

Co-implementing vitamin A supplementation with seasonal malaria chemoprevention

A pilot implementation study in Sokoto state, Nigeria

Key messages

- Vitamin A coverage can be significantly increased when integrated with seasonal malaria chemoprevention (SMC), without decreasing the coverage of SMC.
- Co-delivery of vitamin A supplementation and SMC is acceptable to, and perceived to be effective by, caregivers, community distributors, and state-level and national-level health programme officials.
- These findings support the rationale for implementation at twice the scale. If validated in additional settings, the intervention should be scaled up incrementally to achieve national coverage, with barriers addressed along the way.



CD giving the first dose of life-saving SMC medication to a young boy, Nigeria

Introduction

Globally, about two billion people are estimated to have micronutrient deficiencies,^[1] with children in developing countries affected the most.^[2] Vitamin A deficiency is a major risk factor for child survival in Nigeria, increasing fatalities caused by common diseases. Children with clinical signs of this deficiency are 3–12 times more likely to die than those who are not deficient.^[3] High-dose vitamin A supplementation (VAS) delivered twice yearly, as recommended by the World Health Organization, is a proven low-cost intervention that has been shown to reduce all-cause mortality by 24 percent.^[4]

Nigeria has been identified as one of the priority countries for national VAS programmes due to its high under-five mortality rate (120 per 1,000 live births).^[5] However, although VAS is delivered during the country's twice-yearly maternal, newborn and child health (MNCH) week through a health facility-based approach,^[6] only 41 percent of children aged 6–59 months received VAS in the six months preceding the 2018 National Nutrition and Health Survey. Sokoto and four other states recorded less than 15 percent coverage.^[7]

SMC is a community-based, door-to-door intervention delivered by community distributors (CDs) in four monthly cycles during the peak malaria transmission season in the Sahel region of Nigeria. Caregivers administer sulfadoxine-pyrimethamine and amodiaquine (SPAQ) to children aged 3–59 months to prevent malaria infection.

As SMC provides an existing, viable platform within which VAS could be integrated, Malaria Consortium — in collaboration with the National Malaria Elimination Programme and supported through philanthropic funding — carried out a pilot implementation study (September–December 2019) to assess vitamin A coverage when co-implemented with the fourth cycle of the 2019 SMC campaign.

The study aimed to explore the feasibility and acceptability of integrating VAS with SMC in Dange-Shuni local government area (LGA) in Sokoto state and to provide pragmatic evidence that could guide implementation and scale-up.

Its specific objectives were:

1. to assess the feasibility of integrating VAS with the SMC programme
2. to explore the acceptability of integrating VAS with SMC from the perspective of CDs, caregivers, and state-level and national-level health programme officials
3. to estimate the potential changes to the coverage and quality of SMC after integrating it with VAS.

Methods

Study location and design

We chose Dange-Shuni as the study site given that we have been implementing SMC there since 2016 and have established strong working relationships with state and LGA officials. A pool of CDs trained in SMC delivery was, therefore, already present and administrative coverage of SMC — according to programme data — stood at 100 percent in 2018. Based on the 2006 national census report, the total population of Dange-Shuni in 2019 was estimated at 285,697 — 57,139 of whom were children under five.^[8]

The study population primarily comprised children aged 6–59 months who were eligible for SMC and VAS. Children who fell outside of this age range, suffered severe illness or allergies, or had taken SMC or VAS medication in the month prior to administration were excluded. Only 6.2 percent of children aged 6–59 months in Sokoto state received at least one dose of vitamin A six months prior to the 2018 National Nutrition and Health Survey.^[7]

The pilot implementation study used mixed methods, with qualitative focus group discussions and key informant interviews, and quantitative components (baseline and endline comparisons of VAS and SMC coverage).

Map of Nigeria showing the location of Sokoto state



Sample size and sampling procedure

To provide estimates for VAS and SMC coverage at baseline (September 2019) and at endline (November–December 2019), the study required a sample of 180 eligible children from Dange-Shuni. We used a one sample proportion formula, assuming a proportion of 6.2 percent

and a difference of 0.05, at 95 percent confidence limit, and allowing for a design effect of two with 30 clusters. We selected a total of 188 and 197 eligible children at baseline and endline, respectively, from 33 communities within 11 wards. We randomly selected an eligible child from each of six randomly selected households, from each of three randomly selected communities within each ward.

