THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

Improving Maternal Nutrition in Tanzania

Introducing Multiple Micronutrient Supplements (MMS) by strengthening health systems

A country-level implementation research study

Tanzania Food and Nutrition Centre

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Contents

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Dr. Germana Leyna

Managing Director

List of abbreviations and symbols

AAPH	African Academy for Public Health
ANC	antenatal care
CHMT	Council Health Management Team
CHW	community health worker
COUNSENUTH	Centre for Counselling, Nutrition and Health Care
CRS	Catholic Relief Services
DHIS2	District Health Information System 2
DHS	Demographic Health Survey
DiD	difference-in-differences
FGD	focus group discussion
FILTAR	Find, Link, Treat, Audit, Retain
Hb	haemoglobin
HMIS	health management information systems
HSP	health service provider
IDI	in-depth interview
IFA	iron folic acid
IHI	Ifakara Health Institute
IMAN	Improving Maternal Nutrition
KII	key informant interview
LGA	Local Government Authority
MMS	multiple micronutrient supplementation
MoH	Ministry of Health
MSD	Medical Store Department
MUAC	mid-upper arm circumference
MUHAS	Muhimbili University of Health and Allied Sciences
NIMR	National Institute for Medical Research
PO-RALG	President's Office, Regional Administration, and Local Government
PPS	probability proportional to size
RCH	reproductive and child health
RHMT	Regional Health Management Team
SBCC	social and behaviour change communication
SMS	short message service
SOP	standard operating procedure
TAG	Technical Advisory Group
TDHS	Tanzania Demographic Health Survey
TFNC	Tanzania Food and Nutrition Centre
UIC	urinary iodine concentration
UNICEF	United Nations Children's Fund
UNIMMAP	United Nations International Multiple Micronutrient Antenatal Preparation
WASH	water, sanitation and hygiene
WHO	World Health Organization

CHAPTER 1

Executive summary

Background

Between 1992 and 2022, Tanzania made progress in improving the nutritional well-being of under-five children notably in reducing childhood stunting from 50 per cent to 30 per cent. However, progress has not uniformly reached all demographics, especially adolescent girls and women. The 2022 Tanzanian Demographic Health Survey (TDHS) shows that 56 per cent of pregnant women had anaemia and, despite the availability and accessibility of antenatal care (ANC), only 65 per cent adhere to the national guideline of four or more ANC contacts, with low utilization of iron folic acid (IFA) supplements during pregnancy. Maternal malnutrition significantly impacts pregnancy outcomes, influencing maternal and neonatal mortality rates. Tanzania's maternal mortality rate stands at 104 deaths per 100,000 live births, and neonatal mortality at 24 deaths per 1,000 live births (DHS, 2022).

To better understand and address these trends in Tanzania, UNICEF launched the Improving Maternal Nutrition (IMAN) Project in collaboration with Tanzania Food and Nutrition Centre (TFNC) in 2019. The project comprised two parts: first, conducting a **baseline maternal nutrition landscape analysis** among pregnant women in the Mbeya Region and second, using these findings to inform an **18-month implementation research study** in Mbeya to improve maternal nutrition and well-being among pregnant women.

The baseline analysis, conducted between 2019 and 2021, found high anaemia rates and micronutrient deficiencies and late ANC bookings resulting in inadequate ANC contacts and services. The barriers to ANC attendance included distance to healthcare facilities, lack of spousal support and poor quality of services. These statistics underscored the need for targeted interventions to bolster maternal and child nutrition initiatives, ensuring equitable access to essential healthcare services and nutritional support across all segments of the population. Building on this analysis, the project implemented an 18-month implementation research study aimed at improving maternal nutrition in Mbeya. This included assessing a Find, Link, Treat, Audit, Retain (FILTAR) strategy to increase ANC uptake and adherence in addition to tailored care packages with either existing IFA or with multiple micronutrient supplementation (MMS), which World Health Organization (WHO) recommends in the context of implementation research.

Purpose

The IMAN Project aimed to strengthen the health system's enabling environment for sustainable delivery of a low-cost, high-impact maternal nutrition package, including the promotion of healthy diets and uptake of IFA/MMS. The project addressed key barriers to service delivery, including human resource capacity, supply chain challenges and cultural and social norms. In particular, the implementation research study intended to generate new evidence to understand the barriers hindering IFA uptake and adherence before the country can shift to

MMS utilization. The project aimed to understand if addressing those bottlenecks would increase both IFA and MMS adherence. Considering the added benefits of MMS, evidence of improved adherence would make it easier for Tanzania to opt to shift from IFA to MMS. The feasibility and potential impact of a modified care package will inform decision-making and potential scale-up of MMS in the Tanzanian context.

Study design

This implementation research study was conducted across three districts within Mbeya: Kyela, Chunya and Mbarali. During the 18-month study period (August 2022 to March 2024), all pregnant women in the locations were assigned to three different groups (*see below box*).

To evaluate the effectiveness of the different interventions, the study conducted: 1) **a quantitative endline assessment** with proportional samples of eligible pregnant and lactating women with children aged 0–6 months, and 2) **a qualitative endline assessment** with key actors from across the IMAN Project.

- **Arm 1 (intervention group):** Kyela was assigned to use MMS with enhanced ANC clinic (quality of care) and community promotion (demand generation) by delivering a comprehensive maternal nutrition care package (nutrition assessment, nutrition education and counselling) through the FILTAR strategy.
- **Arm 2 (intervention group):** Chunya was assigned to use IFA with enhanced ANC clinic (quality of care) and community promotion (demand generation) by delivering a comprehensive maternal nutrition care package through the FILTAR strategy.
- **Arm 3 (Control group):** Mbarali was to continue with the usual standard of care (IFA).

Results

In total, the implementation research study reached 73,186 women – with 12,505, 32,401 and 28,280 coming from Kyela, Chunya and Mbarali, respectively. Specifically, within the intervention regions, the project covered 100 per cent of health facilities and 98 per cent of eligible women in Kyela and 92 per cent in Chunya. A total of 148 health service providers (HSPs) (88 from Kyela and 60 from Chunya) and 322 community health care workers (CHWs) (221 from Kyela and 101 from Chunya) were trained to deliver the complete IMAN intervention package. Both the quantitative and qualitative evaluations showed positive results within the intervention districts of Kyela and Chunya, with practical lessons learned for potential national scale-up:

1. Enabling environment for maternal nutrition services

Enabling environments were strengthened by ensuring the availability of essential measuring tools such as mid-upper arm circumference (MUAC) tape and haemoglobin (Hb) machines; capacity strengthening of HSPs; availability of new reproductive and child health (RCH) cards that promote eight ANC contacts, updated from the previous card that promoted four contacts; improved monitoring and tracking systems to ensure most indicators were tracked through the District Health Information System (DHIS2); improved training manuals to cover components of nutrition during pregnancy, anaemia

and nutrition assessment; and availability and utilization of ANC guidelines to treat anaemia.

2. ANC services: uptake and adherence

The proportion of women who attended ANC services during the first trimester (<12 weeks) increased by 9.1 per cent and 29.4 per cent in Kyela and Chunya, respectively, as did the proportion of recently delivered women with optimal ANC contacts (4+) during pregnancy which increased by 84.2 per cent and 78.4 per cent in these districts, while remaining unchanged in the control district of Mbarali. For both intervention districts, the average number of ANC contacts among pregnant women increased from three to six contacts during the 18-month implementation research study period with no change in Mbarali. Both intervention districts saw significant improvement in ANC services compared with the control district. Nearly all pregnant women attending ANC underwent screening for Hb at each ANC contact in Kyela and Chunya, while pregnant and recently delivered women received more ANC services overall (such as antimalarials, deworming, weighing, urine test, blood pressure, Hb level, MUAC, syphilis tests, etc.) during their ANC contacts than in Mbarali. The proactive FILTAR strategy, provision of equipment, consistent supplies, involvement of male partners, and welcoming environment at health facilities were cited as influencing the positive uptake of ANC services. Overall, participants expressed satisfaction with the improved health services, highlighting that comprehensive care translates into better use of services, including subsequent ANC contacts.

