles. This means that even if the administrative coverage rate remains relatively constant from one cycle to the next, it may not be the same children who are reached in each cycle (or, rather, the same children being missed).

Household surveys at the end of the transmission season, conducted shortly after the last SMC cycle, are needed to establish the level of coverage, combined with investigations to understand reasons behind suboptimal coverage and steps needed to improve. Reliable data on adherence to treatment can be obtained from specific surveys (see considerations for household surveys as a means of estimating adherence to treatment). Ideally, personnel involved in data collection should be independent of the SMC programme.

Target population size may come from census projections or other sources such as household enumeration. The method/source should be specified and ideally should not use counts of children made at the time of the SMC visit because that will be limited to households actually visited. Another method to assist with determining complete coverage is in use of digitized building footprints (through MAXAR™ technology). This technology allows you to identify all structures in the SMC eligible area, and then digital tools (such as phones) can track which structures have been visited and which have not. This method could potentially be used during surveys to check completeness of household visits. Monitoring coverage of an intervention delivered door to door, requires that the household visits during the survey are as exhaustive as possible or coverage estimates will be over-optimistic.

Indicators	Operational Definition	Frequency	Source	Challenges & Considerations
Percentage of target children that received 1st SMC cycle **(Core indicator)**	Numerator: Number of target children that received 1st SMC cycle Denominator: Total number of target children (i.e. Target population is the estimated number aged 3-59 months at cycle 1, or aged 3-119 months if applicable)	Monthly	SMC Cycle Activity Report	Number seen, number refused, number sick and referred, are also tallied and could be reported, but not used in this indicator, which is number treated, as % of target.
Percentage of target children that received 2nd SMC cycle **(Core indicator)**	Numerator: Number of target children that received 2nd SMC cycle Denominator: Total number of target children Aged 3-59 months (or 3-119 months if applicable) at cycle 1 (may include in addition, those <3months at cycle 1 who are now 3 months old)	Monthly	SMC Cycle Activity Report	
Percentage of target children that received 3rd SMC cycle **(Core indicator)**	Numerator: Number of target children that received 3rd SMC cycle Denominator: Total number of target children Aged 3-59 months (or 3-119 months if applicable) at cycle 1 (may include in addition, those <3 months at cycle 1 who are now 3 months old)	Monthly	SMC Cycle Activity Report	
Percentage of target children that received 4th SMC cycle (and add similar indicator if a 5th cycle is implemented) **(Core indicator)**	Numerator: Number of target children that received 4th SMC cycle Denominator: Total number of target children Aged 3-59 months (or 3-119 months if applicable) at cycle 1 (may include in addition, those <3months at cycle 1 or born in the month after cycle 1, who are now 3 months old)	Monthly	SMC Cycle Activity Report	
Percentage of target children that have received all planned SMC cycles. **(Core indicator)**	Numerator: Number of target children that have received all planned SMC cycles. Denominator: Total number of target children Target is the target population for cycle 1 (as these children are eligible for all recommended SMC cycles) Need to report separately by region, according to number of cycles planned.		SMC Cycle Activity Report	Please add indicators for % children who received 0,1,2,3 etc treatments (can be done easily if digital reporting is used)
Percentage of children who were given the full three daily doses of SPAQ at cycle 1 (administrative) **(Core indicator)**	Numerator: Number of children who were administered all 3 daily doses Denominator: Target number of eligible children		SMC Cycle Activity report	A similar indicator can be defined for each cycle, and for children treated 0,1,2,3 etc cycles