Data collection and analysis

Trained data collectors obtained quantitative data from caregivers of selected eligible children at baseline and endline using a structured questionnaire on mobile Android devices. We analysed these data using Stata 15. We first estimated frequencies, proportions, means and medians and presented them in tables and graphs. We then calculated coverage point estimates along with 95 percent confidence intervals (CIs) and compared them between survey periods using cluster-adjusted chi-square tests.

Baseline VAS coverage was estimated according to the proportion of eligible children who had received VAS during MNCH week or related interventions in the six months preceding the study. Baseline SMC coverage refers to the proportion of eligible children who had received at least the first dose of SMC in the third cycle of the 2019 SMC campaign. Endline refers to coverage achieved through co-implementation of VAS with SMC during the fourth cycle of the campaign.

We also conducted 12 focus group discussions with caregivers/heads of households, CDs and supervisors, and 12 key informant interviews with representatives of the Federal Ministry of Health (FMoH) who had been involved in the design, planning or implementation of the study and with donors, technical partners, the State Ministry of Health and LGA health officers. Data from audio recordings and notes taken during the interviews were transcribed, and we carried out a thematic content analysis to identify important themes and constructs based on the perceptions of the participants.



CD showing caregivers how to prepare SMC medication for their children, Nigeria. Credit: Susan Schulman

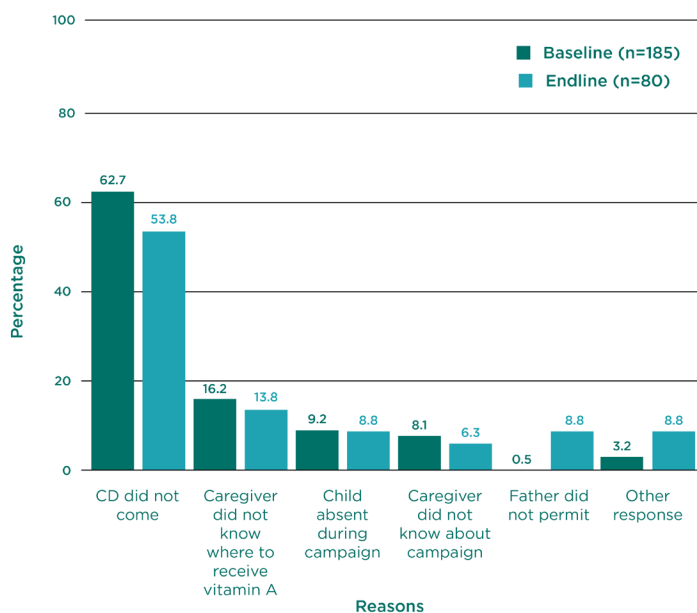
Quantitative results

Demographic characteristics of participants

At baseline and endline, respectively, we interviewed 188 and 197 caregivers of children who were participating in the study. Children aged 24–59 months made up about 60 and 69 percent of the selected children at baseline and endline, respectively. The proportions of heads of households who were male, employed or had ever attended school were lower at baseline than at endline (59 versus 91 percent, 61 versus 97 percent and 22 versus 35 percent, respectively).

At baseline and endline, respectively, almost all the caregivers interviewed were female (98 and 99 percent), married (98 percent in both surveys) and the mothers of the selected children (96 and 98 percent). However, a statistically significantly higher proportion of the caregivers was unemployed at baseline compared to at endline (70 versus 49 percent). While the gender distribution of the selected children was equal, most were aged 12–59 months at baseline and endline (90 and 93 percent, respectively).

Figure 1: Reasons for children not receiving vitamin A supplementation



Treatment coverage

The coverage of VAS increased significantly between baseline and endline, rising from two to 59 percent. SMC coverage increased slightly from 70 to 76 percent; however, these estimates were not statistically significant (see Table 1). In both surveys, the most common reason caregivers gave for children not receiving either VAS or SMC was that a CD had not visited their household. This occurred more frequently at baseline than endline for both (see Figures 1 and 2).

Treatment regimen for seasonal malaria chemoprevention

SMC is given as a three-day course to an eligible child in each cycle. Each course involves one dose of SP and three daily doses of AQ, with SP and the first dose of AQ given under the supervision of the CD — directly observed therapy (DOT) — and the remaining two doses of AQ given by the caregiver over the following two days. A child is expected to receive SMC for four consecutive monthly cycles in a year.