The proportion of pregnant women who adhered to IFA or MMS for more than 90 days was highest in the intervention districts of Kyela (MMS: 93 per cent) and Chunya (IFA: 90 per cent) compared with Mbarali (IFA: 78 per cent). This represented an adherence increase of 39 per cent for MMS in Kyela and 19 per cent for IFA in Chunya, from 54 per cent and 71 per cent in Kyela and Chunya respectively. Some barriers were cited on the use of IFA, including the pill's smell, nausea, vomiting, dizziness and exhaustion. Despite these challenges, pregnant women in Chunya reported that they continued to take the pills as they were aware of their importance. In Mbarali, however, women had a limited understanding of how to navigate side effects. Very few women in Kyela complained of any MMS side effects. Notably, as the current anaemia treatment guideline in Tanzania advocates for the utilization of IFA for anaemia management, few women were transitioned from MMS to IFA in response to incidents of anaemia.

3. Health and nutrition behaviours and barriers among pregnant and lactating women

During the implementation research study, women were advised on the importance of supplementation (MMS in Kyela and IFA in Chunya) and key optimal nutrition behaviours. Emphasis was placed on eating a balanced diet to acquire all necessary nutrients, especially micronutrients. As such, there was an increase in consumption of some healthy foods across intervention districts. The proportion of women who consumed at least one serving per day of dark leafy green vegetables rose from 37.1 per cent to 45.9 per cent. The percentage of women who consumed at least one serving of fruit per day increased from 5.9 per cent to 31.5 per cent.

4. IMAN Project outcomes of acceptability, fidelity, sustainability and scalability

The widespread acceptance (51 per cent) of MMS stood out as a significant result, with both HSPs and the community

recognizing its benefits in enhancing maternal and child health outcomes. In addition, the early identification of pregnant women in the community and their linkage to health facilities for optimal health outcomes for mother and baby received high acceptance.

> *For me, MMS is better because even if I feel nauseated while taking it, the nausea disappears quickly unlike when I was taking the red tablets (IFA). When I was using the red tablets, if I took them in the morning the discomfort would last the entire day until evening, and it was only nausea, nothing else.*
>
> – **Pregnant woman**
> (Kyela, Mbeya Region)

Implementation fidelity was high at both community and facility levels. CHWs adhered to the key components of the training manual, while HSPs conducted counselling, antenatal screening and provision of services as stipulated in national guidelines. This included providing IFA according to national guidelines and MMS according to WHO global guidelines. Participants felt that interventions would likely be sustainable as the project utilized existing health care reporting systems, procurement channels and human resources for intervention delivery. The engagement of key community stakeholders, including local leaders and male partners, was identified as a strong sustainability factor for maintaining project gains. However, new tools not integrated into existing systems were perceived as increasing the workload among service providers and were deemed unsustainable.

Regarding scalability, participants expressed optimism, particularly concerning the increasing demand for maternal health services and MMS acceptability. They anticipated a rise in demand due to the perceived benefits of MMS and its positive reception among both HSPs and recipients. This anticipation of increase in demand underscored the necessity for sustainable supply chains and consistent MMS availability to meet the growing needs of expectant mothers. Participants emphasized the importance of timely availability of MMS to facilitate seamless implementation without interruptions.

> *The demand will continue to increase. Expectant mothers will use it [MMS] in high quantities; therefore, the supply and availability should be sustainable. When MMS is available on time, we will be free to implement it because no woman has experienced MMS side effects.*
>
> – **Health service provider**
> (Kyela, Mbeya Region)

Conclusion and recommendations

The IMAN Project increased the uptake of positive behaviours among pregnant women accessing health services, most notably with improved timely ANC contacts within 12 weeks of gestation, improved use of MMS, IFA and other health services, and fewer reported barriers to the use of ANC services. The positive results within the intervention districts of Kyela (MMS) and Chunya (IFA) – compared with the control district of Mbarali – demonstrated an increase in

the coverage of adequate, equitable and quality maternal nutrition services, especially at the facility level.

The newly generated evidence helped to identify barriers hindering the uptake and adherence of IFA before the country shifts to the use of MMS. The IMAN Project demonstrated that addressing uptake barriers and strengthening the health system can increase MMS adherence, suggesting it was time to shift from IFA to MMS use. MMS proved to have higher acceptability because it causes less discomfort for women while offering similar anaemia prevention benefits as IFA. It also reduces fetal deaths, low birth weight and pre-term births. Furthermore, the multiple nutrients in MMS can address gaps in dietary diversification among pregnant women, which was observed to be significant due to poor economic status. It is important to acknowledge that the decision to focus on a broad system rather than a specific product (MMS or IFA) was a key strength of the IMAN Project.

As such, the following recommendations are proposed for improving maternal nutrition in Tanzania:

Strengthen the health care system, investing in infrastructure, human resources and logistics for efficient delivery of supplements and comprehensive maternal care through ANC services.

Integrate MMS into the essential drugs list for ANC to enhance adherence and ensure its consistent supply. A small amount of iron supply also needs to be sustained for anaemia treatment.

Strengthen the implementation of eight WHO-recommended ANC contacts for pregnant women attending ANC contacts nationwide, accompanied by complementary interventions. This standardized approach ensures consistent and comprehensive maternal care throughout pregnancy, leading to improved health outcomes for mothers and newborns.

Increase the number of HSPs at all levels of health facilities and provide frequent refresher courses on maternal nutrition service delivery. This initiative aims to reduce waiting times, alleviate workloads and maintain the quality of care. By enhancing staffing levels, health care facilities can sustain the delivery of intervention packages without compromising quality.

Explore innovative methods to motivate CHWs to prioritize community work over health facility duties, which commonly hamper their community activities. By improving the quality of services offered by CHWs and their increased reporting rate, the overall effectiveness of nutrition counselling during pregnancy can be enhanced.

Integrate the IMAN Project supplementary data collection tools into existing health management information systems (HMIS) to streamline processes, minimize duplication and alleviate the workload burden on HSPs. This integration enhances efficiency, promotes sustainability and facilitates the generation of accurate and comprehensive health data for informed decision-making and programme evaluation

Decisions made by the Government based on the endline assessment results

The evidence generated from the baseline, overall implementation research and endline assessment was presented during the Technical Advisory Group (TAG) meeting held on 13 December 2024. As a result, the Government of Tanzania, through the Ministry of Health (MoH), approved the transition from IFA to MMS use among pregnant women nationwide and authorized its scale-up. The primary direction established by the TAG was to develop a national roadmap and costed action plan for scaling up this initiative throughout Tanzania.

