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Using the role model approach to optimise caregiver administration of sulfadoxine-pyrimethamine amodiaquine to children aged 3–59 months in Burkina Faso, Chad and Togo: findings from an evaluation

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Abstract

Background Seasonal malaria chemoprevention (SMC) is a World Health Organization-recommended intervention for the prevention of malaria among children at high risk in areas with seasonal transmission. During the coronavirus disease 2019 (COVID-19) pandemic, SMC drug distribution was rapidly adapted to reduce contact and mitigate the risk of transmission between communities and community distributors, with caregivers administering doses. To address the challenges and find local solutions to improve administration and adherence, the role model approach was designed, implemented and evaluated in selected communities of Burkina Faso, Chad and Togo. This paper describes the results of this evaluation.

Methods Focus group discussions were held with primary caregivers in all three countries to understand their perceptions of the approach's acceptability and feasibility. In Burkina Faso and Togo, household surveys assessed the characteristics of caregivers reached by role model activities. Key indicators on SMC coverage and adherence allowed for an assessment of caregiver engagement outcomes related to participation in activities. Statistical associations between participation in study's activities and caregiver beliefs related to SMC had been tested.

Results The majority of caregivers believed the approach to have a positive effect on drug administration, with most adopting the promoted strategies. Greater involvement of fathers in drug administration and acknowledgement of their joint responsibility was a notable positive outcome. However, several barriers to participation were noted and there was criticism of the group approach. In Burkina Faso and Togo, end-of-round survey results revealed that 98.4% of respondents agreed the approach improved their knowledge and skills in malaria prevention, while 100% expressed a desire to continue practicing the behaviours learned. However, there was a relatively low

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level of awareness of the approach among communities. Participation was strongly associated with participants' self-reported belief in ease of remembering to administer, and ease of administering, SMC medicines.

Conclusion Caregivers perceived the role model approach to be beneficial in aiding drug administration, with other positive impacts also reported. Replication and scale-up should utilize the most popular communication channels and existing community structures to ensure activities are promoted effectively. A mixture of group and one-on-one approaches should be used where appropriate and feasible.

Keywords Seasonal malaria chemoprevention, Positive deviance, Caregivers, Drug administration, Role model, Children under five, Behavioural change, Social behavioural change communication, Covid-19

Background

Seasonal malaria chemoprevention (SMC) is a World Health Organization (WHO)-recommended intervention for the prevention of malaria among children at high risk of severe malaria in areas with seasonal transmission [1]. SMC was initially recommended for children aged 3–59 months in the Sahel, however recent updates to the 2012 WHO guidelines do not give geographical restrictions and allow for more flexibility in identifying children of age groups at-risk in areas of seasonal transmission to be targeted by SMC [2]. SMC consists of the monthly administration of the lantimalarials sulfadoxine–pyrimethamine (SP) and amodiaquine (AQ) during the peak malaria season, which are typically delivered door-to-door over a period of 3 days by trained community distributors. The malaria transmission season covered by SMC is referred to as an 'SMC round', consisting of 1-month cycles between each course of SPAQ. The number of cycles may vary by country, but in all areas included in the study analysis, there were four cycles in 2021. Before the COVID-19 pandemic, each month, one dose of SP and the first dose of AQ ('SPAQ') were administered under the supervision of the community distributor as directly observed treatment on day 1. However, in the majority of cases, the doses were administered by community distributor themselves. The remaining two doses of AQ were then administered by the child's caregiver over the following 2 days.

SMC is recommended in the Sahel region where malaria transmission is highly seasonal, with the majority of malarial disease and deaths among children under five occurring during and immediately after the rainy season [3]. Malaria Consortium has been a leading implementer of SMC since the WHO's endorsement and recommendation to scale-up the intervention in 2012, in partnership with National Malaria Control Programmes in implementing countries [4]. SMC implementation in Burkina Faso began in 2014, with approximately 1.9 million children under five reached across six regions in 2021 [5]. SMC was expanded to Chad in 2016 and in 2021, over one million children under five received SPAQ across 26 health districts. In 2020, Malaria Consortium initiated technical support for SMC distribution in Togo, with almost half a million eligible children reached [5].

During COVID-19 pandemic, SMC delivery was rapidly adapted to mitigate the risk of COVID-19 transmission between communities and community distributors during the distribution of SMC drugs [6]. Caregivers administered all three doses of SPAQ, with the first dose of SP and AQ administered under the supervision of a community distributor to reduce contact. While this approach had many advantages, such as building caregivers' capacity to administer the remaining doses of AQ, several challenges arose. A previous study conducted by Malaria Consortium in 2020 found that some caregivers refused to administer SMC medicines to their children or did not administer them correctly [7]. To address the challenges associated with, and find local existing solutions to, improve SPAQ administration within selected communities, the role model approach was designed, implemented and evaluated to optimize administration in Burkina Faso, Chad and Togo.

The role model approach builds on the 'positive deviance' concept and is a problem-solving approach to behaviour change. For this study, the term 'positive deviance' was substituted with 'role model' to avoid potential risks of negative connotations. The underlying principle of the approach is that solutions to public health challenges may exist within communities themselves [8]. Rather than focussing on behaviours that have a negative impact and attempting to 'fix' them, it promotes the amplification and adoption of behaviours with positive impacts. This relies on so-called 'role models'; individuals who exhibit uncommon but positive behaviours that protect them from certain health risks, despite sharing the same or even more limited resources, the same socioeconomic status, and common risk factors with their neighbours. The approach has shown to yield greater acceptance and engagement from community members compared with external interventions due to behaviours being context-specific and culturally appropriate, resulting in longer-term adoption [8, 9]. This paper describes the results of the evaluation of the role model approach, which was deployed within

selected communities of Burkina Faso, Chad and Togo, and outlines recommendations to inform the approach's scale-up and future sustainability.

Methods

Study design

This mixed-methods implementation study was conducted by Malaria Consortium in collaboration with the National Malaria Control Programmes (NMCPs) of Burkina Faso, Chad and Togo. The study comprised of two phases: a formative and evaluation phase, which are outlined in Fig. 2 and described in further detail below. However, this paper will focus on the results of the evaluation phase only.

Study setting and site selection

The study was conducted in Burkina Faso, Chad and Togo, where malaria is highly endemic. In each country, study areas were purposively selected based on criteria such as having a lower coverage of SPAQ compared to other districts in the country, and minimal security risk. Districts were selected in Chad (Bokoro district) and Togo (Blitta district) while in Burkina Faso, the commune (subdivision of a district) of Saponé was chosen. Within each area, one health centre was identified in consultation with health district officials, and the study was implemented in all the villages within the catchment area of that health centre. Villages were divided into three clusters based on their distance from the health facility as outlined in Fig. 1. Further details about each selected area and corresponding health centre can be found in Appendix 1.

Study population, sampling approach and sample size

Qualitative

In the formative phase, focus group discussions (FGDs) were conducted with caregivers (mothers and fathers) in selected communities of each country. These aimed to explore caregivers' knowledge, beliefs and perceptions of SMC and reported practices and normative behaviours around SPAQ administration. From these FGDs, potential 'role models' exhibiting positive SPAQ administration strategies were identified. The FGD facilitators identified the role models based on the uncommon and unique behaviors shared during the discussions. Selection was based purely on practicing an uncommon, positive behaviour that facilitated SPAQ administration, with no consideration of ethnicity, religion, age and gender. Therefore, selected role models represented different segments of the community.

These potential 'role models' were then invited to participate in separate interviews to further explore their positive behaviours and gain an in-depth understanding of their SMC administration strategies.

The local and accessible strategies exhibited by selected role models were used to inform the development of a context-specific behaviour change communication strategy in each country (the intervention).

