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Qualitative Evaluation of the Pilot Introduction of Multiple Micronutrient Supplementation in Burkina Faso

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ABSTRACT

Effective transition from iron-folic acid (IFA) to multiple micronutrient supplementation (MMS) requires context-specific evidence. Using the MMS pilot program in Burkina Faso, this study aimed to evaluate the feasibility and acceptability of MMS and identify factors that can influence a successful scale-up. We conducted a qualitative study. In-depth interviews ($n = 57$) with policymakers, clinicians and community actors as well as focus group discussions ($n = 12$) were conducted with pregnant/lactating women, husbands, and community leaders. Attitudes, barriers, and enablers to MMS access/utilization were assessed after two-years of piloting. A total of 153 participants were interviewed either through focus groups ($n = 96$) or In-depth interviews ($n = 57$). The MMS intervention was perceived to be highly acceptable to most participants. Strong stakeholder engagement, supported by coordination meetings and targeted training increased fidelity to the program. MMS's integration through the use of existing IFA distribution channels, and the high level of participant awareness about micronutrient deficiencies—particularly during pregnancy—were key enablers for effective transition. Stakeholders across all levels perceived MMS as more effective than IFA in preventing anemia and supporting maternal-fetal health even if their perceptions collected through interviews and have not been verified through clinical measurements. However, barriers include women forgetting to take pills, supply chain disruptions, fragmented interdepartmental coordination, mild side effects (i.e. nausea) and cultural practices like food taboos. The barriers raised emphasized the need for increasing the reach of culturally-adapted nutrition education targeting women and influencers in the family. Facilitators found associated to program sustainability were mainly community engagement, health partners' support and awareness campaigns on the MMS. The piloting of the MMS helped identify numerous context-specific enablers and barriers that if addressed could lead to a smoother and more effective transition.

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Summary

- The multiple micronutrient supplementation (MMS) program was found to be highly accepted and preferred over IFA by pregnant and lactating women.
- The MMS program has seen enthusiastic engagement from various stakeholders including policymakers, clinicians, and community influencers.
- A holistic approach, encompassing logistical support, effective coordination, security measures, robust monitoring, and improved communication is needed to sustain demand and improve the program.

1 | Introduction

1.1 | Context and Justification of Multiple Micronutrient Supplementation For Pregnant Women in Burkina Faso

In most sub-Saharan African countries, anemia and related maternal micronutrient deficiencies (MNDs) remain a significant public health challenge. According to the Global Burden Diseases 2023 Anaemia Collaborators 2021 study, the African continent had one of the highest burdens of anemia. Among all sub-regions of the world, the Western sub-Saharan African sub-region had the highest prevalence of anemia (47.4%) (Gardner et al. 2021 Anemia Collaborators 2023). This high anemia prevalence suggests that the likelihood of micronutrient deficiencies is significantly higher in this sub-region. Micronutrient deficiencies, whether associated with anemia or not, can lead to significant consequences for life stages like pregnancy and lactation in particular, where physiological demands are high. Suboptimal micronutrient intake during pregnancy has been linked to adverse perinatal outcomes such as intrauterine growth restriction, impaired cognitive development, preterm birth, and low-birth weight (Zerfu et al. 2016).

Anemia has a complex etiology that can involve nutritional deficiencies of not only iron and folic acid, but also those of vitamins A, B12, to name a few. Besides, in settings where diets are poorly diversified, multiple micronutrient deficiencies are common; consequently, supplementation with MMS (standard UNIMMAP formulation including 15 micronutrients) has been associated with better birth outcomes compared to IFA alone. Indeed, this is confirmed by a growing number of studies indicating that MMS could improve pregnancy outcomes and beyond those achieved by r IFA (Smith et al. 2017; Bourassa et al. 2019; Keats et al. 2019; Gomes et al. 2022). MMS has been shown to significantly lower the risks of preterm birth, low birth weight, and small size for gestational age, which are critical indicators of neonatal health (Smith et al. 2017; Bourassa et al. 2019; Keats et al. 2019; Gomes et al. 2022). Studies have also shown that MMS has a superior effect than IFA in settings where anemia and undernutrition prevalence is high (Smith et al. 2017). In line with these findings, the WHO recommended context-specific transition to MMS in the context of rigorous research (World Health Organization 2020). More recently, a meta-analysis of 15 randomized controlled trials confirmed the superior outcomes of MMS relative to IFA on multiple outcomes including birth weight, anemia, short-for-gestational

age and stillbirth; however, this result was observed with early initiation and higher adherence levels (Smith et al. 2025).

Burkina Faso has a high prevalence of anemia (59.9%), and multiple micronutrient deficiencies are common (DHS 2021; Bationo et al. 2019). Compared to the iron folic acid (IFA), a previous study by Engle-Stone et al. (2019) stated that changing from IFA to MMS might prevent 5000 newborn deaths and 5000 preterm cases in Burkina Faso (Engle-Stone et al. 2019). In an attempt to curb the prevalence of anemia and accelerate the progress toward several Global Nutrition Targets, UNICEF, in collaboration with the Ministry of Health, implemented a pilot MMS project in two health districts (Yako and Ziniaré) (Ministère de la and Burkina 2021). This program was designed to support maternal nutrition. It was implemented from May 2021 to December 2023. While the clinical efficacy of MMS is well-documented (Smith et al. 2017; Bourassa et al. 2019; Keats et al. 2019; Gomes et al. 2022), operational determinants such as adherence, supply chain logistics, and community engagement remain underexplored; hence our study aimed to identify context-specific socio-economic, cultural, and systemic enablers and barriers influencing MMS uptake to inform potential scale-up.

1.2 | Overview of the Maternal Nutrition Program in Burkina Faso

The maternal nutrition program results in a 'package' of interventions to be implemented during ANC visits. The 'package' includes the following: (i) multiple micronutrient supplementation, (ii) monitoring and counseling on adequate weight gain during pregnancy, (iii) counseling on adequate diet during pregnancy, and (iv) counseling on early initiation of breastfeeding and exclusive breastfeeding.