Figure 2: Reasons for children not receiving seasonal malaria chemoprevention

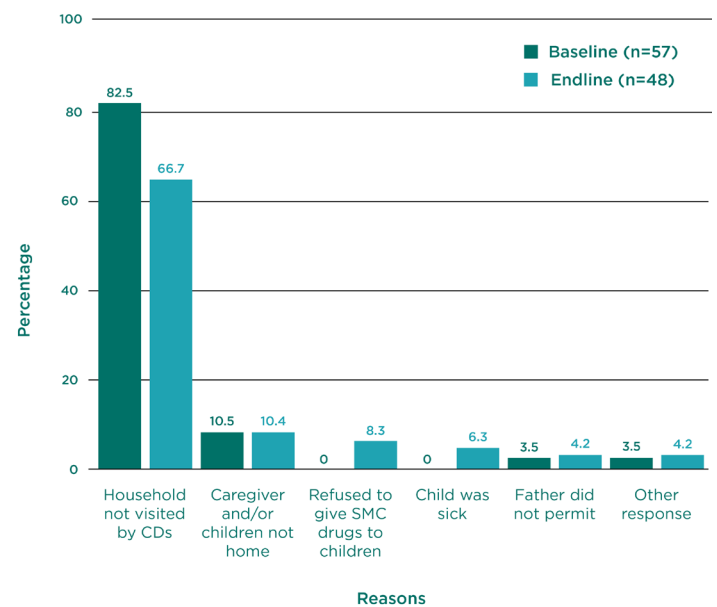


Table 1: Coverage of vitamin A supplementation and seasonal malaria chemoprevention at baseline and endline

Variable	Baseline (n=188)		Endline (n=197)		p value
	percent	CI	percent	CI	
Child received vitamin A					
Yes	1.6	0.4–7.0	59.4	47.0–70.7	<0.001
No	98.4	93.0–99.7	40.6	29.3–53.0	
Child received SMC					
Yes	69.7	57.4–79.7	75.6	64.8–84.0	0.412
No	30.3	20.3–42.6	24.4	16.0–35.2	

Directly observed therapy, adherence to treatment regimen and adverse reactions

Administration of the first dose of SMC by the CDs through DOT was not significantly different between baseline and endline (66 versus 54 percent). Likewise, administration of the second and third doses was similar

at both time points (see Table 2). Among those receiving SMC, very few children reportedly experienced adverse drug reactions (eight percent at baseline and 12 percent at endline). The most common adverse reaction was vomiting (eight and 10 percent at baseline and endline, respectively).

Table 2: Adherence to seasonal malaria chemoprevention treatment regimen at baseline and endline

Variable	Percent at baseline (n=131)	Percent at endline (n=149)	p value
Child received 1 st dose from CD on 1 st day (DOT)	67.5	53.7	0.264
Child received 2 nd dose on 2 nd day	96.2	98.0	0.380
Child received 3 rd dose on 3 rd day	96.2	95.3	0.739

Qualitative results

Feasibility

Reception of integrated programme

Overall, all groups interviewed responded positively to the programme. Caregivers liked the ease and convenience of house-to-house drug distribution and expressed an interest in seeing the programme extended more widely. They also commented that their children were healthier thanks to integrated VAS and SMC administration, which “gives total protection for children”.

Similarly, CDs commented on the benefit of administering VAS and SMC together, and found caregivers to be more open to the programme because of the perceived health benefits and household-based delivery. CDs additionally noted that caregivers requested mosquito nets as part of implementation. Key informants agreed that access to households was better with the integrated programme, allowing for a greater number of children to be reached. They further commented on the cost-effectiveness and efficiency of integrating VAS with SMC.

"Before, our children suffered from malaria. Since they started receiving this medication, they are honestly healthier"

Caregiver, Dange-Shuni LGA

Factors facilitating implementation

Key informants felt that because administering VAS does not require technical knowledge, “anybody who went to secondary school could easily do the work”, which facilitated its integration with SMC. Informants also suggested that the existing CD infrastructure and an established SMC platform — with tools and procurement processes already in place — enabled integrated implementation. Moreover, they believed VAS could easily be absorbed into the SMC supply chain system, and those procuring SMC should be able to support the sourcing of vitamin A.

The role of community leaders

Most CDs and supervisors emphasised the importance of community leaders, including imams and town announcers, in engaging and raising awareness among

communities about the integrated programme. They felt that the pre-implementation radio announcement about the addition of VAS to the SMC campaign was insufficient in this regard and expressed the need to improve information sharing and sensitisation before the campaign through community leaders.