CHAPTER 2

Introduction

Background

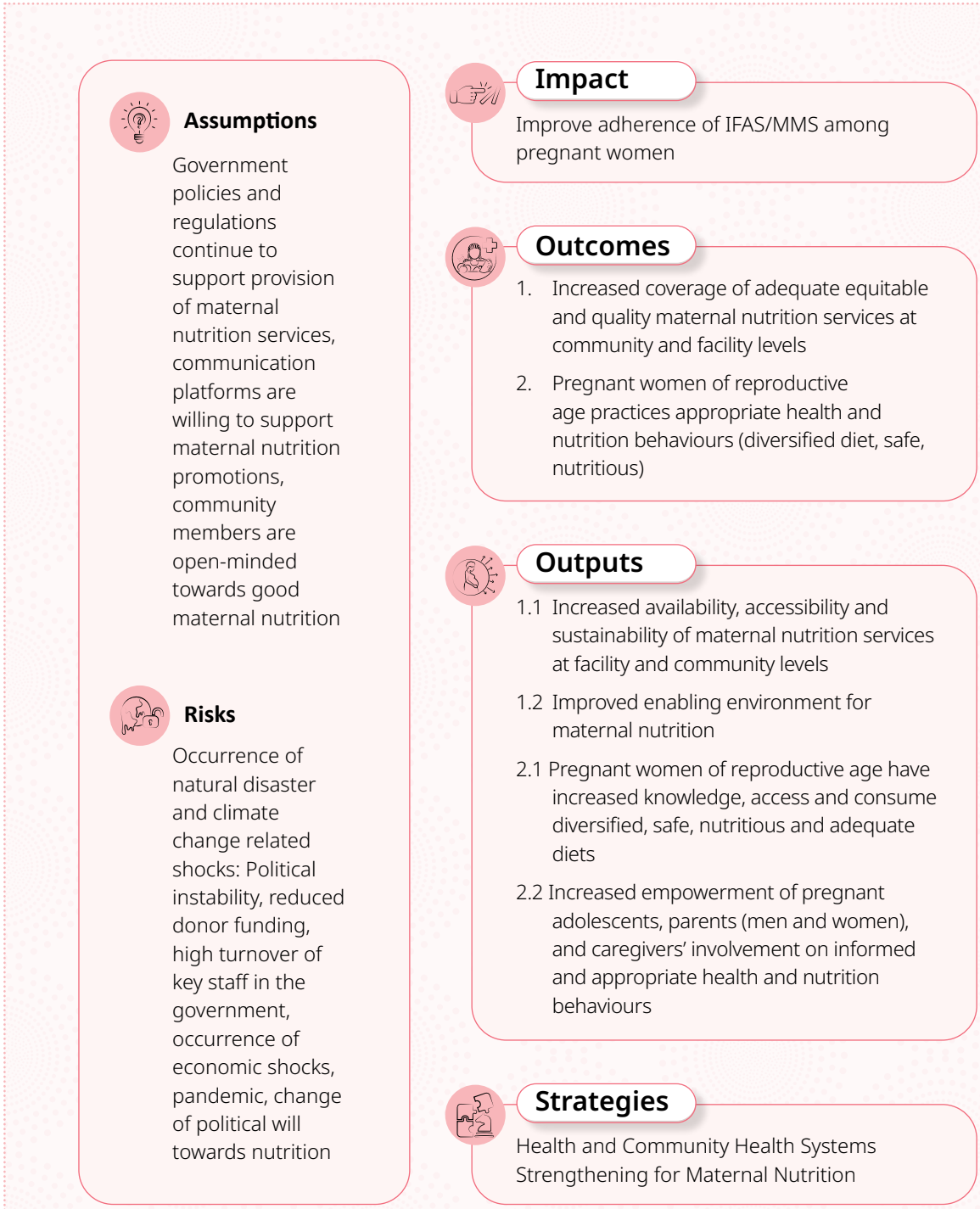
Between 1992 to 2022, Tanzania has made progress in improving the nutritional well-being of under-five children, notably reducing childhood stunting from 50 per cent to 30 per cent. However, while this progress is commendable, it has not been uniformly mirrored across all demographics, particularly among adolescent girls and women. Data from the 2022 DHS reveals concerning anaemia prevalence among women aged 15–49 years (42 per cent) and pregnant women (56 per cent). Although a substantial majority of pregnant women receive antenatal care from skilled health care providers, only 65 per cent adhere to the national recommendation of four or more ANC contacts, indicating that the uptake of these recommended contacts remains suboptimal. Moreover, IFA use during pregnancy, a critical intervention to combat anaemia and improve maternal health outcomes, is also below desirable levels. Nearly 80 per cent of pregnant women reported using IFA, but only 41 per cent consumed the recommended 90 or more tablets during their pregnancy (TDHS, 2022). MMS is another critical supplementation intervention that provides 15 essential vitamins and minerals. When manufactured using the United Nations International Multiple Micronutrient Antenatal Preparation (UNIMMAP), it is a safe and effective way to improve the diets and nutritional status of pregnant women. While MMS has not yet been scaled up in Tanzania, WHO recommends that pregnant women use MMS in the context of a research programme as part of a holistic package of 16 interventions to improve their nutritional status.

The repercussions of maternal malnutrition extend far beyond the individual level, exerting profound effects on pregnancy and birth outcomes. These adverse conditions impact maternal and neonatal mortality rates, ultimately creating long-lasting consequences for women and children, families, communities and the country's economy. According to WHO data, Tanzania's maternal mortality ratio remains high, estimated at 104 deaths per 100,000 live births (TDHS, 2022). Additionally, the country's neonatal mortality rate, standing at 24 deaths per 1,000 live births in 2022, reflects a marginal decrease of two points over a decade (TDHS, 2022). These statistics underscore the urgent need for targeted interventions and sustained efforts to bolster maternal and child health initiatives, ensuring equitable access to essential health care services and nutritional support across all segments of the population.

Responding to this context, UNICEF collaborated with TFNC to launch the IMAN Project. The initiative began with **a baseline maternal nutrition landscape analysis** in Mbeya, which informed an **18-month implementation research study** aimed at improving maternal nutrition and well-being among pregnant women in the district. The project was carried

out in four general phases: exploration through a baseline analysis, design, implementation research study and endline assessment. It was based on the IMAN theory of change, which aimed to address gaps in maternal health and nutrition services observed during the baseline assessment in Mbeya (*see Figure 1*).

Figure 1: IMAN Project theory of change



Purpose

Compromised adherence to ANC services in Tanzania contributes to maternal anaemia. Factors such as late ANC booking and low IFA intake (defined as fewer than 90 tablets during pregnancy) persist despite the reportedly high distribution rates of IFA to pregnant women during ANC visits. As a result, anaemia among pregnant women has remained above 50 per cent for the past two decades, contributing to poor pregnancy outcomes. Recent evidence of the superiority of MMS over IFA in providing crucial micronutrients for better nutrition and health outcomes for pregnant women (Keats et al., 2022; Smith et al., 2017) inspired the inception of the IMAN Project. The project aimed to strengthen the health system and enabling environment for sustainable delivery of a low-cost, high-impact maternal nutrition package – one that included the promotion of healthy diets and MMS uptake. The project's implementation research study aimed to generate new evidence on the feasibility and potential impact of a modified care package that includes MMS. This evidence can inform decision-making regarding potential scale-up in the Tanzanian context. The approach was aligned with the WHO global ANC recommendations, which include the provision of MMS in the context of informed programmes through implementation research. Such research was designed to optimize MMS introduction by assessing its acceptability, feasibility, sustainability and equity.

The overall objective of the project was to assess the effectiveness of strengthening the health system and enabling environment to increase the uptake of ANC services, including MMS, among pregnant women in Mbeya. The project had four **specific objectives**:

- To assess the enabling environment for maternal nutrition services
- To evaluate the uptake and adherence to ANC services
- To understand health and nutrition behaviours, as well as barriers faced by pregnant and lactating women
- To assess key IMAN Project outcomes, including acceptability, fidelity, sustainability and scalability

Baseline maternal nutrition landscape analysis

Conducted between 2019 and 2021, the baseline analysis found that about 38 per cent of pregnant women had serum ferritin deficiency, 62 per cent had a Hb range of 10.0–10.9 g/dl representing mild anaemia, and 0.93 per cent had a Hb of less than 7.0g/dl representing severe anaemia. Anaemia prevalence was lowest among pregnant women with less than 12 weeks gestation (21.3 per cent) compared with those at 12–26 weeks (26.9 per cent) (Abdallah et al., 2022). Multiple micronutrient deficiencies among pregnant women were high, with deficiencies in iron at 38 per cent, vitamin A at 46.1 per cent, serum folate at 24.0 per cent, and vitamin B12 at 9.7 per cent, including a median urinary iodine concentration (UIC) of 279.4 µg/l (John et al., 2023). Four out of 10 experienced at least one form of micronutrient deficiency, with 15 per cent having a double burden and 2.2 per cent experiencing a triple burden (Mchau et al., 2024). Only 12.6 per cent and 29.3 per cent of pregnant women consumed at least four servings of fruits and vegetables per week, respectively (Killel et al., 2024). Most pregnant women book their ANC contacts late and hence achieve below the minimally recommended eight ANC contacts. Evidence indicated that only 53 per cent of pregnant women attended ANC within the first trimester, while 74 per cent started ANC at 12–26 weeks gestation and 50 per cent of women sought ANC services just two to three times.

The baseline analysis also identified barriers faced by pregnant women in using ANC and delivery services. These barriers included distance to the health facility, challenging geography, lack of spousal/partner support and traditional beliefs associated with pregnancy. Furthermore, the demand for ANC services was low due to the suboptimal quality of health care services.