Briefly, the first intervention consists of providing the United Nations International Multiple Micronutrient Antenatal Preparation formulation of MMS (UNIMMAP MMS) as a replacement for iron-folic acid from the time of the first antenatal care visit, throughout pregnancy and during the first 42 days after delivery. The second aims to monitor gestational weight gain and to provide appropriate advice to the mother to correct or maintain adequate weight gain. This monitoring is done using the weight gain tracking sheet and the body mass index reference table. The third aims to monitor the pregnant woman's diet and eating habits in order to provide her with nutritional and dietary recommendations. The last intervention consists of advising the pregnant woman on the early initiation of breastfeeding and exclusive breastfeeding from the time of the first antenatal care visit in order to prepare her to adopt these best practices immediately after delivery.

1.3 | 'Package' of MMS in Yako and Ziniaré: The Pilot Phase

1.3.1 | Preliminary Activities

Preliminary work has been done before the pilot phase implementation in Yako and Ziniaré. This preliminary work consisted of the following activities: the implementation of a technical committee to monitor the program, the baseline

analysis of maternal nutrition program; the baseline analysis of the supply chain situation; an analysis of local production and supply possibilities for MMS in Burkina Faso; a formative research; the development of a communication strategy and materials; the revision of the multisectoral nutrition policy to include MMS; the revision of data collection tools; the definition of each stakeholder's role in the pilot phase implementation.

1.3.2 | Implementation

The small-scale phase of multiple micronutrient supplementation (MMS) for pregnant women during ANC to strengthen maternal nutrition took place in two health districts, Yako and Ziniaré, located in the North and Central Plateau regions respectively, from May 2021 to December 2023. This intervention commenced with an information session for health workers, introducing them to the program's objectives and processes. This was followed by advocacy meetings involving various stakeholders, including customary, religious, and administrative authorities, as well as community leaders. The purpose of these meetings was to explain the intervention's rationale and gather support and consent from these key figures. The initial phase of MMS involved extensive training of health workers, who were then responsible for further training at the community level. A significant aspect of the intervention was direct interaction with pregnant women during prenatal consultations, providing them with MMS. To ensure effective implementation and continuous

improvement, biannual supervisory visits were conducted. These visits aimed to monitor the program's progress, identify challenges, and gather insights for future implementation strategies. Additionally, biannual coordination meetings at the district level were held. These meetings brought together key actors, including heads of maternity wards, multipurpose community workers, regional participants, and partners like UNICEF. The central level of the Department of Education, Culture, and Family Entertainment (DECEF) also participated in these meetings. Finally, an evaluation of the intervention was conducted.

2 | Methods

2.1 | Study Type, Period and Sites

The qualitative study was conducted from September 4 to 18th, 2023, in two health districts Yako and Ziniaré, located in the Nord and Plateau Central regions, respectively (Figure 1) after the implementation of the intervention. Each health district has three health centres, including the Medical Centre with Surgical Antenna (CMA) and two Health and Social Promotion Centers (CSPS).

2.2 | Sampling Strategy and Participant Selection

A purposive sampling strategy was employed to ensure the inclusion of information-rich participants capable of providing