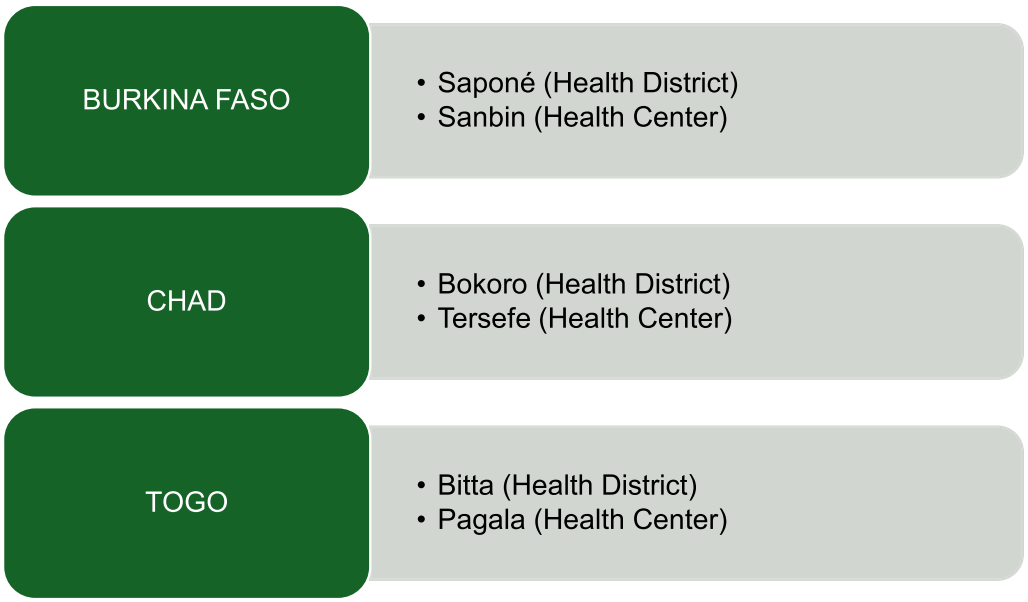

Fig. 1 Selection of health districts and health centres

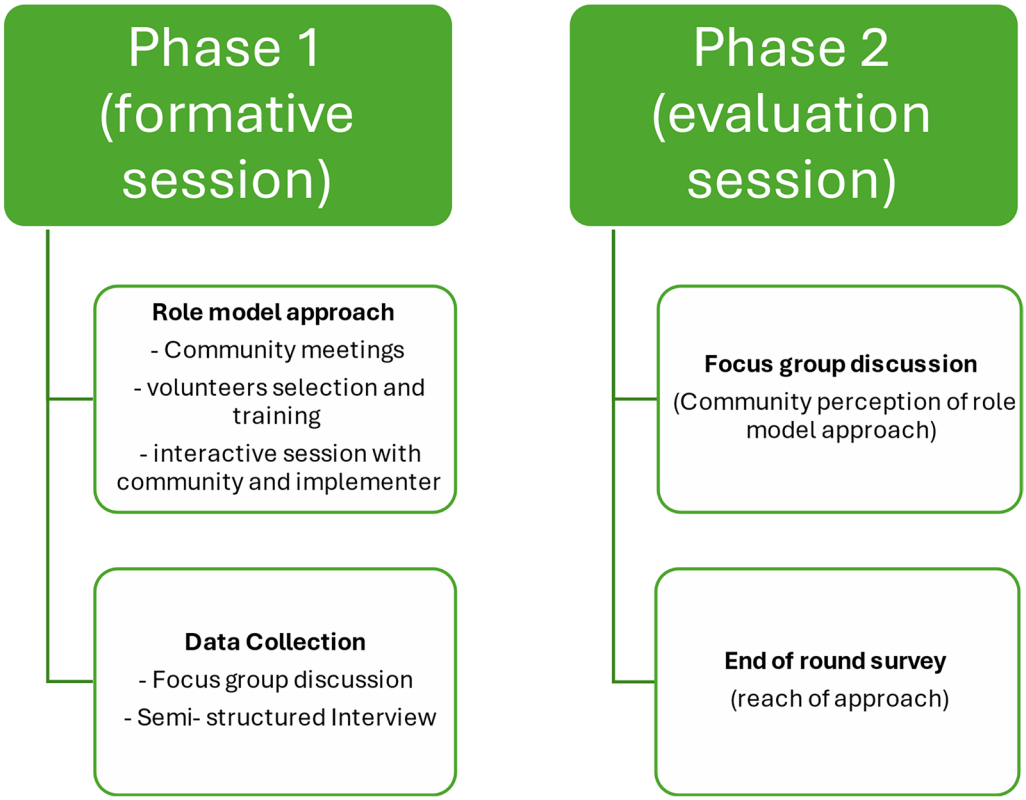

Fig. 2 Role model study phases and steps

Role model approach

In each country, the intervention consisted of at least two community role model sessions held within each cluster per month, led by the selected role models themselves and caregiver volunteers who were trained in key competencies such as interpersonal communication and facilitation skills. The main objective of these sessions was to promote and reinforce the positive behaviours identified during the formative phase, so these successful administration strategies could be shared with other community members. Participatory techniques such as brainstorming, group discussions, role plays and conceptual games were used to make the sessions both interactive and informative. Monthly meetings involving the volunteers were held to discuss progress, achievements and challenges so modifications could be made if necessary. These took place at health centres to engage local health staff for ownership of the approach. The intervention was implemented within the same communities for a period of 6 months.

At the end of the 6-month period, handover seminars were held in each cluster to celebrate achievements and reinforce key messages and role model behaviours with the wider community. The project was symbolically handed over to the communities, making them accountable for continuation and sustainability. In Burkina Faso, one community handover seminar was conducted per cluster (55 attendees in total). In Chad, three community handover seminars were conducted per cluster (789 attendees in total). In Togo, 3 community handovers were conducted per cluster (133 attendees in total). Size of community handover seminars varied quite significantly by country based on the number of community members that could be reached at the time and other logistical considerations, such as Covid-19 situation and guidelines in each country.

In the evaluation phase that aimed to assess the feasibility, acceptability and coverage of the intervention, FGDs were conducted with primary caregivers within each cluster who had at least one child eligible to receive SPAQ. Purposive sampling was used to select the FGD participants and the number of FGDs was decided with the aim of reaching data saturation. All respondents had participated in the formative phase of the study and were selected based on being legally classified as an adult (over 18 years-of-age in Chad and Togo and 20-years-of-age in Burkina Faso), a resident of the selected communities, able to provide informed consent and having a child that has previously received SMC. Those who had signs and symptoms suggestive of COVID-19 or lacked the capacity to provide informed consent were not considered for

selection. Steps in the formative and evaluation phases are outlined in Fig. 2 and the number of evaluative FGDs per cluster are outlined in Table 1.

Quantitative

In the evaluation phase, the representative End of Round survey (EoR), designed specifically for this study, took place in Burkina Faso and Togo. Sample sizes were selected to allow estimation of coverage of Day 1 SPAQ among eligible children within a 95% margin of error of 2.5% based on assumptions of 90% coverage and after correction for finite population based on population estimates of the study areas. In Burkina Faso, where the study was also intended to assess coverage and quality of SMC delivery, the total target sample size was 475, and all 19 communities of the commune of Ipelcé were included with 25 households sampled in each, including in the four communities where role model activities took place during 2021: two in Sanbin, one in Sagabtinga-Yarcé and one in Bandéba. As the sample size of each community in Burkina Faso was not proportional to population size (and the sample could therefore not be considered self-weighting), post-hoc survey weights were generated and applied such that results could be representative of the areas targeted by the role model intervention for the purposes of the descriptive analysis.