Implementation research study

The baseline analysis findings highlighted the need for context-specific nutrition programming through a holistic maternal nutrition care package – one that includes healthy diets and supplementation. The 18-month implementation research study (August 2022 to March 2024) worked through the existing health system to promote essential nutrition actions, including IFA and MMS supplementation during pregnancy; improve the quality and uptake of ANC; integrate essential nutrition actions into ANC guidelines; promote the delivery of ANC services with skilled and trained attendants; emphasize sensitizing pregnant women to practise appropriate nutrition behaviours, such as daily intake of IFA/MMS and consumption of diverse, safe and nutritious foods; and advocate for supportive male involvement.

Figure 2: Training modules and available resources for HSPs

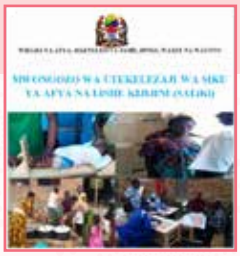
MODULE 1: Overview Of Maternal Nutrition

MODULE 2: Nutrition Assessment

MODULE 3: ANC Services

MODULE 4: Maternal and Nutritional Counselling

MODULE 5: IMAN Project Strategy with Focus on SBCC



MODULE 6: Planning and Budgeting

MODULE 7: Supply Management

MODULE 8: Monitoring and Reporting

The study delivered a comprehensive IMAN care package to both intervention districts (Kyela and Chunya) consisting of early identification and surveillance of pregnant women, nutrition assessment, nutrition counselling, preventive measures through the administration of either IFA and MMS supplementation, and monthly Hb estimation using Haemocue in health facilities. This package was administered to pregnant women by trained HSPs and CHWs at both health facilities and community levels, respectively.

Prior to the study, training sessions were conducted for 92 HSPs in Kyela and 66 HSPs in Chunya, using available resources (*see Figure 2*). Additionally, 221 CHWs from Kyela and 101 CHWs from Chunya were trained to undertake various tasks related to maternal nutrition. The training covered key modules, including: nutrition and health during pregnancy, dietary diversity for pregnant women, nutrition assessment for pregnant women, prevention of anaemia in pregnancy, social and behaviour change communications (SBCC) strategies, nutrition counselling skills using flipcharts and RCH cards, and nutrition data collection and reporting using a digital data collection system.

Figure 3: FILTAR implementation strategy

The FILTAR strategy will be applied to support successful implementation of interventions across five key components

Find

The programme will invest in the Human Resources for Health (HRH) component of the health system by influencing recruitment of adequate and competent CHWs from within intervention villages, as well as skilled health workers (SHWs) for follow-up care.

Link

CHWs will encourage prompt ANC/RCH clinic attendance and schedule ANC/MCH clinic appointments using mobile phone devices during initial CHW visit (Link).

Treat

ANC/RCH clinics in health facilities will provide the complete EHC package to each subject and will mainly address the quality-of-service delivery, technologies and commodities component. Services include haemoglobin testing using haemocue machines and malaria testing using rapid diagnostics tests (RDTs).

Audit

**The programme will implement a quality data plan that includes supervision, regular data quality audits (DQA) and supply assessments to evaluate the completeness, accuracy and timeliness of monthly facility reports submitted to the district level.

Retain

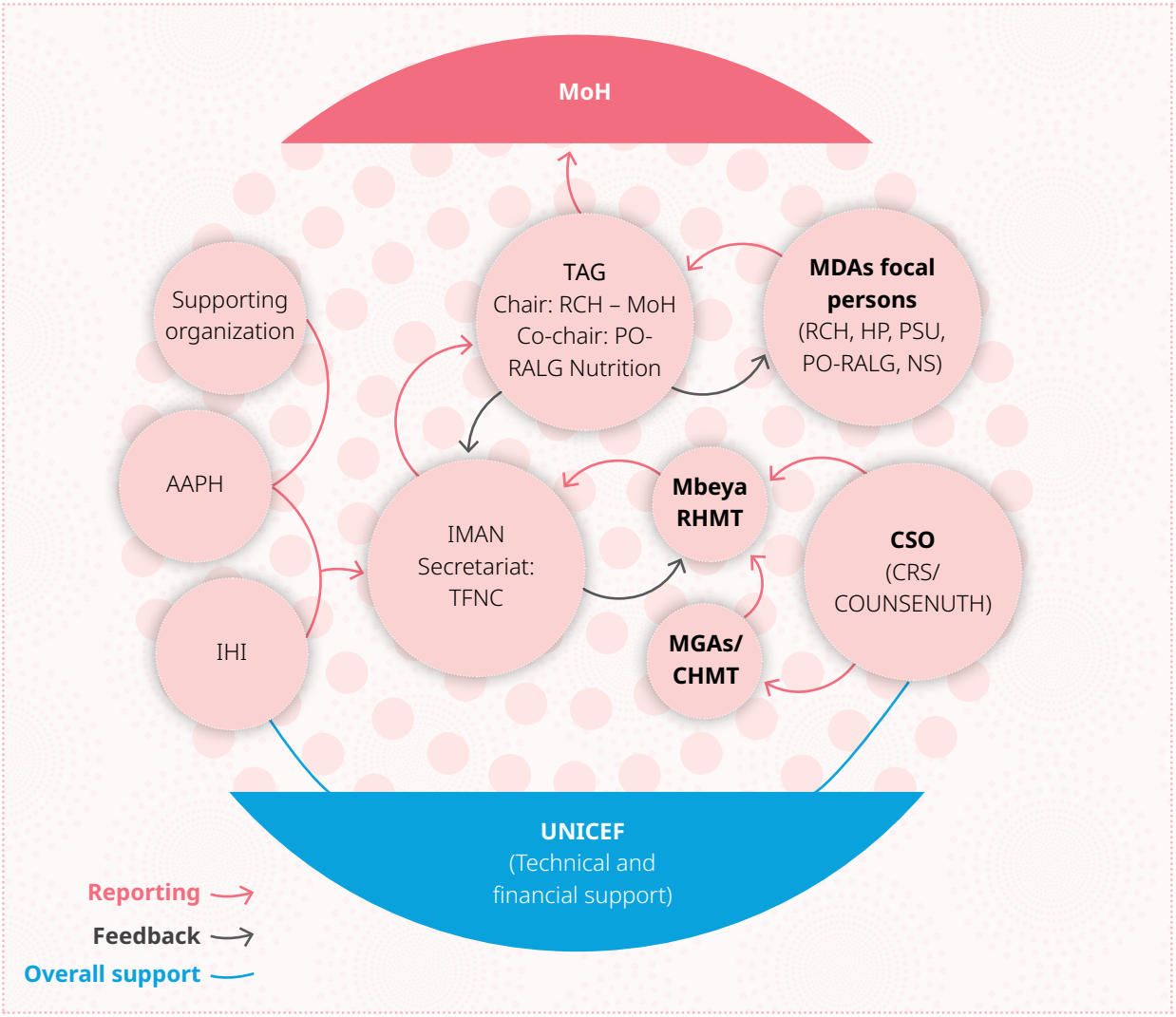
Subjects will be tracked, and if a woman defaults on appointments, a CHW will visit her home to provide counselling to the woman and her family, and accompany the woman to the health facility for her ANC/MCH visit.

**Delivery of the intervention package requires direct investment in human resources, commodities, delivery platforms, nutrition governance and information systems.

To facilitate behaviour change, SBCC "Campaign-in-a-Box" materials on maternal nutrition were developed, validated and disseminated at the community level. These materials aimed to promote early ANC booking, intake of IFA or MMS, consumption of nutritious diets containing animal-origin foods, and male involvement in supporting their pregnant partners. The SBCC messages were designed to be disseminated in the community through jingles, radio spots, flipcharts and posters.