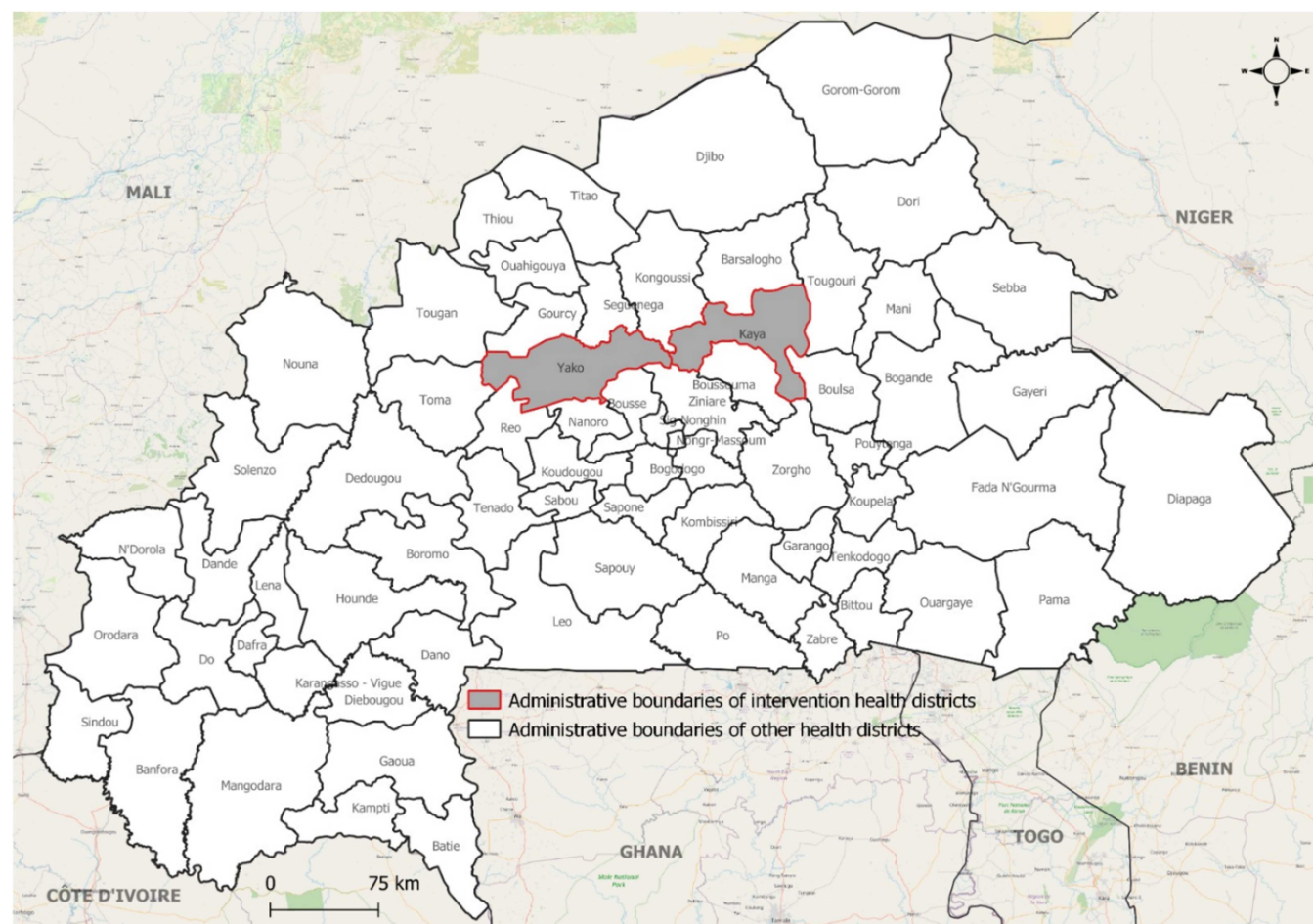


FIGURE 1 | Map showing the sites of the MMS pilot program.

diverse perspectives on the implementation and acceptability of MMS across various levels of the health system. The sampling frame was constructed to reflect the heterogeneity of actors involved in, or affected by, the MMS program, including policymakers, regional and district health managers, clinicians, frontline antenatal care providers, community influencers, and pregnant or lactating women.

Participant selection was guided by predefined criteria aligned with the study objectives: (i) direct involvement in MMS planning, delivery, or supervision for policymakers, clinicians, and managers; (ii) documented exposure to MMS distribution and counseling for frontline health workers; and (iii) variation in adherence, supplementation history, parity, and geographic access (from health facilities) for pregnant and lactating women. Health facilities were stratified by surgical capacity (CMA) and primary care (CSPS), with health facilities proximity considered (Table 1) to ensure that women with differing experiences of the program—including those facing structural or sociocultural barriers—were adequately represented. Besides, Yako and Ziniaré health districts, data was also collected at the national level of the health system in Ouagadougou, the capital of Burkina Faso.

2.3 | Rationale for Group Selection

The inclusion of multiple stakeholder groups was a deliberate strategy aimed at capturing the complexity of the socio-economic, cultural, and systemic determinants influencing the uptake of maternal health services (MMS). Policymakers and program managers were selected for their strategic oversight and expertise in coordination, logistics, and governance structures. Clinicians, midwives, and community-based workers were included due to their central role in the delivery of antenatal care and counseling, as well as their direct interactions with pregnant women. Furthermore, pregnant and lactating women, along with influential family members such as mothers-in-law and husbands, were incorporated to document community-level perceptions, household dynamics, and socio-cultural factors that shape adherence. This multi-level sampling approach facilitated triangulation across various perspectives and enhanced the internal validity of the qualitative findings.

2.4 | Study Instruments

Two (2) focus group discussion (FGDs) guides and seven (7) in-depth interview (IDIs) guides (supplementary file), tailored to each subgroup of participants, were developed by the study team. The interview guides comprised a set of common questions, supplemented by additional inquiries based on participation status. The interview guides were administered in the field using dictaphones to record the discussions.

2.5 | Procedures

All IDIs (45–60 min) and FGDs (approximately 90 min) were conducted by trained qualitative researchers. The latter were recruited based on their prior experience in similar studies. They received comprehensive training on qualitative methods,

ethical procedures, and bias mitigation, and data collection was supervised through regular debriefings to ensure consistency and methodological rigor. All IDIs and FGDs which were in French and local languages including *Mooré*, *Dioula* or *Foufouldé*, according to the interviewee's commonly spoken language, were done in private areas at the study site. IDIs were used to capture individual experiences and FGDs to explore shared sociocultural norms influencing MMS uptake. Every session was recorded, then transcribed verbatim and translated into French prior to analysis. The accuracy of the translations was verified by the second author who is also bilingual. The French transcripts were manually coded—proceeding through open, axial, and selective coding—and analyzed.

2.5.1 | Interviews With Pregnant/Lactating Women

Semi-structured IDIs were conducted with 16 pregnant/lactating women, eight pregnant and breast-feeding women from each of the two health districts participating in the study (four pregnant women and four lactating women from each of the two health districts). The interviews with pregnant and lactating women centered on each woman's individual experiences with antenatal care services and adherence to the maternal nutrition program, which included the use of MMS tablets, as well as her perceptions regarding nutrition, pre-pregnancy and prenatal health, and supplementation. Additionally, the interviews aimed to identify obstacles to the large-scale adoption of the maternal nutrition program incorporating MMS supplements among pregnant/lactating women.

2.5.2 | Interviews With Health Workers

A total of 26 interviews were conducted with healthcare workers. These interviews were organized as follows: two (02) with nutrition focal points, two (02) with pharmacists, two (02) with chief doctors of the health district, two (02) with head of health information system, two (02) with doctors, eight (08) with midwives and eight (08) with head nurses. Their distribution is given in Table 1. The interviews with healthcare workers aimed to identify the logistics of supplement implementation and distribution, coverage of nutritional counseling, health workers availability, factors positively and negatively influencing participants' initiation and adherence, knowledge about MMS product characteristics including packaging, as well as knowledge about the MMS program.

2.5.3 | Interviews With Healthcare Managers

Healthcare managers include health directors, nutrition focal points, and pharmacists from the regional health departments (DRS) of the North and Central Plateau regions. This also involves family health managers, nutrition responsables and managers in charge of supplying health products identified at the central level located in Ouagadougou, the capital of Burkina Faso. A total of fourteen (14) IDIs were conducted with healthcare managers as follow: five (05) with family health managers, two (02) with nutrition responsables, one with the person in charge of supplying health products from the Central Purchase of Generic Essential Drugs and Medical Consumables (CAMEG), two (02) with nutrition focal points, two (02) with pharmacists, and two (02) with health regional officers at

TABLE 1 | Summary of study methods, participants and domains of interest.