In Togo, the EoR survey was conducted in three communities in Blitta prefecture where role model activities took place during 2021: Pagala-Gare Centre, Pagala-Lassa and Tantakoté. The target sample size was 360, and the survey was designed to be self-weighting with numbers of households sampled per community proportional to its population size.

In both countries, households were selected at random in each community from household lists. Only households with at least one child aged 3–59 months were eligible for inclusion. The survey could not be conducted in Chad due to logistical challenges.

Data collection

Qualitative

Qualitative data were collected through FGDs with caregivers of children aged 3–59 months. Each FGD was composed of 6–8 participants and were homogenized by gender to encourage healthy discussion and minimize inhibitions.

Prior to each FGD, participants were given an information sheet and consent form to read, including information on the withdrawal of consent at any point, and given contact details of the Study Coordinator. Participants were allowed up to an hour to confirm their participation and were guided through the information sheet provided to assist their decision. Participants gave consent to participate by signing an informed consent form or marking their digital fingerprint if unable to write. During the End of Round surveys, participants also had time to read the inform consent form and ask any questions on the study before giving their approval to participate to the study.

To ensure participant confidentiality and data authenticity, audio files and transcriptions of FGDs were kept in secure, password protected laptops and then stored in online folders accessible only to Malaria Consortium project staff and other key researchers involved in this study. Subject identifiers were not utilized on data forms or during FGDs; instead, a unique identification code was used to anonymize subject data (e.g. 1001).

Quantitative

EoR household surveys were conducted using the application SurveyCTO to gather data on characteristics of caregivers targeted and reached by role model activities. Key indicators on SMC coverage and adherence allowed for an assessment of caregiver outcomes related to participation in role model activities. Questions related to one eligible child aged 3–59 months per household selected at random from a household roster by SurveyCTO, their primary caregiver and their household. Interviews were conducted in local languages using questionnaires in French provided by Malaria Consortium, with data collectors translating from French and assigning responses to predefined answer categories. Questionnaires were pretested before data collection and the translations in local language had been discuss and validated by research team and data collectors.

Data were collected on a range of variables including SMC indicators specific to cycle four 2021 (coverage of eligible children aged 3–59 months) and adherence to administration of AQ on days 2 and day 3 among caregivers of eligible children who had received day 1 SPAQ. Variables also included awareness of and participation in role model activities, caregiver engagement outcomes (including attitudes to AQ administration in both countries and self-reported improvement in knowledge and intention to practice model behaviours in Togo only), caregiver use of food and/or drink in SMC administration (cycle 4 2021) and individual-level caregiver characteristics. The full list of variables is presented in Table 1 (Appendix 3). Household socioeconomic status was assessed using country-specific Simple Poverty Scorecards [10, 11].

Data analysis

Qualitative

For the FGD data, manual line-by-line coding was used to extract preliminary codes and themes, and a thematic

Table 1 Sample characteristics and role model outcomes among sampled children, caregivers and households in Blitta prefecture, Togo, and Ipelcé commune, Burkina Faso

	Variable	Category	Togo		Burkina faso			Total	
			n	%	n	%	weighted %	n	%
Community	Pagala-Gare_Centre		249	69.8				249	50.8
	Pagala-Lassa		77	21.6				77	15.7
	Tantakoté		31	8.7				31	6.3
	Sambin (division C14)				39	29.3		39	8.0
	Sambin (division C15)				40	30.1		40	8.2
	Sagabtinga-Yarcé				25	18.8		25	5.1
	Bandéba				29	21.8		29	5.9
SMC indicators (cycle 4 2021)	Child received day 1 SPAQ	Yes	322	90.2	129	97.0	96.9	451	92.0
		No	35	9.8	4	3.0	3.1	39	8.0
	Caregiver adhered to administration of AQ on day 2 and day 3	Yes	312	98.1	125	97.7	97.4	437	100.0
		No	6	1.9	3	2.3	2.6	9	2.0
Role model variables	Heard of role model approach*	Yes	90	25.2					
		No	267	74.8					
	Source of information about role model approach*	Local political leader	9	3.4	8	11.1	9.2	17	7.6
		Local religious leader	0	0.0	6	8.3	7.3	6	2.7
		Health facility personnel	9	3.4	28	38.9	39.8	37	16.5
		Community health worker/ SMC distributor	47	17.5	29	40.3	40.6	76	33.9
		Radio	1	0.4	5	6.9	6.4	6	2.7
		Printed materials or banners	0	0.0	0	0.0	0.0	0	0.0
		Television	0	0.0	0	0.0	0.0	0	0.0
		Town announcer	30	11.2	5	6.9	6.5	35	15.6
		Word-of-mouth	9	3.4	33	45.8	48.7	42	18.8
		Other	2	0.7	3	4.2	4.6	5	2.2
	Participated in role model activity	Yes	66	18.5	72	54.1	55.9	138	28.2
		No	291	81.5	61	45.9	44.1	352	71.8
	Activities participated in**	Community orientation meeting	23	30.7	9	12.5	11.3	32	33.3
		Group discussion	46	61.3	60	83.3	85.8	106	110.4
		Talk/presentation	2	2.7	13	18.1	18.5	15	15.6
		Training session	0	0.0	2	2.8	2.5	2	2.1
		One-on-one session at health facility	3	4.0	3	4.2	3.9	6	6.3
		Other	1	1.3	4	5.6	4.4	5	5.2

Table 1 (continued)

	Variable	Category	Togo		Burkina faso			Total	
			n	%	n	%	weighted %	n	%
Caregiver engagement outcomes	"It is easy to remember to administer the second and third SMC doses (day 2 and day 3)"	Strongly agree	68	20.1	62	47.0	46.2	130	27.6
		Agree	234	69.0	65	49.2	50.0	299	63.5
		Neither agree nor disagree	19	5.6	1	0.8	0.5	20	4.2
		Disagree	18	5.3	4	3.0	3.3	22	4.7
		Strongly disagree	0	0.0	0	0.0	0.0	0	0.0
	"I believe it is (or would be) easy to administer the second and third SMC doses (day 2 and day 3) to my children aged under five years"	Strongly agree	81	23.9	61	46.2	45.9	142	30.1
		Agree	216	63.7	63	47.7	48.0	279	59.2
		Neither agree nor disagree	21	6.2	3	2.3	2.2	24	5.1
		Disagree	20	5.9	4	3.0	3.3	24	5.1
		Strongly disagree	1	0.3	1	0.8	0.5	2	0.4
	"The project has improved my knowledge and skills in malaria prevention and administration of SPAQ"	Strongly agree	19	29.7	–	–	–	19	29.7
		Agree	44	68.8	–	–	–	44	68.8
		Neither agree nor disagree	1	1.6	–	–	–	1	1.6
		Disagree	0	0.0	–	–	–	0	0.0
		Strongly disagree	0	0.0	–	–	–	0	0.0
	"I would like to practice the model behaviours for administration of SPAQ that I learned from this project during upcoming [SMC] campaigns"	Strongly agree	15	23.4	–	–	–	15	23.4
		Agree	49	76.6	–	–	–	49	76.6
		Neither agree nor disagree	0	0.0	–	–	–	0	0.0
		Disagree	0	0.0	–	–	–	0	0.0
		Strongly disagree	0	0.0	–	–	–	0	0.0
Caregiver use of food/ drink in SMC administration (cycle 4 2021)	Use of food (day 1 SPAQ administration)***	Yes	11	3.4	28	21.9	21.9	39	8.7
		No	309	96.6	100	78.1	78.1	409	91.3
	Use of food (day 2 and/or day 3 AQ administration)***	Yes	14	4.4	32	25.0	25.0	46	10.3
		No	304	95.6	96	75.0	75.0	400	89.7
	Use of drink (day 1 SPAQ administration)***	Yes	147	45.7	26	20.2	20.6	173	38.4
		No	175	54.3	103	79.8	79.4	278	61.6
	Use of drink (day 2 and/or day 3 AQ administration)***	Yes	148	46.4	26	20.3	21.2	174	38.9
		No	171	53.6	102	79.7	78.8	273	61.1