Barriers to implementation

Potential confusion over integration

One challenge highlighted by both caregivers and key informants was the potential confusion that could arise from administering VAS and SMC to different age groups, since they receive different dosing regimens of VAS and SMC based on their age. Caregivers also worried that two dosing regimens might be too much for their children. Indeed, key informants highlighted that it was important to carefully monitor the different dosages required among different age groups, to prevent the possibility of overdose among younger children.

Another area of concern for key informants was the need for reliable data collection on VAS administration. One interviewee suggested the systematic harmonisation of data tools (e.g. one card to capture all immunisation, SMC and VAS administration).

Many key informants mentioned the additional need to harmonise the different timings of SMC and VAS administration. However, as twice-yearly VAS administration (in February and November) falls outside of the SMC schedule (four monthly courses in July–October), further deliberation is warranted on how best to achieve this.

Community distributors' workload and performance

Both caregivers and key informants felt that CDs' performance had been affected by VAS administration. Caregivers described how CDs often did not wait the required 30 minutes between administering SMC and VAS to “see if the child vomited”, while some simply “gave the drugs at the same time”. They further mentioned that “some CDs did not wait for children to return home” when absent, while others “only asked the number of children in the household...[and then] gave out VAS and SMC and filled in the card”. Caregivers said that CDs need to be more patient and take time to explain the benefits of VAS and SMC before administering them, because this can influence uptake of medication.

Both caregivers and key informants agreed that the integration was too time-consuming and that CDs were

unable to reach the anticipated number of children due to excessive workload. CDs and supervisors confirmed that the additional waiting time between administering SMC and VAS had adversely affected their ability to meet their targets due to more time spent in the field. As a result, supervisors explained that CDs were stressed, unhappy and perceived the wait to be a “waste of time”. To address this, caregivers suggested employing separate teams to administer SMC on a different day to VAS, while key informants suggested reducing daily targets or increasing the number of CD teams.

"We've wasted a lot of time. During SMC activities, we finish at 2 or 3pm, but with the addition of VAS, we're sometimes in the field until 6pm"

Community distributor, Dange-Shuni LGA

Remuneration

Trouble with remuneration was the topic discussed most by key informants, CDs and supervisors in relation to the feasibility of implementing SMC and VAS. CDs and supervisors complained that they had received no increase in payment despite a greater workload, and reported that they had occasionally experienced delays or received no payment at all. Some CDs were, therefore, unable to pay for transport to reach the communities in which they work. There were strong indications from the CDs that they would not participate in the campaign next year or would not do good work if these issues remained unresolved. The key informants regarded these problems as unacceptable and demotivating, and said outstanding payments should be settled as soon as possible. They suggested that any future integrated campaigns should see CDs receive an initial payment before commencing work and the balance paid upon completion.

Resourcing and logistics

Key informants identified two further challenges to implementation: financial and human resources. They mentioned logistical difficulties in deploying materials and drugs to hard-to-reach areas and avoiding stock-outs, and highlighted the need for a sufficient workforce. Adequate

budget to deliver the integrated programme at state level following the pilot was also deemed a major barrier to sustainability.



Ndajiko and her child, Edati — recipients of the SMC programme, Nigeria

Acceptability

Integration is acceptable at the community level

Caregivers are generally willing to support and recommend the integrated programme in future. A common view was that “there was no eligible child that did not receive” SMC and VAS — except if the caregiver or child was absent — and they had not seen anyone “who refused to accept it”. However, respondents said it was possible that some caregivers might reject SMC and VAS based on the traditional health belief that people who are well do not need to take medicine.

The key informants, CDs and supervisors similarly perceived that the integrated programme was accepted at community level. CDs and supervisors reported that “every house accepted us” and “everybody was willing” for their children to receive SMC and VAS. They felt that acceptance was based on the perceived health benefits of the integrated programme, e.g. significantly reduced cases of malaria and malnutrition, and of severe cases of malaria and measles. Key informants suggested that acceptance was partly due to the popularity of vitamin A and the knowledge of its benefits among caregivers.

This view was echoed by CDs and supervisors, who felt that the addition of vitamin A had convinced caregivers to accept SMC — even those who did not want it — and had strengthened the campaign.