For successful implementation, the study designed the FILTAR strategy (*see Figure 3*) and coordinated the participation of various key stakeholders including the MoH (including, Nutrition, Health Promotion and Reproductive and Child Health teams), TFNC, the President's Office – Regional Administrative and Local Government (PO-RALG), Mbeya Regional Secretariat and Local Government Authorities (LGAs), UNICEF, Catholic Relief Services (CRS)/ COUNSENUTH, the Procurement System Unit, the Medical Store Department (MSD), the African Academy for Public Health (AAPH), the Ifakara Health Institute (IHI), and TAG (*see Figure 4*).

Figure 4: IMAN coordination structure



CHAPTER 3

Study methodology

Study design

The implementation research study was conducted in three districts within Mbeya – Kyela, Chunya and Mbarali. The Mbeya Region was selected for the project based on several factors: high prevalence of stunting (38 per cent, TDHS 2016), low adherence to IFA supplementation (31.5 per cent taking less than 90 tablets) and high adolescent pregnancy (33 per cent, TDHS, 2016). Additional selection criteria included the existence of quality infrastructure, a functional network of CHWs established in over 80 per cent of villages, and HSPs who had received on-the-job training, mentoring and coaching on maternal and child nutrition in each health facility. The existence of international and local partners, who support LGAs in that region, was also pivotal in choosing the project's location. The three districts were then selected based on a high score of multiple deprivations experienced by their communities, including relatively higher levels of anaemia among women of reproductive age.

The implementation research study was a mixed-methods non-randomized quasi-experimental design and secondary data analysis. During the 18-month study period (August 2022 to March 2024), all pregnant women were assigned to one of the following three research arms depending on which district they were from:

- **Arm 1 (intervention group):** Kyela, which was assigned to switch from IFA to MMS use, with enhanced ANC clinic (quality of care) and community promotion (demand generation) through the delivery of a comprehensive maternal nutrition care package via the FILTAR strategy
- **Arm 2 (intervention group):** Chunya, which implemented the standard of care – IFA supplements, with enhanced ANC clinic (quality of care) and community promotion (demand generation) through the delivery of a comprehensive maternal nutrition care package via the FILTAR strategy
- **Arm 3 (control group):** Mbarali, which continued with the usual standard of care – IFA supplements to pregnant women

Throughout the implementation research study, evidence was collected on the enabling environment, delivery systems (including issues related to demand and data systems), supply systems, and experiences in identifying and addressing barriers to uptake and utilization of maternal nutrition services. The study's long-term outcomes to be assessed included effectiveness, acceptability and sustainability of the intervention in terms of increased coverage of adequate, equitable and quality maternal nutrition services at the community and facility levels. This included the adoption of appropriate health and nutrition behaviours, including adherence to the consumption of diversified safe, nutritious and adequate foods by pregnant women.

To assess the impact of the various interventions, the study conducted: 1) **a quantitative endline survey** with proportional samples of eligible pregnant and lactating women with children aged 0–6 months; and 2) **a qualitative endline assessment** using an exploratory approach with key actors from across the IMAN Project.

Study participants

Under the implementation research study, pregnant women and lactating women with children aged 0–6 months living in Kyela, Chunya and Mbarali districts were reached. A sample size of the total study participants was then selected to undertake a quantitative endline survey that assessed ANC services uptake and adherence during pregnancy, as well as MMS acceptability.

Pregnant women and recently delivered women attending RCH clinics at the time of the quantitative endline assessment were screened for eligibility to participate in the study. Pregnant women were eligible if they were attending their third or later ANC contacts on the day of the interview, allowing for an assessment of adherence to IFA/MMS uptake for 90 days or more. Recently delivered women were eligible only if they had children aged 0–6 months, to reduce recall bias.

The study also included only women who had resided in the project area for at least six consecutive months. This inclusion criterion ensured that respondents had the opportunity to benefit from the interventions provided within the study districts and had prior experience before the intervention.

Meanwhile, the qualitative endline assessment included a broader selection of participants from across the IMAN Project – pregnant and lactating mothers; HSPs; CHWs; male parents with a child under two years of age; national, regional and district government comprising the Regional Nutrition Officer, RCH coordinators and national-level key actors working in nutrition.

Study sampling

A list of health facilities offering ANC services in Kyela (47 facilities), Chunya (37 facilities), and Mbarali districts (65 facilities), along with data on the number of pregnant women receiving ANC services at each health facility, was obtained. Using probability proportional to size (PPS) sampling, 19 facilities in Kyela, 15 in Chunya and 26 in Mbarali were randomly selected for the study. The list of pregnant women and recently delivered women attending RCH clinics on the day of the survey was established and screened for eligibility. This list of eligible participants served as a sampling frame to systematically and randomly select those who fit the inclusion criteria. For the qualitative endline assessment, purposive sampling was used to select participants with the desired characteristics.

Data collection

Pregnant women and recently delivered women attending RCH clinics during the quantitative endline assessment were interviewed across Kyela, Chunya and Mbarali districts using a semi-structured questionnaire. The questionnaire captured sociodemographic data, including gravidity, number of children a woman has, pregnancy information (including initial ANC contact and subsequent contact frequency), access to nutrition counselling, distance to a health facility, and MMS acceptability (only for Kyela respondents); household characteristics;

and dietary pattern in all three districts. This survey mainly focused on assessing the uptake and adherence of ANC services during pregnancy.

The qualitative endline assessment employed three data collection methods – in-depth interviews (IDIs), key informant interviews (KIIs) and focus group discussions (FGDs). A total of 165 respondents (131 females and 34 males) participated in the assessment comprising 24 IDIs and 21 FGDs conducted in Chunya, Kyela and Mbarali districts, and 12 KIIs at the regional and national levels.

For triangulation, information on the coverage of adequate, equitable and quality maternal nutrition services at the facility level was extracted from various systems during the review period of October 2022 to December 2023. The minimal individual dataset of nutrition indicators for pregnant women receiving ANC services was gathered from the DHIS2 system across all three districts.

Additional nutrition indicators were extracted from the IMAN Project supplementary tools in the intervention districts (Kyela and Chunya). These indicators included the number of ANC contacts, weight, MUAC and Hb measurements, IFA/MMS supplement provision, tablet consumption quantities, nutrition counselling provision, and spouse accompaniment during each of the eight recommended contacts.

Data on maternal nutrition services provided at the community level in the intervention arms were collected from an existing digital nutrition data collection system. This system employs a short-code SMS platform compatible with all types of phones (both regular mobile phones and smartphones), making it user-friendly while providing real-time data.

Various documents were crosschecked to ensure the implementation of different IMAN Project activities. At the health facility level, as part of evaluating the enabling environment and adequacy and quality of ANC service delivery, the presence of national guidelines and tools – including supplementary tools and job aids developed by the IMAN Project – was assessed. Moreover, reports from TAG meetings and supportive supervision were crosschecked to confirm compliance as planned.

Data analysis

The quantitative endline survey data were collected using an electronic questionnaire, with data quality checks conducted before and after each submission. Data were extracted from Kobo Collect and transferred into Stata Software Version 17 for management and analysis. For outcome comparison, difference-in-differences (DiD) methodology was employed to estimate the causal effect of the intervention. This approach compared changes in outcomes over time between treatment and control groups, thereby accounting for pre-existing differences and temporal trends.

For the qualitative endline assessment, interviews were transcribed and translated using reviewed notes from the notetakers and audio recordings prior to data analysis. Coding was conducted using both inductive and deductive approaches, which organized content according to themes identified during the FGDs and IDIs. NVivo 12 software facilitated line-by-line reading and coding to identify main and emerging themes while ensuring analytical consistency.

Ethics approval

The implementation research study received ethical approval from the National Health Research Ethics Committee of the National Institute of Medical Research (NIMR) in Tanzania (Reference No. SZEC-2439/R.V/V.1/151). In addition, implementation permission was granted by PO-RALG. Authorization to conduct the quantitative endline assessment data collection was also secured from relevant authorities at the regional, council and health facility levels.

All study participants provided informed written consent prior to data collection. For participants under 18 years of age, additional oral consent was obtained from guardians. Confidentiality was strictly maintained throughout the research process. Both study participants and their guardians were informed of their right to withdraw from the survey at any time without consequences. Peer-reviewed journal publications based on this research are currently under development.