Table 1 (continued)

	Variable	Category	Togo		Burkina faso			Total	
			n	%	n	%	weighted %	n	%
Caregiver characteristics	Sex	Female	335	93.8	125	94.0	93.6	460	93.9
		Male	22	6.2	8	6.0	6.4	30	6.1
	Marital status	In a marriage or partnership	322	90.2	124	93.2	93.6	446	91.0
		Not in a marriage or partnership	35	9.8	9	6.8	6.4	44	9.0
	Self-reported literacy	No	89	24.9	66	49.6	50.1	155	31.6
		Yes	268	75.1	67	50.4	48.9	335	68.4
	Employment status	Employed****	264	73.9	50	37.6	65.1	314	64.1
		Not working	93	26.1	83	62.4	34.9	176	35.9
	Household poverty status (> 50% probability household is below poverty threshold of $1.90/day (2011 PPP), 2015 definition	Yes	209	58.5	64	48.1	51.4	273	55.7
		No	148	41.5	69	51.9	48.6	217	44.3
Interview characteristics	Interview language	French	142	39.8	6	4.5	3.5	148	30.2
		Local majority language*****	147	41.2	125	94.0	94.8	272	55.5
		Minority language	68	19.0	2	1.5	1.7	70	14.3

*The question on whether caregivers had heard of the role model approach was not included in the Burkina Faso survey but subsequently included in the Togo survey

**Non-exclusive response categories: respondents could list more than one information source or activity

***Responses of "don't know" or "don't remember" were considered missing and excluded from the analysis

****Including unremunerated employment (e.g. farmers working their own land as a sole income source)

*****Majority languages in the areas studied were Éwé in Togo and Mooré in Burkina Faso

analysis using a mixed deductive-inductive approach was conducted [12]. Transcripts were read to generate a coding list for each country dataset, which was then applied to all transcripts. Codes were then collated and categorized into emerging themes observed across all three countries, which were reviewed discussed by the full team before final consolidation. Relevant verbatim quotes had been used to highlight qualitative result.

Quantitative

First, analytic sample had been described by the variables mentioned above. Analyses were then performed for the combined sample of caregivers from Burkina Faso and Togo. EoR data were used to perform univariate and multivariate logistic regression models to assess the association between caregiver and interview characteristics and participation in a role model activity. Caregiver and interview characteristics included in the univariate and final multivariate models included caregiver's sex (female/male), marital status (in a marriage or partnership/not in a marriage or partnership), self-reported literacy (yes/no, defined as ability to read and write a simple sentence related to daily life), employment status (employed/not working), household poverty status (< 50%/ > 50% probability of household being below a poverty threshold of $1.90/day), and interview language (French/local majority language/minority language). Strength of association was assessed using odds ratios (OR) with 95% confidence intervals (95% CI), and significance of associations was assessed with p-values.

For those caregivers who had participated in a role model activity, additional questions including the activity/activities participated in and sources of information on the approach were also asked, and caregiver engagement outcomes (operationalized as five-point Likert scale variables) representing caregivers' degree of agreement to statements: strongly agree, agree, neither agree nor disagree, disagree, strongly disagree) were explored. The associations between participation in role model activities and respondents' levels of agreement with

Fig. 3 Pictorial messages used by community volunteers in Togo to promote role model behaviours during the 2022 SMC campaign: presence of both mothers and fathers during SMC administration (left), keeping drugs visible and out of reach of children (right). In Burkina Faso, two posters were created following a workshop with stakeholders on the study results. A pre-test of these took place in a health facility among community distributors, caregivers and health workers. This allowed them to match pictures with the relevant messages for promoting two role model behaviors: flattering children with treats prior to SPAQ administration (Fig. 4) and the role of family members in reminding caregivers to administer SPAQ (Fig. 5)

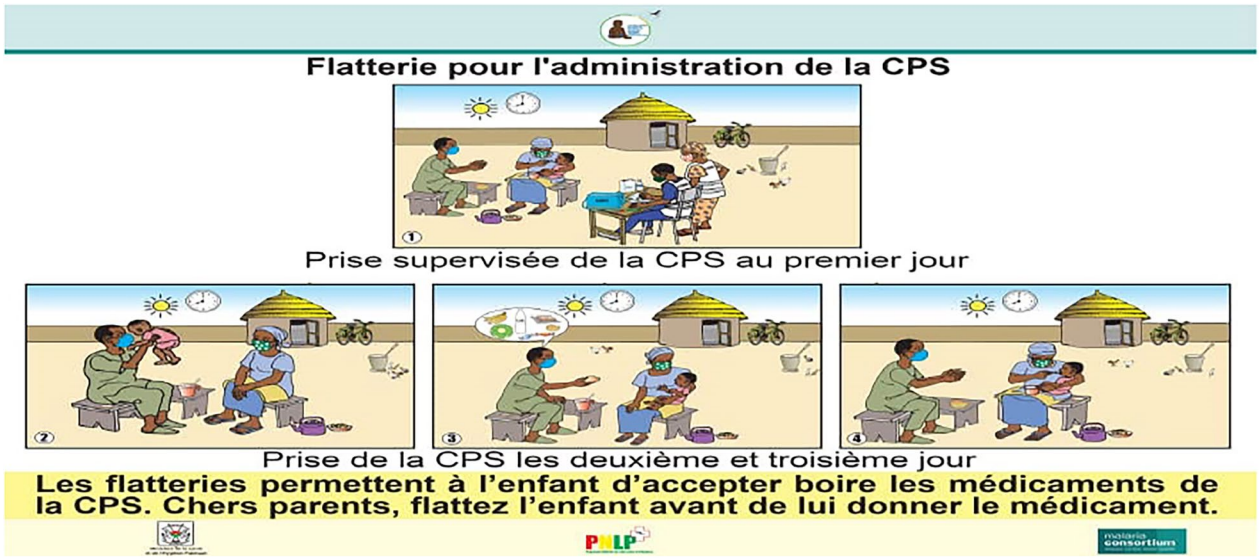

Fig. 4 Poster illustrating the use of treats to flatter children prior to SPAQ administration

the statements on perceived ease of remembering and administering AQ using Mann–Whitney U tests, due to the continuous but non-normal distribution of the outcome variables. Associations between caregiver participation in role model activities, and adherence to day 2 and day 3 AQ administration, and administration of day 1 SPAQ and day 2 or day 3 AQ with food and drink were assessed using chi-square tests with strength of association expressed using exact odds ratios. All data management and analyses were performed in Stata 17. Associations with p-values of < 0.005 were considered statistically significant.