Qualitative method	Hierarchical system of health facilities	Study sites	Participants	Sample size	Key domains of interest
In-depth interview	Central level	DSF DN	Family Health managers Nutrition responsables	Ouagadougou Yako Ziniaré 5 NI NI 2 NI NI	– Coordination and management of the MMS program – Logistics of supplement implementation and distribution – Health workers availability – Perceptions of multiple micronutrient supplements and the challenges associated with their use – Perceived benefits and side effects of MMS program – Logistics of supplement distribution
	Regional level	CAMEG	MEG and multiple micronutrient tablets Supplier	— NI NI	– Logistics of supplement distribution
In-depth interview	Regional level	regional health departments	Nutrition focal points Pharmacists Health regional officers	— 1 1 — 1 1 — 1 1	– Logistics of supplement distribution – Coverage of nutritional counseling
	District level	District health department	Nutrition focal points Pharmacists District medical officers	— 1 1 — 1 1 — 1 1	– Logistics of supplement distribution – Coverage of nutritional counseling
In-depth interview	District level	CMA	Head of SISSE (Health Information System) doctors	— 1 1	– Logistics of supplement implementation and distribution – Health workers availability
			Midwives Head nurses/midwives, midwives, auxiliary midwives, certified midwives	— 4 4 — 4 4	– Nutritional counseling Coverage – Factors positively and negatively influencing participants' initiation and adherence – Knowledge about MMS product characteristics including packaging Knowledge about MMS program
			Pregnant and breast-feeding women	— 8 8	– Knowledge about nutritional needs and micronutrient deficiencies

(Continues)

TABLE 1 | (Continued)

Qualitative method	Hierarchical system of health facilities	Study sites	Participants	Sample size	Key domains of interest
Focus group discussion	District level	CSPS	Pregnant and breast-feeding women	4* 4*	<ul style="list-style-type: none"> – Perceived benefits and side effects of nutritional supplements – Experience with supplements before and during the MMS uptake – Knowledge about food prescriptions and food proscriptions (i.e. taboos) 3 – Perceived benefits and side effects of MMS program – Knowledge about nutritional needs and micronutrient deficiencies – Knowledge about food prescriptions and food proscriptions (i.e. taboos) during pregnancy – Experience with supplements before and during the MMS program – Perceived personal susceptibility to nutrient deficiency before, during, and after pregnancy – Perceived severity of negative health effects from preconception and prenatal nutrient deficiency for mother and baby – Knowledge about the multiple micronutrients supplementation program – Knowledge about MMS program – Experience with supplements before and during the MMS uptake – Perceived benefits and side effects of MMS program
	Community level	CSPS	Husbands and mothers-in-law and heads of husbands' schools	2† 2†	<ul style="list-style-type: none"> – Knowledge about nutritional needs and micronutrient deficiencies – Knowledge about food prescriptions and food proscriptions (i.e. taboos) during pregnancy – Perceived benefits and side effects of MMS program

(Continues)

TABLE 1 | (Continued)

Qualitative method	Hierarchical system of health facilities	Study sites	Participants	Sample size	Key domains of interest
In-depth interview	Community level	CSPS	Village health workers	— 3 3	— Knowledge about nutritional needs and micronutrient deficiencies — Perceived benefits and side effects of MMS program
	Health partners	NGOs	Maternal nutrition manager	1 1	— Logistics of supplement implementation and distribution
		UNICEF	Maternal nutrition manager	— 1	— Perceptions of multiple micronutrient supplements and the challenges associated with their use — Perceived benefits and side effects of MMS program
Total				77 interviews, including 12 focus groups	

Abbreviations: CAMEG: Central Purchase of Generic Essential Drugs and Medical Consumables; CMA: Medical Centre with Surgical Antenna; CSPS: primary health care; DN: Nutrition Department; DSF: Family Health Department; FG: Focus group; MEG: Médicaments Essentiels Génériques; MMS: Multiple Micronutrient Supplementation Program; no participant was included within this site; NGO: non-governmental organizations; UNICEF: United Nations Children's Fund; *8 people per FG including 06 pregnant women and 02 nursing women; †8 people per FG including 6 mothers-in-law and 2 husbands.

regional level. The objectives of these IDIs were to assess the capacity of health system to deliver MMS at scale including (i) coordination and management of the MMS program, (ii) logistics of supplement implementation and distribution, (iii) health worker's availability, (iv) perceptions of multiple micronutrient supplements and the challenges associated with their use, (v) perceived benefits and side effects of the MMS program.

2.5.4 | Interviews With Health Partners

Health partners include representatives from non-governmental organizations (NGOs) contributing to the implementation of the multiple micronutrient supplementation program at the health district level. Semi-structured IDIs were conducted with two (02) maternal nutrition manager from NGOs and one with maternal nutrition manager from UNICEF. The objectives of these interviews were to understand health partners' perceptions of multiple micronutrient supplements and the challenges associated with their use, their perception of benefits and side effects of MMS program and logistics of supplement implementation and distribution.

2.5.5 | Focus Group Discussions (FGDs) With Pregnant/Lactating Women

Ten (10) FGDs, each with 8 participants including 06 pregnant women and 02 lactating women were organized (five FGDs from each of the two health districts participating in the study). The discussions examined how these women viewed micronutrient deficiency as a threat to their health and their perspectives on MMS as a potential solution to that threat. This included a focus on perceived barriers to the initiation and sustained adherence to supplement use, as well as facilitators that support ongoing adherence. These domains of interest were incorporated into the focus groups to complement individual histories and perceptions.