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Indicators	Operational Definition	Frequency	Source	Challenges & Considerations
Number of children reached in a given year **(Core indicator)**	Average number treated over the cycles completed (Sum of the number treated, divided by number of completed cycles) (Average within each region according to the number of cycles implemented, and then sum to get the total)		SMC Campaign Report	There are typically 3 measures that could be used but with 3 different purposes. The lowest number at any given cycle would be a safe estimate of the number of children covered. The average, as described here, is what has been reported in the World Malaria report. Use the maximum number of children at any given cycle for manufacturing purposes to ensure max use is accounted for and to avoid a stockout).
Percentage of children who experienced an adverse reaction to SMC in the past **(Core indicator)**	Numerator: number of children excluded due to previous side effects of SMC Denominator: the number of children seen in the cycle.	After each cycle	SMC Cycle Activity Report	
Proportion of communities who know the start date of SMC implementation **(Core indicator)**	**Numerator**: Number of sampled communities who know the start date of SMC implementation **Denominator**: Number of sampled communities for the SMC assessment	Annual	SMC assessment reports	Needs rapid assessment surveys before the start of the SMC campaign
Percentage of target children that have received all planned SMC cycles (by survey). **(Core indicator)**	Numerator: weighted total number of eligible children who received SMC in all planned cycles Denominator: weighted total number of children eligible for the full number of cycles (aged 3-59 months, or 3-119 months if applicable, at cycle 1) (report separately by region according to number of planned cycles)	At end of campaign, every 1-3 years	Household survey	Please add indicators for % that received 0,1,2,3....cycles, and the % that received at least 1 (=reach of the programme), (available for end-of-season survey)
Percentage of the 1st dose supervised by the drug dispenser (given as DOT) **(Core indicator)**	Numerator: Weighted number of children that received the 1st dose under supervision. Denominator: Weighted total number of number eligible children	After each cycle or end of campaign	Household survey	
Proportion of children aged 6-7 or 6-8 yrs who received SMC (in areas where SMC is given to under-5's) (In areas where SMC is given up to age 9, this would be children aged 10-11 or 10-12) **(Core indicator)**	Numerator: Weighted number of children (aged 6-7, or 10-11) who received SMC at least once Denominator: Weighted number of children aged 6-7, or 10-11	After each cycle or end of campaign	Household survey	
Proportion of children who were given the full three daily doses of SPAQ at last cycle	Numerator: Weighted number of eligible children that took all three doses of SPAQ at last cycle Denominator: Weighed total number of eligible children that received SMC at last cycle	After each cycle or end of campaign	Household survey	

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Indicators	Operational Definition	Frequency	Source	Challenges & Considerations
Percentage of households visited	Numerator: Number of households visited with an eligible child Denominator: Total number of households targeted with eligible children	After each cycle	SMC Cycle Activity Report	In order for this indicator to be representative, it will be important to do an accurate household registration exercise to ensure eligible HH are not missed
Percentage of caregivers who knew the date of the most recent SMC cycle in advance	Numerator: weighted number of caregivers aware of SMC date Denominator: weighted number of caregivers with an eligible child	After each cycle or end of campaign	Household survey	
Number of days between cycle 1 and cycle 2	Mean number of days between dates of 1st and 2nd cycle among children who received SMC in both cycles	End of campaign	Program data or household survey	This indicator repeated for the interval between cycle 2 and 3, and between 3 and 4, and 4 and 5 etc
Percentage of children with SMC card (or other document for that child showing SMC treatments) during the survey	Numerator: Weighted number of eligible children with SMC card (or other document for that child showing SMC treatments) seen in the survey Denominator: Weighted total of eligible children seen in the survey	End of campaign	Household Survey	

Notes on household surveys as a means of estimating SMC coverage and adherence:

Certain measures should be taken to ensure the survey is representative. The survey should use methods which sample children with known probability, and non-response should be minimized by arranging call-back visits if a caregiver is not at home during the survey. The sample size (the number of clusters and number of children per cluster) is chosen to achieve geographically representative sample and to yield estimates of coverage with the desired level of precision, overall, and in specific geographical strata (cluster sample survey designs are not well suited to producing highly granular estimates of coverage in each local area, as this would require representative sampling of each local area). Guidelines on sample size and sample selection for coverage surveys are available at https://www.who.int/immunization/documents/who_ivb_18.09/en/ As an example, recent surveys in Guinea, where SMC was implemented in 13 districts, used a sample size of about 1700 eligible children in 66 clusters, designed to yield survey estimates of coverage with a precision of +/-6% overall and, within each of three geographical zones, within +/-10%. In this survey, children were included up to age 7 years to be able to assess the amount of treatment above the age range.

Other countries, including Cameroon, Burkina Faso and Benin, have adapted the Lot Quality Assurance Sampling (LQAS) method for SMC surveys, allowing for identification of issues in SMC delivery (e.g. low programme coverage) at a local level while providing national-level summaries of key indicators.

A protocol detailing the methods and including the survey questionnaire, the participant information sheet and consent form, should be approved by the local ethics committee before the survey starts. Surveys are costly, and value can be added by including questions about other relevant topics (LL IN use for example). SMC indicators cannot in general be included in national surveys (MICS, malaria indicator surveys, DHS surveys), as the timing may not be optimal for SMC (surveys need to be done after the last cycle to minimize recall bias).