Results

Qualitative

Based on the results of the formative phase, key role model behaviours for each country were consolidated, being deemed accessible, culturally appropriate

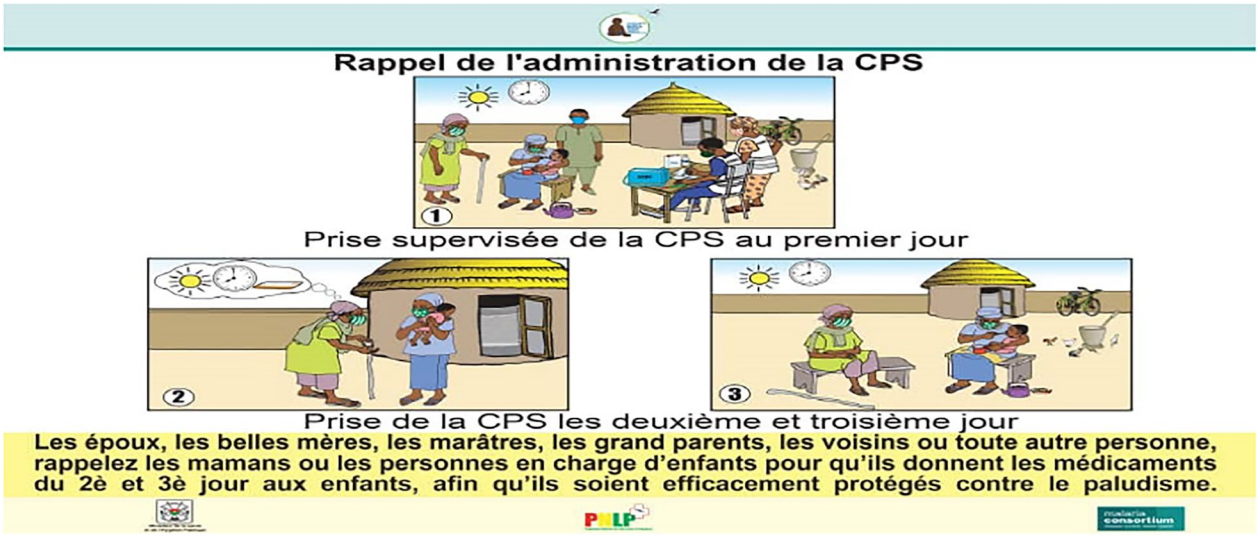

Fig. 5 Poster illustrating the role of family members in reminding caregivers to administer SPAQ. To evaluate the promotion of role model behaviours during the 2022 SMC campaign, routine surveys were adapted in each country. In Burkina Faso, an end-of-cycle and EoR survey was created for the area of Ipelce including questions on the role model approach during November and December 2022. In Chad, questions on role model behaviours were added to routine end-of-cycle surveys after SMC cycle 2 and to routine EoR surveys, acting respectively as baseline and endline surveys. In Togo, questions related to role model messaging were also included in the routine SMC coverage surveys

strategies to successfully facilitate SPAQ administration. Behaviours were promoted through the volunteer sessions within each community and are listed in Table 3 (Appendix 3). Several themes emerged from the evaluative FGDs, encompassing various sub-themes: (i) positive outcomes of the role model approach, (ii) participation and information-sharing, (iii) perceptions of activities and (iv) participant recommendations.

Positive outcomes of the role model approach

Practice of promoted behaviours

Male and female caregivers recounted the various new strategies learnt to successfully administer SPAQ, including dissolving the tablet in water first. Although hiding the tablet in food or drink prior to administration *"so that the child does not notice it"* was mentioned across all countries, this was most prominent in Burkina Faso, where "sagabo" (white porridge) and sauce, milk, juice and tea were used. In all countries, this was considered a successful strategy as many caregivers reported that their child vomits when ingesting SPAQ alone. However, it is not clear whether this is an adverse reaction to SPAQ itself or whether children are simply gagging on the drug.

In Togo, the most adopted new method was first incentivizing and "*flattering*" the child with their favourite food, gifts, money and candy. Some caregivers believed that promising the child candy was considered an easy, cheap method, while others who did not have enough money pretended the tablet itself was candy or used gentle persuasion tactics. Another strategy mentioned across all countries was gently *"coaxing"*, *"cajoling"* and *"consoling"* the child by cuddling them, making them smile and laugh, and by singing and dancing.

> *"You can take him and deceive him if you sing and you dance for him" (Mother, cluster 1, Togo)*

Realization of negative behaviours

Besides learning and adopting new strategies to aid SPAQ administration, perhaps one of the most pertinent outcomes of the activities was the realization of negative behaviours by many caregivers, particularly with regard to *"purging"* (injecting) the medicine and the use of force. This was evident among both male and female caregivers in rural and peri- urban areas, particularly in Burkina Faso and Togo. Caregivers described how in the past, children who refused SPAQ would have their nostrils pinched or cheeks pressed and be forced to swallow the drug or have the drug injected with a syringe anally.

However, there was a widespread understanding of the negative impacts of this, including that *"this brings other complications"*. There was widespread gratitude towards the role model volunteers for highlighting this, with a mother in Togo expressing how *"our way of seeing things changed… we handle our children gently without abusing them as before"*.

"You said that you should no longer purge[inject] the children because this product is not for purging[injecting], that you should no longer pinch the children's cheeks."
(Mother, cluster 2, Burkina Faso)

Improvements in malaria prevention and control practices

In addition to improvements in SPAQ administration, there were widespread improvements in caregivers' knowledge and practice of malaria prevention and control strategies, despite not being the main focus of role model activities. This was apparent in all three countries among both mothers and fathers in all areas. Strategies included sleeping under a mosquito net, clearing sewage water and wearing long-sleeved clothing. For one father in Burkina Faso, the role model activities led to the realization that head of household must help women to protect their children against mosquito bites.

"During the exchanges we knew that if we do not protect the children from the mosquito nets and let them go outside while we ourselves are under the mosquito net, when there is a problem, it is we who are responsible. Third, often when the women receive the mosquito nets from the health centre, and can drop them off without tying them, thanks to your activities, even if the woman does not tie the mosquito net, you the head of the family will be obliged to tie it so that they sleep inside, because if there's a problem, it's up to you. It was the exchanges that made us realize that even if the woman does not tie the mosquito net, you the man can do it "(Father, cluster 2, Burkina Faso)
"They taught us that in order to fight malaria, we have to clean around the house and disinfect it every time and in the rainy season there are more mosquitoes." (Father, cluster 1, Togo)

Participation and information-sharing

Ease of participation

The majority of caregivers expressed no difficulties in FGD participation and believed this to be equal within their community, with no members being marginalized. Caregivers believed activities were held at safe, neutral, accessible and private locations. In Togo, caregivers mentioned how holding activities at the Chief's house was very effective as *"when the Chief himself invites his people everyone pays attention"*. Community members were also consulted on the best time to hold the activities and given adequate notice of the schedule.

The role model approach appeared to be well-promoted within communities and, according to one father in Burkina Faso.

"There is no one who can say that he is not informed of the activities (…) We have been informed that you will be coming to discuss with us as part of SMC, this is what I know of what we have had new". (Mother, Cluster 2, Burkina Faso)

Many caregivers believed that even for those who did not partake, the information still reached them due to the culture of informing others within the community and relaying messages. Some caregivers felt as though they were representatives of the community and believed it was their *"duty"* to share knowledge with fellow community members.

"All the seven quarters have their relatives here, at the women's level I can't know, but at the men's level, all the seven quarters are represented here." (Father, cluster 2, Burkina Faso)

Barriers to participation

A small proportion of caregivers experienced barriers to participation, particularly in Burkina Faso. For one father, the activities coincided with a busy period at work while others were unaware of the schedule. This complements the quantitative finding that employed caregivers were less likely to participate, as described in the quantitative results below. This was also the case in Chad, where several caregivers were not aware of activities. Other caregivers cited the rainy season as a barrier and the difficulty in bringing everyone from the village together. In Togo, only fathers from cluster 3 (the furthest from the health facility) experienced challenges, namely the distance of the activities from their village and the clash with work in the fields.

"The place is accessible we are welcome there but those who do not want to come it
Is because of the distance." (Father, cluster 3, Togo).