2.5.6 | FGDs With Key Community Stakeholders

Two (02) FGDs, each with eight key community stakeholders including 6 mothers-in-law and 2 husbands (one FGD from each of the two health districts participating in the study) were conducted. The discussions with key community stakeholders centered on their knowledge about nutritional needs and micronutrient deficiencies, food prescriptions and food proscriptions (i.e. taboos) during pregnancy, and their perceived benefits and side effects of the MMS program.

2.6 | Data Analysis

We conducted a thematic analysis following the framework proposed by Braun and Clarke (2006). Two analysts independently carried out manual open coding and subsequently developed a shared codebook. Through iterative comparison and discussion, the coding framework was refined to identify overarching themes across the data. Regular intercoder agreement checks were performed to ensure analytical consistency, and analytic memos were maintained to document coding decisions and emerging interpretations. This analytical approach was chosen to capture the complex sociocultural, systemic, and

individual factors shaping the uptake of multiple micronutrient supplementation (MMS) within the context of the pilot implementation.

2.7 | Ethical Considerations

This study received approval from the Health Research Ethics Committee (CERS) under deliberation number. 2023-08-199. Written informed consent was secured from participants prior to all individual interviews and FGDs. Additionally, informed consent was also obtained for the digital recording of the interviews. Before the commencement of data collection, briefing notes were disseminated by the Ministry of Health to inform health district managers and local authorities regarding the objectives of the study.

3 | Results

A total of 154 participants divided into 96 FGD participants and 58 IDIS participants were included in our study. One participant, the responsible in charge of supplying health products from the Central Purchase of Generic Essential Drugs and Medical Consumables (CAMEG), dropped out of the study. Table 2 shows the participants' distribution and their characteristics.

The themes identified through the qualitative assessment were (1) supply side findings, (2) demand for the MMS program, (3) changes observed since the introduction of MMS as compared to IFA, (4) barriers to program efficacy and sustainability and (5) facilitators to program efficacy and sustainability. The themes are discussed below.

3.1 | Supply Side Findings

Supply side findings include the following: (i) implementation, (ii) coordination and (iii) service delivery. The first focuses on the opinions of stakeholders regarding training, meetings involving various stakeholders, information sessions for health workers, community engagement and logistics of supplement implementation. The second examines stakeholders' feelings about coordination meetings and management of the MMS program, as this is an essential element in the implementation process of a health intervention. The third focuses on participants' opinions regarding the provision of care including an MMS distribution. Overall, the opinions of the various stakeholders on these three components were positive, but shortcomings or challenges in the coordination meetings have been highlighted.

TABLE 2 | Distribution of stakeholders and their characteristics.

Stakeholder category	Number	Roles/characteristics
National policymakers	13	MOH Family Health, Nutrition, UNICEF/NGO advisors
Regional/District Health Staff	12	Directors, pharmacists, nutrition focal points
Facility clinicians/CHWs	22	Doctors, midwives, nurses, community health workers
Pregnant/lactating women	16	Varied parity, adherence, rural/urban residence
Community influencers	8	Husbands, mothers-in-law, village leaders

3.1.1 | Implementation

Both health managers at the central level, regional and district health officers, clinicians, pregnant and lactating women and community influencers recognized that activities introducing of the MMS program combining training, meetings, information session, had taken place. Prior to the MMS pilot implementation, formative research and supply chain mapping was conducted to inform the pilot program's design. As part of the pilot program, health facilities were supplied with guidelines on effective health service delivery (specific roles of community and health workers), Hemocue devices and monitoring tools (record books). A reference manual, covering dosage, scheduling, management of side-effects, and protocols for MMS use, served as the core training resource.

We designed boxes with images specific to maternal nutrition, we designed posters to display in health facilities; the images, because they speak, we also have leaflets that we give to mothers-in-law, husbands and even wives, and when you look at the leaflets each image speaks. They provided us with baby scales and this year we received more baby scales, thermometers in any case we received quite a few. We also received devices called Hémocue from UNICEF to measure the hemoglobin level.

(From a district health officer)

3.1.2 | Coordination

Key actors of the MMS program including family health managers, nutrition responsables, health central, regional and district officers, heads of maternity wards, and partners like UNICEF and NGOs stated that they were involved in coordination activities including meetings and management of the MMS program. These coordination activities aimed to ensure effective implementation, continuous improvement and to identify challenges and gather insights for future implementation strategies. Despite these initiatives, stakeholders reported fragmented coordination at central and local levels, citing insufficient planning and monitoring, as illustrated by the following quotation:

MMS coordination needed improvement... ineffective planning and delayed supply deliveries hindered adherence.

(From a district officer)

This is partly illustrated by the reported gaps in the supply of monitoring tools, particularly notebooks for tracking hemoglobin, limiting the program's capacity to detect and respond to anemia. The resilience of the supply chain was also tested by

the unfortunate warehouse fire incident in 2021 that was reported to have destroyed the stock and led to prolonged stock-out that forced clinicians to temporarily revert back to IFA, which might have a hard impact on demand for MMS.

3.1.3 | Service Delivery

One of the significant aspects of the MMS program was to improve service delivery during prenatal consultations, providing awareness campaigns and logistical support. To enhance community awareness and compliance with MMS, the Ministry of Health developed a range of visual materials, including image boxes, posters, and leaflets. These resources were intended for display in health centers and for distribution to influential community members, such as husbands and mothers-in-law, thereby reinforcing demand for the maternal nutrition program in general and the MMS in particular.

Each month, the ASBC organizes awareness campaigns called “GASPA groups”, and during these meetings, awareness-raising talks are held. This allows women to better understand the benefits of MMS and encourages them to adhere to taking it without difficulty.

(From a clinician)

3.2 | Demand for MMS Program and Acceptability of MMS

Demand for MMS includes the following: (i) perceived susceptibility to micronutrient deficiencies either during pregnancy or outside pregnancy; (ii) perceptions of MMS acceptability, benefits and side effects. Overall, MMS acceptability and uptake were notably high among pregnant women.