Examples of questionnaires, and reports of SMC coverage surveys, are available at: https://doi.org/10.17037/PUBS.04654302.

Informed consent should be sought from all caregivers, who should be provided information on the objectives of the survey, ethical approval, and point of contact should any issue arise because of the survey.

Notes on household surveys as a means of estimating adherence to treatment:

Adherence to treatment may be based on household surveys, interview of caretakers and inspection of blisters left over or, in research settings, by measurement of drug blood levels in children.

Impact indicators

Indicators	Operational Definition	Frequency	Source	Challenges & Considerations
Confirmed uncomplicated malaria incidences in u5 (or u10) in district where SMC has been conducted	Numerator: Number of children u5 (or u10) with confirmed uncomplicated malaria Denominator: children u5 (or u10) population per 1000 in SMC target areas	Monthly	Routine Data Collection (HMIS)	Changes in testing rates and reporting rates. Changes in care seeking behavior related or unrelated to SMC activities
Severe malaria incidences in u5 (or u10) in district where SMC has been conducted	Numerator: Number of children u5 (or u10) with severe malaria Denominator: children u5 (or u10) population per 10,000 in SMC target areas	Monthly	Routine Data Collection (HMIS)	Low quality of care at the health facilities Poor referral systems
Malaria-attributable hospital deaths in under-fives (or u10)	Numerator: Malaria-attributable hospital deaths in under-fives Denominator: children population per 10,000 in SMC target areas	Monthly	Routine Data Collection (HMIS)	Low quality of care at the health facilities Poor referral systems Malaria recorded deaths may be overestimated as some children may have an infection while the cause of deaths may not be due to malaria
Monthly ratio of under-5 to over-five (u10/o10) uncomplicated confirmed cases	Numerator: Number of confirmed uncomplicated cases in U5* (or u10) Denominator: Number of confirmed uncomplicated cases in O5* (or o10) *Adapted to the age targets	Monthly	Routine Data Collection (HMIS)	Potential of SMC reducing transmission intensity in an area, which would affect the number of cases observed in the untargeted group (over 5)
Anemia-attributable hospitalizations in under-fives (or u10)	Numerator: Number of hospitalizations in under-fives due to anemia Denominator: children population per 10,000 in SMC target areas	Monthly	Routine Data Collection (HMIS)	Changes in co-morbidities affecting anemia

Factors that affect all impact indicators: Changes in rainfall patterns, use of LLIN and/or IRS, concomitant community-based interventions that affect transmission or severity of disease, timing of the SMC, coverage of the SMC

Considerations:

« Confirmed uncomplicated malaria case incidence in children under-five (under-ten where applicable) per 1,000 population per month in areas performing SMC:

This indicator can be obtained from the monthly routine data collected at the health facility or aggregated to the district level in areas targeted for SMC. The evaluation of monthly trends allows observing the impact of SMC on incident malaria clinical cases among children during the SMC implementation, as well as monitor the same trends for the months when SMC is not implemented. In terms of confounders, the variable

is sensitive to changes in testing or reporting rates and care seeking behaviour. The first two factors affect the number of cases observed within the health facilities and can be corrected using the following equation per month if all the variables are available:

$$N = [C + (P*(C/T))] / R$$

Where:
N= Adjusted number of cases
C=Confirmed malaria cases among children under 5 years
P=presumed malaria cases among children under 5 years. Some countries may directly report this information while in others this variable may need to be calculated as the number of unconfirmed malaria treatments, or the difference between the number of suspected and confirmed malaria cases.
T=Malaria tests performed in children under 5 years
R=reporting rate (hf reported for month i / hf expected to report for month i within a given district).

This indicator is also affected by care seeking rates (i.e. the proportion of children with a fever who seek care from a public health facility) as this affects C and P in the above formula. Changes in care seeking behaviour may be due to factors related or unrelated to SMC, that will need to be considered when interpreting the observed trends in under-five malaria incidence:

- **Factors unrelated to SMC**: Expansion of the health system through the availability of more CHWs or more HFs in an area, changes in universal health care policies, conflict arousal, environmental or climatic events, etc can lead to changes in care seeking patterns. The impact of these factors will be evident by monitoring the trends in all-cause outpatients over time. Differing trends in the number of outpatients seeking care in a district will need to be considered when interpreting the trends in under-five (under-ten where applicable) uncomplicated malaria incidence and may be included as covariates in impact evaluation models that aim to attribute impact of SMC on malaria incidence.
- **Factors related to SMC**: Changes in care seeking behavior patterns may also occur if children with a fever are excluded from SMC activities and referred to a HF for malaria testing and treatment. The additional number of fevers due to the SMC activities may be directly collected during SMC round as the number of children referred to a HF and excluded from treatment (Y). Given that the number of referrals may be biased by low care seeking among the referred children, the number of referrals reported during SMC rounds represent the maximum expected number of "excess" fevers that would be observed in a HF due to the SMC activities. Therefore, the proportion of referrals during a given SMC round over the fevers observed at a HF (F) for the same month can be used to monitor the magnitude of the changes in care seeking behavior associated to SMC activities (Y. Low proportions of referred fevers indicate minimum changes in care seeking and low bias to the under-five (under-ten where applicable) incidence estimates introduced by SMC-referrals. High proportions of referred fevers indicate that the under-five (under-ten) incidence estimates observed during the SMC rounds may be overestimated by the referrals during the SMC. However, high proportions of

referred fevers are also indicative of low care seeking behavior in the community, which highlight the limitations of the routine data overall to monitor the impact of SMC.

» Severe malaria cases among children under-five (under-ten where applicable) per 10,000 population per month in areas performing SMC

Compared to uncomplicated malaria, a higher percentage of severe malaria is likely to be seen and reported by health facilities as such patients are likely to be taken to hospitals. For this reason and because the diagnosis is more likely to be confirmed for severe malaria, in low resource settings the incidence of malaria severe malaria cases is considered to be more robust measures of trends than the incidence of outpatient malaria. When severe malaria is not reported, malaria admissions can be used as a proxy for malaria severity.

However, they are also susceptible to reporting, changes in the severe disease management at health facilities, or changes in the referral systems from CHWs to health facilities to hospitals. Changes in admission practices and reporting of inpatient cases need to be accounted for when interpreting the trends of severe malaria incidence through time. Such changes can be monitored through the examination of trends in health facility reporting rates, as well as total numbers of inpatients. If there have been changes in these indicators, it may be more informative to examine trends in the proportions of inpatients cases due to malaria or to confine the analysis to the subset of health facilities that have reported consistently over time.

» Hospital-based attributable deaths due to malaria among children under-five (under-ten where applicable) per 10,000 population per month in areas performing SMC

Hospital-based Malaria attributable mortality rate calculated as the number of malaria-attributable deaths reported at hospital level among children under five (under ten where applicable) over the under-five (under-ten) population at risk, can also serve as a good indicator to evaluate the impact of SMC during the SMC implementation and non-implementation period. As for severe malaria cases, the number of reported malaria-attributable deaths can be affected by changes in reporting rates, quality of management of severe malaria, or changes in the referral system. Similar approaches to those for severe malaria can be followed to better interpret the trends in malaria mortality. If substantial changes are observed in reporting rates, all-cause admissions or all-cause deaths through time, it may be more informative to examine trends in the proportions of malaria deaths among all-cause deaths or to confine the analysis to the subset of health facilities that have reported consistently over time.

This indicator is also affected by the definition of malaria-attributable death followed by the health facility or practitioner. In highly endemic countries, infected children may die of other undiagnosed co-morbidities, and malaria is therefore reported as the cause of death. If this factor is consistent through time the bias introduced to this indicator may be minimal. However, changes in reporting practices or case definitions can substantially bias trends in malaria-attributable deaths over time.

« Monthly ratio of under-5 to over-five (u5/o5) uncomplicated confirmed cases in areas performing SMC

As an intervention aimed to clear malaria infections and protect children from new infections for a period of time, SMC is expected to have an impact on the number of incident uncomplicated malaria cases that would differ from the trends expected in the absence of the intervention. In the absence of comparison areas, the ratio of the number of cases observed in the targeted (under-fives, or under-tens) and the untargeted (over-fives or over-tens) SMC population within a given SMC district can be used to estimate the impact of SMC during the SMC intervention and non-intervention months.

The monthly ratio of targeted-to-untargeted uncomplicated cases in areas with constant and sustained malaria prevention measures targeted to the whole population are believed to be stable if no sudden age-specific changes in coverage of such interventions occur that may affect the vulnerability of specific age groups towards infections. Therefore, as an age-targeted intervention, the impact of SMC will be evident through the evaluation and comparison of the ratios of targeted-to-untargeted uncomplicated malaria cases between the SMC implementation and non-implementation months. During the months of SMC implementation, the ratio of targeted-to-untargeted cases is expected to decrease as a result of the reduction in the number of cases in the targeted group.