Participation and involvement of fathers

The involvement of fathers reported here is two-fold: participation in the role model activities and involvement in SPAQ administration. Regarding participation, both mothers and fathers in Burkina Faso perceived fathers to have participated fully and equally. According to some mothers, the presence of men did not influence the behaviour of women as *"it was to make things easier"* and both share the same interest; their child's health. Several fathers highly valued the exchange with women as traditionally, information would be shared *"with women without exchanging with men"*.

"I don't think the presence of the men interfered with the speaking because it was to make things easier so I don't think that influenced the intervention" (Mother, Cluster 1, Burkina Faso)

Regarding fathers' involvement in SPAQ administration, one father in Burkina Faso was particularly appreciative of the approach and expressed how before, *"it is the mothers of the children who have this information"* but since, there is an awareness of the father's responsibility. Several mothers described how there is now better conflict resolution with the husband, with fathers now playing an active role and reminding mothers of the schedule. On the other hand, one mother in Burkina Faso believed *"not associating with men is a good thing"* due to differing opinions. The involvement of fathers was particularly prevalent in Togo, with mothers and fathers describing working together to administer SPAQ as per the new strategies.

"On the day of the meeting, the husband himself asks you, is it not time for the meeting? He is more concerned than you yourself the wife." (Mother, cluster 1, Burkina Faso)

Perceptions of activities

Criticisms of the approach

Criticism was particularly apparent among male caregivers in Togo which mainly related to the group approach. Several caregivers felt they would understand information better through a door-to-door strategy and that the likelihood of participation would be much higher. Others mentioned the increased risk of COVID-19 transmission when in a group setting and feeling more comfortable to ask questions with the community distributor alone as in a group. In Chad, there were no critiques of the approach while in Burkina Faso, only fathers expressed criticism, mainly related to the need to involve more community members.

"The error at this level is that the number of participants is not enough." (Father, cluster 2, Burkina Faso).

Participant recommendations

Across all three countries, the most common recommendation for the approach was to involve more community members in the activities. Caregivers also wanted the approach to be expanded to other areas within the country, so they too can *"adopt these tips and reap its benefits"*. However, one mother in Burkina Faso highlighted that different engagement and SPAQ delivery strategies may be needed in other villages. Other recommendations included giving more notice of the activity schedule and conducting activities during the dry season when people are less busy.

"This way is good, as not everyone can come to assist us also when we go back we will exchange with our entourage, but soon it is better to inform at least 3 days in advance otherwise when we tell you that, the day before it finds that you have something to do it can be a little difficult" (Mother, Cluster 1, Burkina Faso)

"It was an appropriate time, but if you can do it in the dry season as well, i.e., right now until the start of the rainy season, that will be fine too, because in those times we have enough time. When it's right now until the beginning of winter, even if you want a hundred people, it's possible to have them because people are available at these times. The timing of your activities was when really, we were quite busy. In these times, apart from those who are understanding, it is difficult to leave your work and come and have discussions. (Father, cluster 2, Burkina Faso)

"Tell them to continue with the good practices: nets for the whole family, health centre visits for pregnant women." (Mother, cluster 1, Chad)

Quantitative

SMC indicators and role model activities

Table 1 shows the descriptive analysis of survey data from Burkina Faso and Togo. Results for Burkina Faso are shown with and without application of post-hoc survey weights. Descriptive analysis of SMC indicators from cycle 4 2021 in Togo showed that 90.2% (95% CI 86.6–92.9) of eligible children received day 1 SPAQ and, of those, 98.1% (95% CI 95.9–99.2) received doses of AQ on both day 2 and day 3 from their caregiver. The weighted results for Burkina Faso for these indicators in the four communities with role model activities were 96.9% (95% CI 91.8–98.9) and 97.1% (95% CI 92.1–99.2), respectively. In Togo, 25.2% of respondents reported awareness of the role model approach and 18.5% reported participation in activities; in Burkina Faso 55.9% of respondents reported participating in a role model activity. In both countries, the most commonly mentioned information source on the role model approach was community health workers or SMC drug distributors.

Regarding caregiver characteristics in both countries, over 90% of those responding to the survey were women, and in a marriage or partnership. The majority of caregivers were in employment and around half were considered to be at a > 50% probability of living in a household with an income below a poverty threshold of 1.90 purchasing power parity-adjusted 2011 US Dollars per day.

Over 85% of caregivers in both countries expressed agreement with statements that it is both easy to remember to administer, and administer, AQ on day 2 and day 3.

Of 72 respondents who participated in a role model activity and responded to the additional questions, all but one (98.4%) agreed that the project had improved their knowledge and skills in malaria prevention, while all respondents expressed a desire to practice the model behaviours they had learned during the activities for administration of SPAQ.

In Togo, less than 5% of caregivers reported administering day 1 SPAQ, or either day 2 or day 3 AQ, with food in cycle 4 of 2021, while just under half reported administering SMC drugs with drinks. In Burkina Faso, around one fifth administered day 1 SPAQ, or either day 2 or day 3 AQ, with food or drink.

Role model activities and caregiver beliefs

The results of the logistic regression analysis for associations between caregiver and interview characteristics, and participation in role model activities, are shown in Table 4. The results of the multivariable model showed that being in a marriage or partnership (OR: 2.35, 95% CI 1.00–5.51, p = 0.049) was positively and significantly associated with participation in role model activities. Meanwhile, employed caregivers (OR: 0.60, 95% CI 0.38–0.93, p = 0.023), and those using a minority language (versus French) were less likely to have participated in role model activities after mutual covariate adjustment (OR: 0.24, 95% CI 0.09–0.64, p = 0.005). T there was no statistically significant difference in participation between those using the majority language versus French (OR: 1.42, 95% CI 0.88–2.28, p = 0.154). There was no independent statistically significant association between caregiver sex, self-reported literacy, and household poverty status, and participation in role model activities.

Our analysis of outcomes of participation showed that while participation in role model activities was not associated with caregiver adherence to day 2 and day 3 AQ administration ($\chi^2 = 0.2$, df = 1, p = 0.644), the results of the Mann–Whitney U tests found that participation was strongly associated with participants' self-reported belief in ease of remembering to administer day 2 and day 3 AQ doses ($z = -3.97$, $p < 0.001$) and ease of administration of day 2 and day 3 AQ doses ($z = -3.92$, $p < 0.001$).

Results of chi-square tests showed that participation in role model activities was associated with administration of SPAQ with food on day 1 (exact OR: 3.21, 95% CI 1.56–6.40; $\chi^2 = 12.8$, $p < 0.001$) and on day 2 or day 3 (exact OR: 2.99, 95% CI 1.53–5.83; $\chi^2 = 12.9$, $p < 0.001$). However, there was no significant association between participation and administration of day 1 SPAQ with drink ($\chi^2 = 0.6$, df = 1, p = 0.439) or day 2 or day 3 AQ ($\chi^2 = 0.4$, df = 1, p = 0.524).

Discussion

This pilot evaluation assessed the feasibility, acceptability and coverage of the role model approach, which was implemented within selected communities of Burkina Faso, Chad and Togo for 6 months. Participant sociodemographic characteristics and caregiver engagement outcome data were also explored through end-of-round surveys. The community-driven approach was adopted to address the challenges associated with and improve SPAQ administration with locally existing solutions through the identification of 'role models' [8].

Quantitative results demonstrate that adherence to day 2 and day 3 AQ administration was already high within selected communities but participating in role model activities increased self-reported administration of AQ, particularly among those who spoke the majority language. Language is widely documented as a common barrier to participation and inclusion among linguistically diverse communities, including in a recent study on community engagement for malaria elimination in the Greater Mekong Sub-region [13]. This highlights the need for strategies that ensure these groups are identified and not excluded from future activities, such as actively recruiting volunteers who can communicate in minority languages to act as translators or role models. In addition, nonverbal forms of communication such as pictorial tools, conceptual games and role play may be utilized more, which may also yield greater engagement from participants with low literacy levels [14, 15]. Pictorial messages have been used in Togo (Fig. 3) and in Burkina Faso (Fig. 4 and Fig. 5) by volunteers and SMC community distibutors. Working caregivers were less likely to attend sessions, as highlighted by both the quantitative and qualitative results. Should the role model approach be replicated elsewhere, activities must be optimized to fit around work schedules as much as possible.