CHAPTER 4

Results

In total, the implementation research study reached 73,186 women across three districts: 12,505 in Kyela, 32,401 in Chunya and 28,280 in Mbarali. Within the intervention regions, the project achieved comprehensive coverage, reaching 100 per cent of health facilities along with 98 per cent of eligible women in Kyela and 92 per cent in Chunya. A total of 148 HSPs (88 from Kyela and 60 from Chunya) and 322 CHWs (221 from Kyela and 101 from Chunya) were trained to deliver the complete IMAN intervention package. All participating health facilities were equipped with essential tools including ANC guidelines, algorithm charts, MUAC tapes and *Bango Kitita* to facilitate efficient implementation of interventions.

The study conducted a quantitative endline assessment with a sample size of 889 pregnant women and lactating women having children aged 0–6 months across all three districts (276 from Kyela, 261 from Chunya and 352 from Mbarali). Demographic, household and pregnancy characteristics were collected from all 889 participants (*see Table 1*). Among the participants, 366 (41.2 per cent) were pregnant and 523 (58.8 per cent) were women who had recently given birth to children aged 0–6 months. The age distribution showed that 57 per cent of women were aged 20–29 years, while 12.8 per cent were adolescents (aged 15–19 years). Educational attainment data revealed 61 per cent had received no more than primary-level education. Regarding marital status, 87 per cent reported being married or in cohabiting relationships.

A significant proportion, accounting for 57.6 per cent, were employed, with 22.8 per cent belonging to the fourth wealth quintile. Concerning reproductive history, 78.7 per cent had experienced multiple pregnancies, with over half (54.6 per cent) reporting that their current or most recent pregnancy represented their second to fourth child. ANC attendance was notably high, with 94.3 per cent of pregnant women attending four to six ANC contacts, while 90.1 per cent of recently delivered women had completed four or more ANC appointments before giving birth.

Table 1: Sociodemographic characteristics of quantitative endline assessment participants

Variable	Number	Percent
Council		
Chunya	261	29.4
Mbarali	352	39.6
Kyela	276	31.0
Age categories		
15–19 years	114	12.8
20–29 years	506	56.9
30–39 years	228	25.6
40–49 years	41	4.6

Variable	Number	Percent
Education level		
No education	126	14.2
Primary	542	61.0
Secondary	198	22.3
Tertiary	23	2.6
Marital status		
Married/cohabiting	779	87.6
Single/unmarried	110	12.4
Occupation		
Unemployed	377	42.4
Self-employed	494	55.6
Employed	18	2.0
Clinic		
Antenatal clinic (ANC)	366	41.2
Postnatal clinic (PNC)	523	58.8
Wealth quintiles		
Lowest	186	20.9
Second	193	21.7
Middle	156	17.5
Fourth	203	22.8
Highest	151	17.0
Total	**889**	**100**

Meanwhile, 165 respondents (131 females and 34 males) participated in the qualitative endline assessment, comprising 24 IDIs and 21 FGDs conducted in Chunya, Kyela and Mbarali districts, and 12 KIIs at regional and national levels. The demographic profile of participants showed most were 20–39 years of age, with adolescent mothers representing a minority (10 per cent). Marital status indicated 88 per cent were married, while educational attainment showed 55 per cent had completed primary-level education. Regarding employment status, 68 participants had no formal work, with only 9 per cent engaged in formal employment.

The comprehensive analysis from both quantitative and qualitative evaluations revealed positive results across all four specific objectives within the intervention districts of Kyela and Chunya. These outcomes yielded practical lessons for potential scale-up of the project.

Objective 1: Enabling environment for maternal nutrition services

Enabling environments were strengthened through multiple strategic interventions: ensuring availability of essential measuring tools such as MUAC tape and Hb machines; enhancing capacity strengthening of HSPs; introducing new RCH cards that promote eight ANC contacts (updated from the previous card recommending only four contacts); improving monitoring and tracking systems to ensure comprehensive indicator tracking through DHIS2; upgrading training manuals to include components on nutrition during pregnancy, anaemia and nutrition assessment; and ensuring availability and utilization of ANC guidelines for anaemia treatment.

While these changes translated into improved ANC service delivery at intervention sites, some HSP respondents at health facilities cited workload concerns. They noted that increased demand for ANC services, coupled with additional workload caused by the use of supplementary tools, created strain on an already capacity-limited system.

> *We have received essential tools such as MUAC tapes, Hb machines, registers and posters, which have significantly improved our services. Previously, we didn't measure Hb levels, leading to pregnant women travelling far for tests. Thanks to the IMAN Project, we can now measure Hb levels and MUAC, and provide counselling for food groups, reducing the need for extensive travel.*
>
> – **Health service provider**
> (Kyela, Mbeya Region)

Guidelines and tools availability

All guidelines and tools disseminated by the project were available in all intervention health facilities and communities, with two exceptions: algorithm charts (available in 88.2 per cent of communities) and radios (available in 70.6 per cent of communities).

Human resources at RCH clinics

Prior to the study's commencement, only two RCH service providers across all health facilities in both intervention districts had received training on ANC, maternal health and nutrition services. By the time of the quantitative endline survey, 88 per cent of all facilities providing RCH services had at least one trained HSPs. Furthermore, 71 per cent of all RCH HSPs assessed during the survey had received training through the project.

Commodities and supplies availability

MMS stock was generally sufficient across all Kyela health facilities throughout the study, with one exception: a complete stock-out in all MMS-dispensing facilities during March and April 2023 (*see Figure 5*) due to challenges with importation logistics. In contrast, IFA stock adequacy demonstrated steady improvement throughout the implementation period, ranging from 52 per cent to 100 per cent. Notably, no instance occurred where all health facilities simultaneously reported IFA stock-outs, and stock adequacy remained high through the conclusion of study implementation (*see Figure 6*).

Figure 5: Proportion of health facilities reported to have adequate stocks of MMS, Kyela district