3.2.1 | Perceived Micronutrient Deficiencies to Taking Supplements

The most significant micronutrient deficiency related to taking MMS raised by pregnant and lactating women was anemia. Several women interviewed through FDGs and IDIs revealed that anemia locally known as “blood problem” “was perceived as a serious threat, both during and after pregnancy. Women attributed anemia to dietary insufficiency and were relatively cognizant of the complications it may have during delivery.”

Usually [...] when they don't take blood products, it causes problems because they may lack blood at the time of delivery.

(From a pregnant woman)

However, cultural practices and structural barriers complicated nutritional adequacy. Food taboos, rooted in beliefs that certain foods like dairy, mangoes, and *yogré* (marrow) can have potential harm to the fetus, resulted in their avoidance despite the fact that these foods are nutrient –dense.

In my case, I don't eat milk and dairy products because the child can gain weight leading to complications during childbirth.

(From a mother-in-law)

[...] if you eat mangoes a lot, before delivering the baby, you should deliver mangoes. That is why pregnant women are advised to not eat mangoes during pregnancy.

(From a lactating woman)

Socio-economic constraints (e.g., food insecurity, large household size) and endemic malaria exacerbated existing deficiencies. Despite acknowledging the significance of prenatal nutrition, these systemic inequities hindered adherence to dietary guidelines, highlighting the necessity for context-sensitive interventions that address both biological and socio-cultural determinants of maternal health.

Given that we are in the village, it is difficult to get what we need nutritionally speaking, so we have to deal with what we have.

(From a pregnant woman)

3.2.2 | Focus on MMS Acceptability

The MMS program was perceived by the majority of interviewed participants including (i) pregnant and breastfeeding women, (ii) community members and (iii) caregivers as advantageous compared to IFA. They communicated high acceptance of the MMS supplement.

3.2.2.1 | From Pregnant/Lactating Women

MMS acceptability was high. Women described the product as odorless, easy to swallow, and free of the nausea and vomiting often associated with IFA. The color-coded packaging of MMS was also recognizable even for women with low literacy levels.

MMS is very good compared to iron folic acid because MMS has no odor [...].

(From a pregnant woman)

The analysis is clear, [...] MMS is different from IFA with its nausea. There is no vomiting when vomiting when taking MMS on the contrary of IFA [...].

(From a regional health officer)

The analysis is clear, it is true. Women do not hide their satisfaction about the MMS program. The MMS packaging design, colour and pictogram showing pregnant women are satisfactory characteristics for them [...]. Women are comfortable with MMS [...].

(From a Regional health director)

Women commonly associated the use of MMS with improved maternal health outcomes, expressed as reduced exposure to anemia and enhanced fetal development. Many beneficiaries reported adherence to MMS, citing its tolerability and perceived benefits as key factors contributing to their compliance:

Our common health problem is the blood side. When having a medical examination and the doctor tells us we are anemic, we are lacking blood, they give MMS

pills [...] if you take the pills regularly, the blood problem disappears within the next medical examination deadline [...].

(From a pregnant woman)

3.2.2.2 | From Community Members

Community members including mothers-in-law, husbands and community leaders, had a positive view of MMS mentioning the regular attendance of pregnant women at health centers, a healthy appetite of their wives' and MMS significant contribution to fight against nutritional deficiencies among pregnant women, owing to the national context of high prevalence of such deficiencies. For example, a husband described the following:

I can assure you that even though my wives are menopausal, I know a bit more about the subject from the experience I've gained with my married sons and other young couples. Regarding prenatal care, couples are always motivated to attend health facilities to receive better medical care.

(From a husband)

Below is another quote from mothers-in-law in regarding MMS perceptions.

When our daughters-in-law become pregnant they strictly took and adhered to MMS.

(From a mother-in-law)

3.2.2.3 | From Caregivers

Overall, the MMS program is well-regarded and accepted by caregivers including doctors, midwives, head nurses and village health workers. In their opinion, the MMS program had a positive impact on both women's and children's health. Furthermore, nurses and health workers reported perceiving a decrease in the incidence of low birthweight (LBW), as illustrated by the following quotes:

In any case, from starting the MMS program, we only have positive effects from the supplements because of the reduced number of low-birth-weight as a result of the improved nutritional status of mothers.

(From a clinician)

3.3 | Stakeholder Perceptions of MMS Effectiveness Compared to IFA

Stakeholders across all levels perceived MMS as more effective than IFA in preventing anemia and supporting maternal-fetal health. In addition to stakeholders, health workers also perceived MMS as more effective than IFA in preventing anemia. These perceived improvements were based on the clinical measurements using health record books and essential devices like Hemocue in this program. However, these perceived improvements require further quantitative verification through clinical outcome evaluation. These perceived improvements are illustrated by the following quotes:

Previously, we frequently recorded many cases of nutrient deficiency and anemia among women. Since last November, as I previously stated, it has become rare to transfer a pregnant woman because of anemia. We observed a clear decrease in the incidence of anemia.

(From a clinician)

Based on women's statements, some of them prefer MMS more than iron because, in the past, iron use in pregnancy led to side effects including nausea and vomiting. On the other hand, with the use of MMS, none of these side effects are recorded.

(From a clinician)

Through MMS we observed that the incidence of low-birth-weight babies, neural tube defects decreased. That is reality and it's very promising.

(From a clinician)

3.4 | Barriers to Program Efficacy and Sustainability

A number of supply and demand-side barriers were identified.

3.4.1 | Demand Side Barriers

On demand-side, at the individual level, adherence to MMS was mainly compromised by forgetfulness, early pregnancy nausea, and continued misconceptions. About a third of respondents admitted missing doses, and some doubled the dosage to compensate for missed pills, a practice that was associated with side effects. These findings are illustrated by the following quotations:

My face became strange after taking two pills.