There was no statistically significant association between participation in activities and complete AQ administration; however, this may have been due to a lack of statistical power to detect an association given the already high adherence in the areas surveyed.

In the FGDs, a practice reported consistently across all three countries was mixing SPAQ with local food or beverages prior to administration to hide the bitter taste of the drug. Guidelines state that SPAQ must be taken after food and dissolved in a small amount of water. Evidence remains limited, however, on the combination of SP and AQ and their interaction with various types of foods. Studies on AQ suggest that intake of AQ with a high fat meal may affect safety and tolerability and is not advised [16, 17]. To avoid unclear messaging for caregivers, mixing SPAQ with food and drinks was not promoted as a role model behaviour.

A salient finding from the FGDs was the widespread identification and understanding of previously practiced forceful behaviours, with many caregivers now resorting to more gentle administration tactics. The use of force when administering drugs to children has been documented in other studies, and future SMC campaigns should discourage use of force, threats and violence during community engagement activities and between each SMC cycle [18]. Another promising outcome of the approach was the shift in social norms and increased involvement of fathers in administration and their child's health as previously, this was typically the mother's responsibility. This held particularly true in Togo as male and female caregivers described working together to administer SPAQ and expressing gratitude for male involvement. Another recent study conducted in rural Kenya describes the positive impacts of fathers' support to the mother in matters related to children's health through providing interpersonal support or sharing decision-making duties [19]. This shift in social norms is particularly positive in not only reducing the burden on the mother to administer SPAQ, but also in facilitating more dialogue between fathers and mothers and better conflict resolution as reported by caregivers of both sexes in this study.

However, several caregivers highlighted challenges with the approach, including that more community members should have been involved to ensure representation from all neighbourhoods. Quantitative results also demonstrate a fairly low coverage of the approach. In Burkina Faso, 55.9% of caregivers having participated in a role model activity and 26.67% of mothers interviewed have participated to at least one activity of the study in Togo. This suggests there may be a need for more popular interpersonal communication channels to be utilized (e.g. town criers or community leaders/influential figures) to facilitate greater awareness and participation. Caregivers in Togo also critiqued the use of group discussions, with a preference for a door-to-door approach. Group dynamics as a barrier to open dialogue surrounding health topics has been described elsewhere in the literature [20].

Nevertheless, the majority of caregivers pledged to continue to implement the identified behaviours and disseminate knowledge within their communities. This is confirmed by the quantitative results which show a significant proportion of caregivers intend to continue to apply lessons learned. In the future, role model awareness sessions could be combined with individual house-to-house visits for those who cannot participate due to their work schedule, language or geographical barriers.

The results of the formative and evaluation phases were used to develop tailored recommendations for each country which were integrated into their respective 2022 SMC campaigns (details can be found in Appendix 2).

Limitations

It is worth noting that the EoR survey relied on retrospective self-reporting a few months after cycle 4 was delivered, potentially resulting in recall bias. Social desirability bias may also have arisen during FGDs evaluating the role model approach. Furthermore, it is not possible to determine causation between the role model activities and outcomes, such as whether a child received day 1 SPAQ. Mistranslation may have also occurred in interpreting survey questions from French to local languages, potentially influencing participant responses.

The strength of the role model approach lies in the promotion of positive behaviours from within communities themselves, recognizing that communities own rich knowledge and set positive examples. However, a potential limitation of the approach is understating the great diversity that communities can exhibit, whereby selecting role models can disregard inequalities that are present. Inequalities may be reinforced by role models setting unachievable goals for marginalized or vulnerable community members; this may affect the generalisability of findings to other SMC settings. Studies should consider representative and purposive sampling and recruitment of community participants, such as the inclusion of working caregivers by conducting activities at catered times, while ensuring that role model behaviours identified do not reinforce already existing inequalities in access or marginalization. Throughout this study, similarities were observed in SPAQ administration challenges and positive

behavioural examples across the three countries, suggesting that some consistencies could be assumed.

Conclusion

Overall, caregivers perceived the role model approach to be beneficial in aiding SPAQ administration, with other positive impacts also reported. Evidence provided here offers promising scope for the approach to be expanded to other areas within and beyond the three study countries, along with other areas of child health.

Replication and scale-up should involve representative sampling and recruitment of community participants for FGDs to avoid the exclusion of minority groups and reinforcement of already existing inequalities in access or marginalization. Scale-up should consider building on and strengthening existing community structures such as village volunteers and health committees for the sustainability of the approach. The most popular communication channels should be utilized to ensure activities and information are promoted effectively, along with a mixture of group and one-on-one approaches where appropriate and feasible.

Appendix

Appendix 1

Study setting and site selection

Burkina Faso In Burkina Faso, the study was implemented in Saponé health district (see Fig. 2), which is located approximately 40 km southwest of the capital, Ouagadougou, and has 26 health facilities (25 rural and one urban). The most commonly spoken language is Mooré, the rainy season starts from June to October, and SMC implementation in the district began in 2016. Sambin health centre was selected for study implementation, with a catchment area consisting of 3 villages and a total 3–59 month population of 1,083 [21].

Sambin was selected due to its location within the health district, for being the health facility with the lowest SMC coverage in the district in 2020, and for its accessibility. The study was implemented in each of the three villages in the health facility catchment area, with each village corresponding to a cluster. Cluster 1 was the closest to the health facility (0 km), cluster 2 was 7 km from the health facility and cluster 3 was the furthest, at 9 km from the health facility.

Chad In Chad, the study was implemented in Bokoro health district of Hadjer Lamis province in central Chad. Bokoro has a total population of 50,347 children under five, is supported by 24 health facilities and is comprised of urban and rural areas [22]. Local languages include French and Arabic, and SMC has been implemented in the district since 2014. Tersefe health centre was selected for the study implementation, with a catchment area consisting of 14 villages and a total under-five population of 2,920 [22].

The health centre was selected for its accessibility during the rainy season, the relatively stable security situation, high malaria endemicity and for being located within an SMC implementation district. Villages in the catchment area were divided into three clusters on the basis of distance from the health facility. Cluster 1 was less than 5 km from the health facility, while clusters 2 and 3 were 10 km and 27 km respectively from the health facility.

Togo In Togo, Blitta health district (in Centrale region) was selected for the implementation of the role model approach. The district has 22 health facilities with a total population of 163,585 in rural areas and 9,274 in urban areas. The total under five population is 31,632 [23]. The majority spoken language is Ewé, and SMC has been implemented in the district since 2020. Pagala Gare health centre was selected for study implementation, with a catchment area consisting of 14 villages and a total under-five population of 5,232 [24]. Pagala Gare health centre was selected due to its accessibility to limit possible disruptions to movement due to the COVID-19 pandemic control measures. Villages in the catchment area were clustered based on distance from the health facility. Cluster 1 was the closest, cluster 2 was 4 km from the health facility and cluster 3 was 7 km from the health facility.

Appendix 2

Adaptation of 2022 SMC campaigns

Using the results of the formative and evaluation phases, tailored recommendations for each country were compiled to aid future SPAQ administration within communities. These were integrated into each country's respective 2022 SMC communication campaigns to ensure the continuation of activities and sustainability, as well as making the information more accessible on a larger scale.