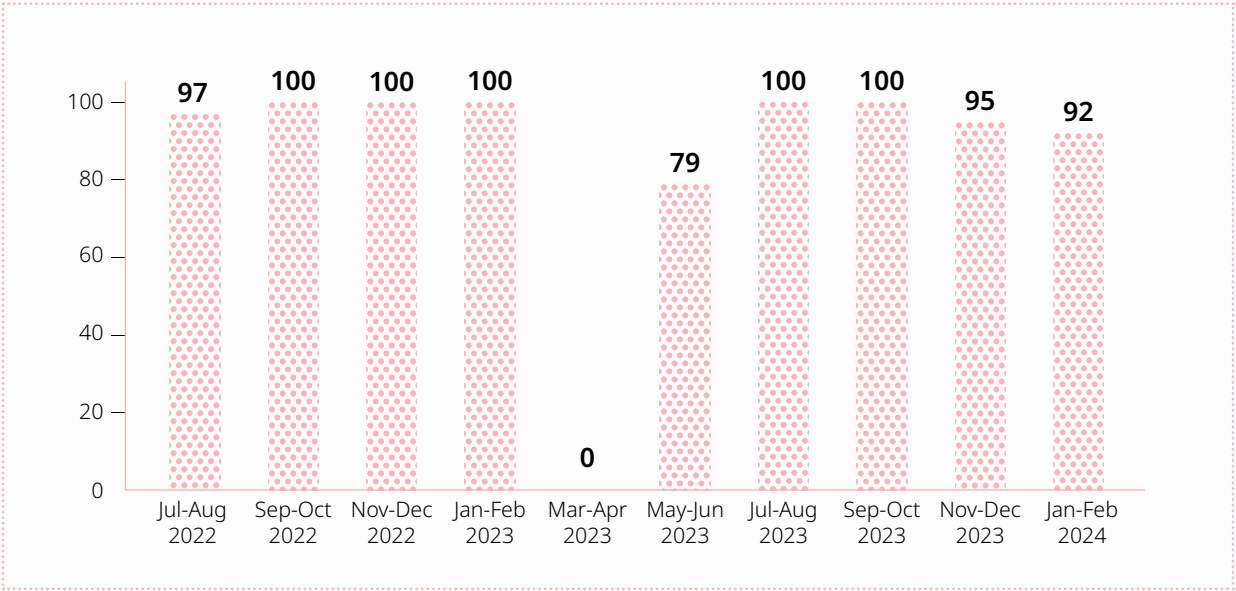
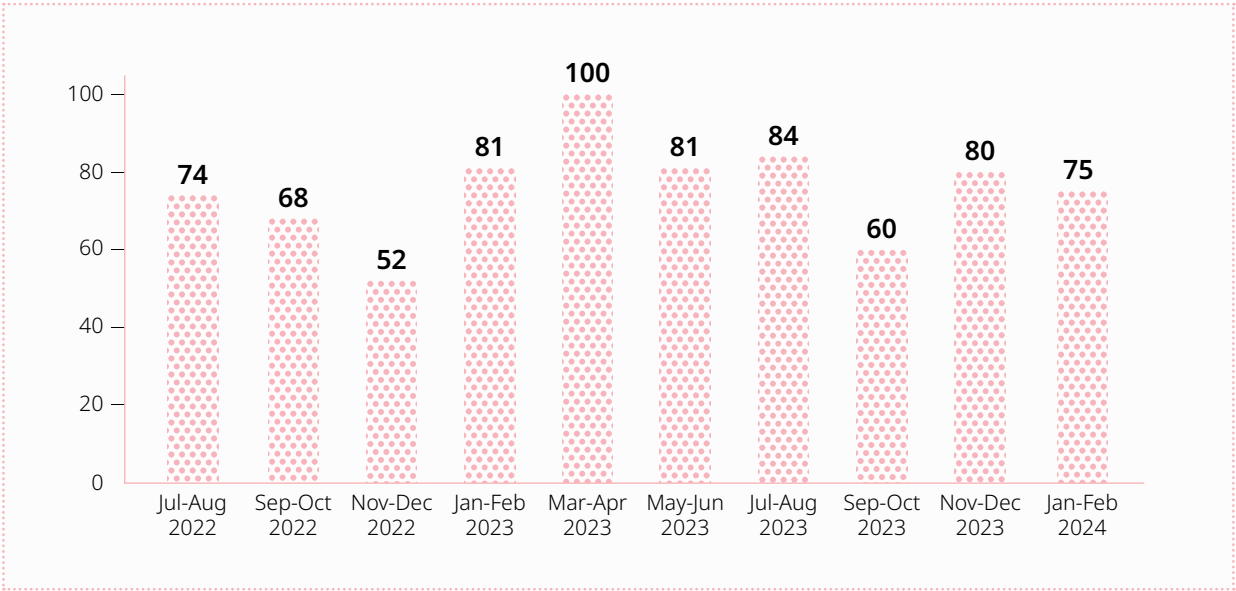


Figure 6: Proportion of health facilities reported to have adequate stocks of IFA, Chunya district



Supportive supervision and project coordination

Throughout the implementation period, six out of eight planned supportive supervisions were conducted at both facility and community levels to monitor the quality of care provided by RCH HSPs and CHWs respectively. To further ensure quality of care and proper project implementation, three TAG meetings were convened with various maternal health and nutrition stakeholders. Several challenges were identified during these supportive supervisions: MMS had a short lifespan extending only to January 2023; health facilities faced inadequate human resources; and CHWs lacked essential incentives (such as bicycles, identity cards, printed t-shirts, and protective gear including boots, bags, umbrellas and raincoats), potentially affecting their motivation to accomplish additional project-related tasks.

Objective 2: ANC services uptake and adherence

Early booking of ANC contacts

The proportion of women who attended ANC services during the first trimester (<12 weeks) showed significant improvement in the intervention districts: an increase of 9.1 per cent in Kyela and 29.4 per cent in Chunya. Similarly, the proportion of recently delivered women achieving optimal ANC contacts (4+) during pregnancy increased substantially by 84.2 per cent in Kyela and 78.4 per cent in Chunya, while remaining unchanged in the control district of Mbarali. Average ANC attendance among pregnant women in both intervention districts doubled from three to six contacts during the 18-month implementation research study period, with no comparable change observed in Mbarali. The proportion of early ANC booking increased most notably among specific population segments: women aged 20–29 years, those with primary and secondary education, married/cohabiting women, women with fewer than two children, and those in middle to low wealth quintiles (*see Table 2*).

> *The attendance is good, unlike before. Now pregnant women come as per scheduled appointments. Since the start of the IMAN Project, tools have been made available, which also contributed to good attendance at ANC. Since we started the project, attendance has been good – about 85 per cent, which is good. But sometimes pregnant women fail to come early to the facility as per scheduled appointments, so as a facility, we use CHWs to follow up.*
>
> – **Health Service Provider**
> (Kyela, Mbeya Region)

The qualitative endline assessment identified several key factors that encouraged pregnant women in the study areas to initiate ANC services earlier. The increase in early ANC initiation was attributed primarily to proactive CHWs in the communities. Additionally, the adoption of the WHO guideline recommending a minimum of eight ANC contacts enhanced contact frequency. Equipment provision for measuring Hb levels and consistent MMS supply effectively addressed both practical and informational barriers to ANC initiation. Furthermore, male partner involvement in information sharing and the creation of welcoming environments at health facilities were identified as significant contributors to the positive uptake of ANC services.

> *Previously, we were waiting until the pregnancy reached three months to take women to ANC. But based on the education we received, we now know that pregnant women should start ANC soon after realizing they are pregnant. Pregnant women will miss important education if they delay starting ANC.*
>
> – **Male partner**
> (Chunya, Mbeya Region)

Table 2: Proportion of study participants with early ANC bookings

	Control						Intervention					
	Baseline		Endline		Difference coefficient		Baseline		Endline		Difference coefficient	
	n (%)	N	n (%)	N		p-value[1]	n (%)	N	n (%)	N		p-value[1]
Age categories												
15-19	23 (36.5)	63	11 (26.8)	41	-9.7	p>0.05	4 (20)	20	32 (43.8)	73	23.8	p>0.05
20-29	49 (26.9)	182	60 (28)	214	1.1	p>0.05	11 (22)	50	141 (48.3)	292	26.3	p<0.001
30-39	16 (21.9)	73	26 (32.5)	80	10.6	p>0.05	7 (29.2)	24	47 (31.8)	148	2.6	p>0.05
40-49*	0 (0)	8	3 (17.6)	17			0 (0)	1	6 (25)	24		
Education level												
No education	4 (16)	25	16 (21.1)	76	5.1	p>0.05	2 (22.2)	9	25 (50)	50	27.8	p>0.05
Primary	66 (28.1)	235	60 (30.3)	198	2.2	p>0.05	16 (23.9)	67	134 (39)	344	15.1	p<0.05
Secondary	13 (25.5)	51	23 (31.9)	72	6.4	p>0.05	2 (14.3)	14	62 (49.2)	126	34.9	p<0.05
Tertiary	5 (33.3)	15	1 (16.7)	6	-16.6	p>0.05	2 (40)	5	5 (29.4)	17	-10.6	p>0.05
Marital status												
Married/cohabiting	75 (26)	288	91 (29.5)	308	3.5	p>0.05	20 (23.8)	84	201 (42.7)	471	18.9	p<0.001
Single/unmarried	13 (34.2)	38	9 (20.5)	44	-13.7	p>0.05	2 (18.2)	11	25 (37.9)	66	19.7	p>0.05
Birth order												
Zero	37 (37)	100	8 (29.6)	27	-7.4	p>0.05	7 (23.3)	30	28 (51.9)	54	28.6	p<0.05
First born	21 (21.9)	96	27 (33.3)	81	11.4	p>0.05	3 (13.6)	22	55 (43)	128	29.4	p<0.001
Second–fourth	29 (25.2)	115	53 (27.9)	190	2.7	p>0.05	12 (31.6)	38	126 (42.7)	295	11.1	p>0.05
Fifth+*	1 (6.7)	15	12 (22.2)	54	15.5	p>0.05	0 (0)	5	17 (28.3)	60	28.3	p>0.05
Number of pregnancies												
Primigravida	32 (41)	78	23 (29.1)	79	-11.9	p>0.05	5 (19.2)	26	43 (39.1)	110	19.9	p<0.05
Multigravida	56 (22.7)	247	77 (28.2)	273	5.5	p>0.05	17 (24.6)	69	183 (42.9)	427	18.3	p<0.001
Wealth quintiles												
Lowest	24 (29.3)	82	25 (25)	100	-4.3	p>0.05	4 (16.7)	24	30 (34.9)	86	18.2	p<0.1
Second	18 (30)	60	19 (26)	73	-4	p>0.05	3 (17.6)	17	53 (44.2)	120	26.6	p<0.05
Middle	12 (24)	50	15 (29.4)	51	5.4	p>0.05	4 (20)	20	52 (49.5)	105	29.5	p<0.05
Fourth	13 (21.3)	61	28 (33.7)	83	12.4	p>0.05	8 (34.8)	23	47 (39.2)	120	4.4	p>0.05
Highest	21 (28.8)	73	13 (28.9)	45	0.1	p>0.05	3 (27.3)	11	44 (41.5)	106	14.2	p>0.05
Total	**88 (27)**	**326**	**100 (28.4)**	**352**	**1.4**	**p>0.05**	**22 (23.2)**	**95**	**226 (42.1)**	**537**	**18.9**	**p<0.001**