Demand to widen eligibility

A further indication that integrated SMC and VAS was accepted at community level was the demand from caregivers to widen the eligibility criteria for VAS to include older children, adults and the elderly, because of the perceived positive impact on their children’s health. They suggested that since vitamin A improves children’s sight, adults and older people could also benefit as they suffer from similar health issues.

Willingness to support scale-up

The key informants were in favour of scaling up the integrated programme. Several national-level informants welcomed the pilot study as it provided a good opportunity to determine if an integrated programme would work.



Pharm. Mustapha Othman Ali (Permanent Secretary, Sokoto state MoH) administering SPAQ to a child, Nigeria. Credit: Rilwanu Muhammed

Effectiveness

Caregivers perceived children to be healthier

A common perception across all caregiver discussions was that children were healthier and there was less suffering from malaria since the integration of VAS and SMC. Some female caregivers implied that the burden of caring for an ill child had been removed, while male caregivers talked about less frequent visits to the health facility and a lower rate of malaria fever in children.

"A few days back, a community member told me how grateful they were for the intervention"

Community distributor, Dange-Shuni LGA

Side effects were uncommon

Female caregivers unanimously agreed that there were no side effects from SMC and VAS administration, noting that they had not heard anyone complain that their child had experienced these. Some mentioned that children occasionally vomited and suffered fever, weakness, or lack of energy after taking SMC. However, this was not considered unusual since children experience similar symptoms when vaccinated and, usually, these symptoms are relieved the next day.

Coverage of both treatments increased

Some CDs and supervisors felt that both SMC and VAS coverage had increased with the integrated programme. They highlighted that children in hard-to-reach areas who previously had not received health interventions had now been covered and there was less reliance on child health week alone to reach children who had never received VAS. However, several key informants were cautious about commenting on the effectiveness of the pilot, with some saying it was "too early to talk of overall success".

Views on sustainability

Many caregivers felt that continued awareness raising, mobilisation and advice at the community level — particularly with the help of religious and traditional leaders — would be integral to ensuring the programme's sustainability. Not only would this help to convince those who had previously rejected the programme, but it would also alert caregivers to the importance of giving children

the complete dose of VAS and SMC and enlighten them about the programme more generally.

Some supervisors and one key informant felt that being able to employ CDs from the communities that they would treat was key to successful implementation. This is because of CDs' ability to provide more value in their own communities, easy mobilisation and better acceptance — especially in hard-to-reach areas.

Supervisors and CDs believed that the programme's continuity relies on responsibilities being fulfilled at all levels of the health system. Both groups agreed that they should work diligently to ensure sustainability, while community members should support the programme. Many key informants strongly felt that the state government should take ownership of the integrated programme in terms of contribution, funding and accountability. One national-level key informant suggested that community governance was important for sustainability and could be achieved through health development committees ensuring stewardship, accountability and monitoring of government and partner programmes. Others suggested exploring alternative ways of funding health interventions, through corporate social responsibility funds and public private partnership, rather than relying on foreign donors.

"Creating awareness is the key to success in this programme — we need to mobilise and sensitise people in the community"

Caregiver, Dange-Shuni LGA

Discussion

The study showed that VAS coverage can be increased by integrating its delivery with SMC, which would boost coverage achieved by the MNCH week and the National Immunization Plus Days. It also found that SMC coverage itself was not negatively affected by this integration.

The perceived benefits and acceptance of this integration appear to cut across all levels of stakeholders; it is notable that all participants appreciated the advantages of household-based delivery of VAS over current health facility-based delivery. This, along with the general perception that the implementation is effective, calls for further scale-up.

However, attention should be given to those issues participants raised that may threaten future implementation, such as caregivers' confusion about administering VAS and SMC simultaneously or possible rejection of these due to social norms or CDs' impatience. Better training of CDs is required to improve their interactions with caregivers, to ensure that the latter receive adequate information. Furthermore, traditional health beliefs that are inimical to acceptance of the intervention should be identified and targeted by social and behaviour change communication. Caregivers' demands for mosquito nets suggest that further acceptance may be achieved by also distributing insecticide-treated nets.

It is also crucial to address CDs' perceived increased workload and the feasibility of waiting the full 30 minutes between SMC and VAS administration. Exploration of protocol design in this regard could be worthwhile. Unwillingness to revisit a household when a child is absent, failure to visit at all or simply handing SMC and VAS over to caregivers are similarly problematic as they pose a threat to coverage, quality and safety. To ease workload, CDs' daily coverage targets could be reduced and/or the number of teams in operation could be increased. CDs should also understand that VAS must never be given to caregivers to administer at home^[9] — optimised training and improved supervision will encourage CDs to adhere to the recommended protocols. CDs are also likely to be more committed if they are engaged in their own communities and paid promptly.