(From lactating woman)

Women report experiencing nausea following consumption, leading to refusal.

(From clinician)

MMS causes oversized babies requiring surgery.

(From clinician)

On the other hand, our findings have identified that maternal health choice, in this case taking MMS or not, was influenced by family members such as mother-in-laws. These intergenerational dynamics underscore the influence of patriarchal structures on maternal health choices, as illustrated by the following quotes:

Mothers-in-law oppose MMS, fearing overdue births.

(From a clinician)

3.5 | Supply Side Barriers

From the supply-side, stock-outs, absence of notebooks for tracking hemoglobin and coordination issues within the health sector were mentioned as barriers to MMS adherence. Below

are two quotes from health workers regarding the shortage of supplies and equipment.

There are stock outs of notebooks for tracking hemoglobin and weight gain.

(From a clinician)

Yes, we sometimes have MMS stock shortages. For instance, at the beginning of MMS program, there were CAMEG [Shops where supplements are supplied, stored for distribution] fires and there were more than 1000 MMS bottles that were burned. So, because of these fires, we had limited supplies of MMS in health facilities during 1 year.

(From a nutrition focal point)

Some health workers identified specific effects of notebooks and MMS tablets stock outs on the program's ongoing effectiveness. These effects involved to back to former practices and delays of frequency of ANC visits, change health facilities reducing effectiveness in some cases.

When there are stock outs of MMS tablets, it's iron and folic acid supplements we give to pregnant women.

(From nutrition focal points)

The main problem concerns the notebooks. We received an initial package of notebooks, but we have currently used all of them. Unfortunately, there are no more in stock at the moment, [...] These stock outs led some women to change health facility.

(From a clinician)

3.6 | Facilitators to Program Efficacy and Sustainability

Several facilitators to MMS program efficacy and sustainability have been identified. The key highlights include (i) health partner support, (ii) community members consent, (iii) raising awareness of the MMS program, (iv) healthcare and nutrition services, (v) Communication around MMS for change.

3.6.1 | Health Partner Support

Many program implementers recognized health partner support as a key factor into program efficacy and sustainability. MMS program settings in the two health districts of Yako and Ziniaré were facilitated by the technical and financial support from UNICEF Burkina Faso and non-governmental organizations (NGOs) such as IBFAN and SEMUS, as illustrated by the following quotation:

In terms of financial sources of this program, it is UNICEF who provided technical support in collaboration with the Ministry of Health of Burkina Faso. Thus, that is the main financial source.

(From nutrition manager)

3.6.2 | Community Members' Consent

The program commenced with an information session and meetings involving various stakeholders including customary, religious, and administrative authorities, as well as community leaders. The purpose of these meetings was to explain the project's rationale and gather support and consent from these key figures. For example, some mothers-in-law reported that strictly encouraged their new daughters-in law to take and adhere to MMS.

Concerning my new daughters-in-law who were in their first pregnancy, we made everything to accompany them at least three times to the antenatal visits to receive MMS.

(From a mother-in-law)

3.6.3 | Raising Awareness of MMS Program

The village health workers played a vital role in community outreach, conducting home visits, and providing educational talks, thereby directing women to health centers for necessary health services. For example, one village health worker stated the following:

Village health workers conduct educational talk activities within meetings called GASPA, which are places set up to raise participant's awareness of MMS program.

(From a village health worker)

Another way to raise awareness of MMS was the design of communication tools including picture boxes and posters stuck on the health centers' walls.

Yes, we have communication tools, including picture boxes, and there are other posters here on the clinic and the maternity walls. The picture boxes are very expressive. Even if some women did not go to school, if you ask them to explain what they saw through the picture boxes, they were able to do so.

(From a clinician)

4 | Discussion

Using the MMS pilot program in Burkina Faso, our study aimed to identify context-specific socio-economic, cultural, and systemic enablers and barriers influencing MMS uptake. Several key findings are worth noting. First, MMS was accepted and preferred over IFA, with perceived improvement in maternal and neonatal outcomes testified by pregnant/lactating women and health workers. Second, supply-side barriers such as stock-outs, delayed deliveries, and inadequate supply of monitoring tools were observed. Third, demand-side barriers including forgetfulness, misconceptions about MMS related to the fear of having oversized babies and related delivery complications, and the influence of family members on health choices of pregnant/lactating women affected adherence to MMS. However, facilitators such as health partners and community members support and consent combined with enthusiastic engagement from community-based health workers have been instrumental in

the program's success, effectively bridging the gap between the community and health services.

A key finding of this study is that MMS was accepted and preferred over IFA, with pregnant/lactating women and health workers perceiving health benefits such as reduced low-birth weight, better appetite, and decreased anemia. The primary reasons mentioned for preferring MMS over IFA were the reduction of side effects and the absence of off-odor, which was also confirmed by studies in Mali and Cambodia. In the Cambodian study, reported side-effects at 30 days were 23% in the MMS group compared to 48% in the IFA group (Sauer et al. 2024). Side effects are often the main barrier to adherence; hence, lower side-effects could mean better adherence to the supplement as reported in studies (albeit in clinical settings) from Mali and Cambodia (Aguayo et al. 2005; Sauer et al. 2024). MMS was also perceived to have maternal and neonatal benefits, which are confirmed in previous qualitative and randomized trials (Smith et al. 2017; Bourassa et al. 2019; Keats et al. 2019; Gomes et al. 2022; Abebe et al. 2025; Ba et al. 2025). For example, in recent research conducted in Ethiopia, Abebe et al. (2025) found that most women (87%) are up to take MMS instead of IFA as they believe MMS will be more beneficial than IFA (Abebe et al. 2025). In another study conducted in Indonesia by Alfaqeh et al. (2025), most participants (90.1%), showed a positive attitude toward MMS. Altogether, these findings suggest that MMS is a superior product, not only for the broader range of nutrients it contains, but also for its sensory acceptability, lower side effects, and perceived improved perinatal outcomes, supporting the existing conclusions on MMS use (Alfaqeh et al. 2025).