In Burkina Faso, posters on two role model behaviours were shared in all health facilities of Saponé district and

used during awareness sessions by volunteers. First, a poster on the flattery of children to encourage them to swallow SPAQ and second, a poster on the involvement of spouses, in-laws, grandparents and neighbours to help remind caregivers of SMC administration. Town criers were also involved in the dissemination of the two messages in the communities. A further scale up of these promotion posters for community members and/or healthcare workers is planned for the 2023 SMC campaign.

In Chad, the main role model behaviours identified during the formative phase of this study were promoted during the 2022 campaign in all districts where Malaria Consortium implements SMC. Role model messages were included in the sensitization of key actors involved in SMC information dissemination at community level (e.g. health facility in-charges and community distributors). Community members were sensitized through the integration of role model behaviours into community mobilization messages prior to and during SMC distribution. Four main role model behaviours were promoted in the 2022 campaign. First, the use of positive incentive techniques such as coaxing, flattering and cuddling the child, or promising sweets. These techniques were promoted both for their successful outcome reported by some caregivers during the formative phase of the study and to promote an alternative to counter other, more forceful behaviours reported during formative discussions. Second, the use of circumstantial reminders to administer AQ on day 2 and 3, such as placing blister packs next to tea, cooking condiments and mirrors, or other items regularly accessed by caregivers, to set a visual reminder. Third, involvement of spouses, extended family and other community members in SPAQ administration and adherence to support mothers who were largely reported as the primary caregivers and in charge of SPAQ administration. Fourth, the use of mosquito nets alongside SMC in protecting children against malaria.

In Togo, nine new villages were selected in Blitta district and eight were selected in Oti-Sud district in Savanes region for the promotion of role model messages. Volunteers raised awareness in their communities using pictorial messages produced by the study team. Five key behaviours emerging from the formative study phase were promoted. First, the role of paternal and maternal affection before SPAQ administration, including playing with the child, promising small gifts or food and discouraging any type of violent administration behaviour by caregivers. Second, the presence of both mother and father during SPAQ administration to promote male involvement and spousal support. Third, dissolving SPAQ in a small amount of water prior to administration to help reduce the risk of vomiting and to avoid mixing SPAQ with other food or beverages. Fourth, placing the child in a vertical position during administration and avoiding the obstruction of the child's nostrils. Fifth, placing blister packs in a visible location out of reach for children to help remind caregivers to administer day 2 and 3 AQ doses while preventing children from accessing the tablets.

Appendix 3

See Tables 2, 3, and 4.

Table 2 Number of evaluative FGDs per cluster by type of respondent in each country

	Number of FGDs per cluster by type of respondent	Participants per FGD	Participants per country
Burkina Faso	Cluster 1: 1 (mothers) Cluster 2: 1 (mothers), 1 (fathers) Cluster 3: 1 (mothers)	8 per FGD = 8 8 per FGD = 16 8 per FGD = 8	32
Chad	Cluster 1: 1 (mothers), 1 (fathers) Cluster 2: 1 (fathers) Cluster 3: 1 (mothers)	8 per FGD = 16 8 per FGD = 8 8 per FGD = 8	32
Togo	Cluster 1: 3 (mothers), 2 (fathers) Cluster 2: 3 (mothers), 2 (fathers) Cluster 3: 3 (mothers), 2 (fathers)	9 per FGD (mothers), 8 per FGD (fathers) 8 per FGD (mothers), 9 per FGD (fathers) 9 per FGD (mothers), 7 per FGD (fathers [one participant withdrew])	126
Total participants	190		

Table 3 Key role model behaviours that were promoted based on formative phase findings, by country

Country	Promoted role model behaviour
Burkina Faso	Involvement of fathers by administering SPAQ themselves, reminding their wife of administration times or using gentle encouragement tactics on the child to facilitate administration
	Involvement of other relatives such as mothers-in-law to remind the mother to administer SPAQ
	Crushing and hiding the medicine in local foods (e.g. cornflour and porridge) to deceive children and ease consumption
	Flattering the child with food and drink (e.g. tea) as an encouragement tactic
	Mixing SPAQ with drinks (e.g. coffee and milk) prior to administration
Chad	Placing SPAQ tablets next to sugar packets so each time the caregiver prepares tea, they are reminded of the need to administer SPAQ
	Incorporating SPAQ administration as part of a daily routine, occurring at the same time each day. By doing daily actions in chronological order (e.g. washing and feeding children, administering SPAQ and placing children under a mosquito net before bed), this makes the task easier to remember
	Diluting the medicine in a glass of water prior to administration
	Involvement of fathers by: Encouraging children to ingest SPAQ by promising sugar in return Supporting the mother and reminding her of when it is time to administer SPAQ Keeping the remaining doses of SPAQ in a clean, safe place that is easy to remember
Togo	Mixing SPAQ with food (e.g. porridge or maize) or drink (e.g. milk or juice) to make it easier to swallow
	Involvement of fathers by: Singing songs to encourage and reassure children Helping mothers to administer SPAQ Promising to take children on a motorcycle ride in return for ingesting SPAQ

Table 4 Results of logistic regression models for associations between caregiver and interview characteristics, and participation in role model activities, in target communities in Blitta prefecture, Togo, and Ipelcé commune, Burkina Faso (sample size = 490)

Variables			Model 1 (univariate)		Model 2 (multivariate)	
			OR (95% CI)	p	OR (95% CI)	p
Caregiver characteristics	Sex	Female	Ref		Ref	
		Male	0.62 (0.25–1.55)	0.309	0.60 (0.23–1.54)	0.289
	Marital status	Not in a marriage or partnership	Ref		Ref	
		In a marriage or partnership	2.20 (0.96–5.06)	0.064	2.35 (1.00–5.51)	0.049
	Self-reported literacy	No	Ref		Ref	
		Yes	1.25 (0.81–1.92)	0.315	1.57 (0.94–2.61)	0.083
	Employment status	Not working	Ref		Ref	
		Employed	0.59 (0.39–0.88)	0.010	0.60 (0.38–0.93)	0.023
	Household poverty status (> 50% probability household is below poverty threshold of $1.90/day (2011 PPP), 2015 definition	Yes	0.96 (0.65–1.43)	0.858	1.04 (0.69–1.57)	0.863
		No	Ref		Ref	
Interview characteristics	Interview language	French	Ref		Ref	
		Local majority language	1.27 (0.82–1.96)	0.286	1.42 (0.88–2.28)	0.154
		Minority language	0.19 (0.07–0.52)	0.001	0.24 (0.09–0.64)	0.005

Abbreviations

AQ Amodiaquine
CD Community distributor
EoC End-of-cycle
EoR End-of-round
FGD Focus group discussion
KII Key informant interview
SMC Seasonal malaria chemoprevention
SP Sulfadoxine-pyrimethamine
SPAQ Sulfadoxine-pyrimethamine plus Amodiaquine
WHO World Health Organization

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Author contributions
L.D. was the major contributor in writing the manuscript, A.S. and L.D. analyzed qualitative data, M.S., L.D., S.R., E.V., C.W. and KB designed the protocol, S.R. analyzed statistical data, A.T., C.C., N.T., H.B., N.D., F.A., E.S., G.T., M.D. and T.O. involved in roll-out of the study. All authors read, addressed comments, and approved the final manuscript.

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Availability of data and materials
The datasets used and analysed during the study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study was approved by the Comité d'Ethique pour la Recherche en Sante in Burkina Faso [DELIBERATION No 2021–02-172], the Comité National de Bioethique in Chad [0016/PCMT/PM/MESRSI/SE/DGM/CNBT/SG/2021] and the Bioethics Committee for Health Research in Togo [27/2021/CBRS]. All respondents provided informed consent for their participation in the study. The study protocol was created and conducted in accordance with the Declaration of Helsinki.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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