Ensuring proper documentation of VAS, harmonising tools across programmes specific to children aged 6–59 months and integrating co-implementation with other existing VAS programmes (e.g. MNCH week) are critical for future

scale-up. This will require collaboration between SMC implementers and relevant agencies under the FMOH (e.g. National Primary Health Care Development Agency and the nutrition division).

The scale-up and sustainability of implementation depend on financial and human resources, as well as commitment and ownership from government. Some stakeholders believe that funding support to the government could be provided through public-private partnerships and corporate social responsibility. For existing coverage of SMC implementation, other LGAs that are currently involved in SMC delivery should also help with scale-up. Moreover, sustainability will be enhanced through community involvement, especially by engaging community leaders to raise awareness on the benefits of integration.

Successfully scaling up implementation to the national level will require several sequential phases.^[10] An initial phase would involve implementation at twice the scale (e.g. in 2–4 LGAs) to validate our findings, followed by testing in varied contexts at a larger scale to tackle potential barriers at full scale-up. A final step would be to assess cost-effectiveness to inform decisions around scale-up and national coverage.

Our study appears to be the first to integrate high-dose VAS with SMC; VAS integration programmes have, to date, mostly been based on immunisation campaigns.^[11,12] Our research supports the findings of a previous study that delivered SMC co-packaged with lipid-based supplements, which similarly reported that SMC coverage was not reduced by the integration.^[13] However, another study integrating VAS with a mass drug administration deworming campaign in Kenya reported a lower coverage for VAS (31 percent) than obtained in our study.^[14]

There are a few limitations to bear in mind when interpreting the results of our study. Firstly, some key informants initially selected for interview were unavailable. Among those eventually interviewed, two were unfamiliar with the pilot (though knew of the SMC programme) and, therefore, could provide only limited information. Secondly, social desirability bias may have been present in caregivers, CDs and supervisors' responses. Finally, differences in the gender, educational level and occupation of the participants between baseline and endline may have contributed to differences in VAS coverage, but we were unable to adjust for these via multivariate analysis due to the small sample size of the VAS recipients at baseline.



A mother welcomes a CD into her home to treat her children with SMC during the 2019 campaign, Nigeria. Credit: Susan Schulman

Recommendations

The following actions are recommended based on the findings of the study.

Implementers and donors should:

1. work with national-level and state-level trainers to ensure that CDs undergo thorough training, with an emphasis on protocol adherence and on changing the attitudes of CDs in their interactions with caregivers during service delivery.
2. engage state governments to determine the best remuneration modalities to ensure prompt payment to CDs. This should increase work satisfaction.
3. select and deploy CDs based on their familiarity with community members to enhance acceptability and reduce rejection.
4. use the integrated programme to create avenues to educate caregivers on the benefits of taking both VAS and SMC, and allay any fears around giving their children too many drugs.
5. prioritise social and behavioural change communication — and actively engage the help of community and religious leaders therein — by addressing traditional health beliefs that may affect acceptance of the intervention.
6. provide further funding and support for phased scale-up, during which the intervention would be sequentially extended and tested in different contexts in order to better identify, understand and resolve key barriers to implementation. This strategy will increase the likelihood of a successful national-level scale-up.

National and state malaria programmes should:

7. work with relevant departments/divisions in the FMoH, such as immunisation and nutrition, to develop harmonised tools for data collection that allow information to be documented on VAS, SMC and other essential child health interventions. This will simplify and aid the process of documentation for tracking interventions targeting children under five.
8. work with the FMoH to leverage the integrated intervention by incorporating it into the national public health programme, in line with other VAS initiatives. Such integration should ensure that eligible children receive VAS twice a year without the possibility of overdosing.

Researchers should:

9. follow up this study with further operational research that evaluates the cost-effectiveness of alternative methods of implementation, as well as the efficiency of inputs.
10. develop and test alternative approaches for delivering both SMC and VAS to reduce CDs' workload. Options to be considered include extending delivery periods or increasing the number of CD teams, taking cost-effectiveness into consideration.
11. conduct further research to identify prevailing traditional health beliefs and practices in communities that may affect the acceptance of the intervention. These findings should inform implementation.

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