This indicator may be subject to potential changes in transmission associated to the implementation of SMC as a result of the sudden reduction of gametocytemia among children. As such, the number of cases in the untargeted group during SMC may also decrease, thus leading to less noticeable changes in the ratios between SMC implementation and non-implementation periods. Age-specific changes in care seeking behavior may also affect this indicator. As for uncomplicated malaria cases, this may be monitored by evaluating the age-specific trends in all-cause outpatients.

« Anemia-attributable hospitalizations in under-fives (under-ten where applicable) per 10,000 population per month in areas performing SMC

The reduction of the human parasite reservoir because of SMC is expected to lead to a reduction in the cases of severe anemia among children with otherwise long-term untreated infections. As such, the trends in the number of hospitalizations due to anemia among children under-five (under-ten) per 10,000 population may offer an additional source of information regarding the indirect impact of SMC in its target population. Unlike all other indicators, changes in this indicator may not be observed only during the SMC period, but also in between SMC implementations, given that severe malaria-attributable anemia may arise after the exposure to parasites for a longer period of time. Therefore, this indicator should be evaluated monthly throughout the year to observe the patterns of change and aggregated annually for the 12 months since the first SMC round, to observe changes as a result of the four SMCs.

This indicator may be affected by changes in the prevalence of other anemia-causing comorbidities, such as malnutrition, sickle-cell disease, or other neglected tropical diseases. To solve for this, in districts where health facility records consistently register the underlying cause of anemia, the non-malarial anemias can be excluded from this indicator. However, this should only be considered if such information is believed to be sufficiently reliable. Additionally, the diagnosis and treatment of anemia varies considerably within and between countries, affecting the robustness and reliability of this indicator to measure SMC impact. A retrospective evaluation of the hospitalizations due to anemia in any given area can provide more insight around the quality of this indicator.

The prevalence of anemia among children measured during household surveys may be used as a proxy instead. Prevalence estimates beyond the regional level (or lowest sampling unit of the survey), should be evaluated with caution due to the lack of power from the surveys to provide reliable estimates at this level. However, in countries where SMC may be performed more widely, survey estimates of anemia prevalence among children could be considered to evaluate the long-term impact of SMC on anemia in children. Specifically, results for indicators can be used to: engage with stakeholders involved in SMC planning and delivery; identify specific issues in SMC delivery and inform actions to rectify them; identify geographic areas where SMC delivery should be improved; and quantify the impact of SMC to support its continued implementation and for advocacy at the global level.

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Many factors influence the effectiveness of SMC, and the overall impact is the result of interaction of many of the factors shown in the diagram below. Several contextual factors essential for planning are listed in the box "environment" and are very relevant at subnational and community levels. These factors are not covered by the performance framework but are essential to inform the planning and management of SMC, particularly at subnational and community levels. These factors are always included in the activity reports.

All factors listed under readiness are monitored by multiple input and output indicators listed in the performance framework, while most factors listed under implementation are monitored by output and outcomes indicators. Some of those related to implementation, such as acceptability and adherence to medicines are monitored through household coverage surveys. Intervals between doses are monitored via outcome indicators and, like distribution modalities, are also monitored via activity reports.

The overall effectiveness of SMC is measured through the impact indicators included in the last section of the performance framework. Specific factors affecting performance of medicines, namely drug resistance and protective efficacy, are not covered in the present document as new WHO approaches are under development and will become available in 2022.

Readiness	Environment	Implementation	Medicines
• Target setting • Funding • Planning • Forecasting • Supply chain • Training • Sensitization	• Geography • Security • Start and end of rainy season • Health context (e.g. COVID) • Concomitant malaria interventions • Link to other health programs	• Acceptability (refusals) • Supervision • Adequate intake of medicine • Coverage of eligible children • Distribution modality (fixed post vs door to door) • Number of households per distributors	• Adherence • Drug resistance • Protective efficacy • Interval between doses

National level → **Sub-National level** → **Community level** → **Effectiveness**

DATA FEEDBACK LOOP

Timely, complete, accurate, data for planning, course correction
E.g. pop movement (denominator), EOD sitreps (rumors, incidents), distribution data, survey data, HMIS data (e.g. cases, hospital admissions), active test and treat where relevant

SMC
Alliance