One of the major key factors for the MMS program sustainability was male involvement. Most of the male from community members were willing to encourage women take and adhere to SMS. These findings might be attributed to widespread sensitization efforts to raise awareness about the program's benefits among communities. In sub-Saharan Africa, including Ethiopia, it is well-known that males have a significant influence on their wives and their health. The latter often need their support before receiving antenatal care services (Bhatta 2013; Paulos et al. 2020).

In addition to the quality attributes of the supplement, ensuring adequate supply is critical to ensure a successful transition and adherence to MMS. MMS, when delivered, is integrated into the existing health system as part of ANC activities, which often experience a number of challenges including suboptimal supply of resources, stock-outs, poor accessibility of health facilities, high turnover, poor motivation of the health workforce, and limited supportive supervision. The motivation from the health workforce witnessed in this study may partly help facilitate uptake of MMS, but sustaining this motivation would require streamlining the supply and support towards the health workforce operating at ground level. Indeed, motivated midwives supported with job aids can play a key role in creating demand and improving adherence as observed in a study in Mali (Ba et al. 2025).

While counseling during ANC serves a key role in creating demand, prior knowledge of pregnant women about anemia and its consequences can help (Nechitilo et al. 2016). Our study highlighted that anemia is a key concern of women and the

risks associated with it are also relatively well understood. While this can facilitate uptake of nutritional messages, a number of challenges remain. First, concerns related to the risk of having an oversized baby due to taking supplements, as reported in many countries, were also reported in Burkina Faso (Zerfu et al. 2016; Ba et al. 2025). Second, health choices were found to be highly influenced by mother-in-law, husbands, and other family members. Hence, promotion of MMS and related maternal interventions should target not only women but also family members (Khaled et al. 2024; Ba et al. 2025). Third, in line with earlier findings, forgetfulness was a key barrier to adherence. As illustrated in our study, attempts to compensate for missed dosage were associated with adverse outcomes; hence, support materials such as trackers, SMS messages, or designs of blisters that can facilitate tracking should be sought (Gomes et al. 2021; Ba et al. 2025). However, the ineffective coordination raised combined to shortage of health record books and essential devices like Hemocue should be viewed as major shortcomings for ensuring a consistent and regular flow of information. This is crucial for maintaining a coherent understanding of ground-level activities. In this study, ineffective coordination: issues in aligning activities efficiently, causing delays and reduced effectiveness in some cases. All of barriers raised in this study were also supported by other qualitative findings from Ethiopia, in which authors stated that forgetfulness, social beliefs and fear of health risks like getting oversized baby discouraged the use of MMS during pregnancy (Abebe et al. 2025).

The present study is among the few studies documenting lessons learned from a pilot MMS implementation project, capturing a multi-stakeholder perspective spanning policy-makers, clinicians, community influencers, and beneficiaries. The identification of actionable supply- and demand-side barriers and facilitators helps provide a roadmap for adapting the program and informing effective scale-up. However, it should be noted that the present findings may be context-specific to the pilot project sites and additional studies may be needed to capture areas with different sociocultural backgrounds. All health outcomes reported represent stakeholder perceptions collected through interviews and have not been verified through in depth clinical measurements. Detailed information on women's parity, adherence levels, and geographic differences in terms of percentages of the studied population would have strengthened this work. Besides, given the implementation of the pilot during the COVID-19 pandemic, some of the gaps in the supply system may be related to disruptions related to the pandemic. It's important to highlight that the MMS program was implemented in times of two major crises in Burkina Faso including the COVID-19 pandemic and terrorism. This public health emergency of national and international concern combined to the terrorism were serious threats to the social dynamics and security of Burkina Faso. Their impact on the program efficacy and sustainability were probably underestimated in this study. The generalizability of these findings to other regions in Burkina Faso should not systematically be done. Each region of the country has its own specific context, including geographic differences, security measures, individual health status, socio-economic factors, and cultural norms. The latter could influence the MMS program

sustainability and efficacy. The latter are particularly determinant for MMS efficacy and sustainability in some regions owing the increasing concerns about the humanitarian conditions due to terrorism. Some of the findings may also be prone to social desirability bias, although the findings were triangulated and were confirmed by findings from other studies including quantitative studies.

5 | Conclusion

The findings of this study underline the multitude of factors that can determine the success of an MMS program, ranging from product (supplement) quality attributes to supply chain efficiency, sociocultural norms, and individual level behaviors as simple as forgetfulness. The high acceptability, largely due to fewer side effects, the perceived benefits of MMS and the leveraging of existing health systems were facilitators for a successful program. On the other hand, misconceptions like food taboos and fear of an oversized baby due to adherence to supplementation should be countered. Improvement in the coordination and logistics of the program along with frequent supportive supervision help adapt the program and improve coverage and adherence. Local production of MMS and further optimization of distribution channels can help alleviate supply-related challenges. Altogether, the findings of this study provide a roadmap for adapting the program and inform effective scale-up.

Author Contributions

F.B., A.R.B., W.A.R.Z., B.O., A.L., S.N. and K.B. participated in conceptualizing the study and developing the protocol. F.B., A.R.B., W.A.R.Z., K.B., and B.O. implemented the study. F.B., A.R.B., W.A.R.Z., and K.B. analyzed. J.D., A.S., O.O., B.O., D.K., C.P., and M.H.D. provided critical inputs/comments for the analysis and reviewed the draft manuscript. FB wrote the first draft. All authors reviewed and approved the final version of the manuscript.

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Disclosure

The funder had no role in the study design, data collection, analysis, interpretation or report writing, or approval of the manuscript and decision to submit the manuscript for publication.

Data Availability Statement

Data supporting the findings of this study are available upon reasonable request from the corresponding authors Kaleab Baye and Fabrice Bationo.

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