[1]p-values are based on a DiD model to check for differences in the proportion of women receiving the services across intervention (Chunya and Kyela) against control (Mbarali). <0.05 indicates significance

** Small sample for baseline-endline comparison*

Commonly reported reasons for early and late ANC bookings

Most pregnant and recently delivered women (46.2 per cent) reported that education from HSPs prompted them to attend ANC clinics early (*see Figure 7*). A majority also reported that the absence of their spouse/partner caused them to start ANC clinic contacts late (*see Figure 8*). Notably, certain barriers to ANC access identified during the baseline assessment did not emerge as significant issues at endline. For instance, mistreatment from health professionals, particularly verbal abuse, was reported less frequently at endline, potentially indicating positive shifts in healthcare delivery practices. Similarly, the lack of trained healthcare providers, which was frequently mentioned during baseline, received no mentions at endline.

Despite these improvements, several barriers continue to hinder full utilization of available ANC services in the study areas. Persistent challenges include seasonality of factors, geographical obstacles, long waiting times due to a shortage of health care providers in select facilities, and financial constraints affecting service accessibility.

Figure 7: Reasons for early ANC booking among pregnant and recently delivered women

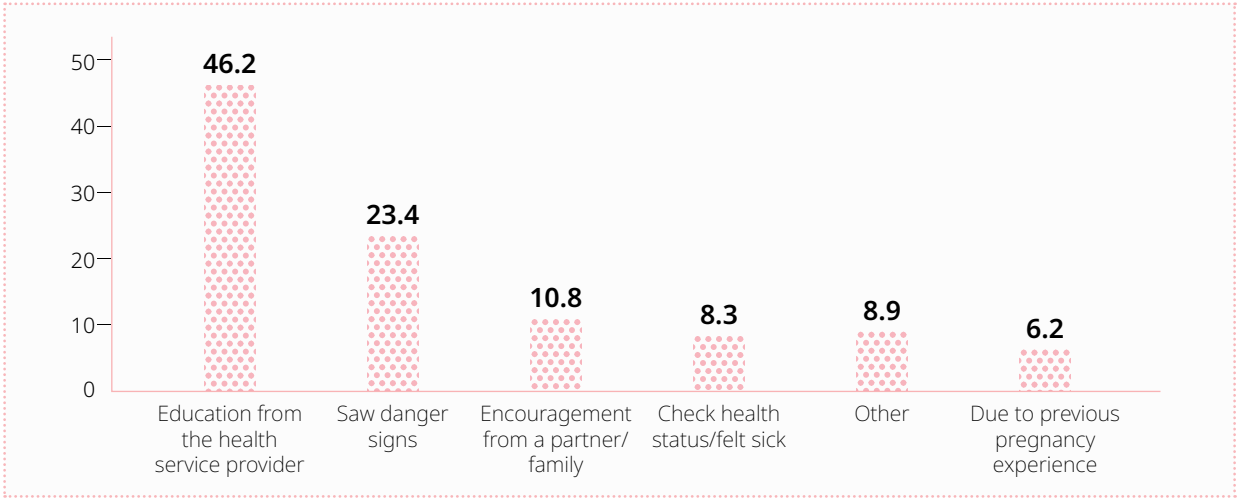
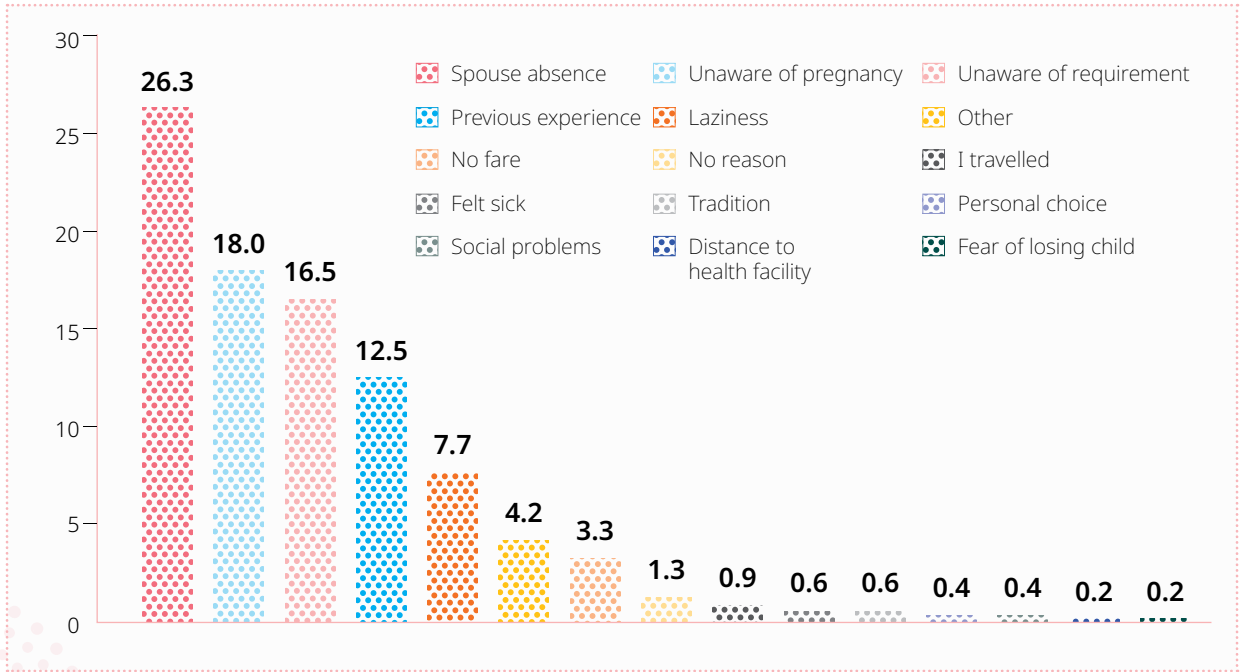


Figure 8: Reasons for late ANC booking among pregnant and recently delivered women



Selected ANC services

Across the intervention districts of Chunya and Kyela, pregnant and recently delivered women received more comprehensive ANC services during their visits compared with the control district of Mbarali. These services included antimalarials, deworming, weighing, urine testing, blood pressure monitoring, haemoglobin level assessment, MUAC measurement, syphilis testing, among others.

Importantly, the proportion of women attending at least four ANC contacts increased in both intervention districts: from 14 per cent to 98.2 per cent in Kyela and from 17.7 per cent to 96.2 per cent in Chunya. Furthermore, a substantial percentage of women in intervention districts achieved 5–6 contacts (51.7 per cent in Chunya and 45.3 per cent in Kyela), compared with baseline. While no women exceeded four contacts at baseline, the quantitative endline survey revealed notable improvements, with 18.8 per cent in Chunya and 23.2 per cent in Kyela attending seven or more ANC contacts.

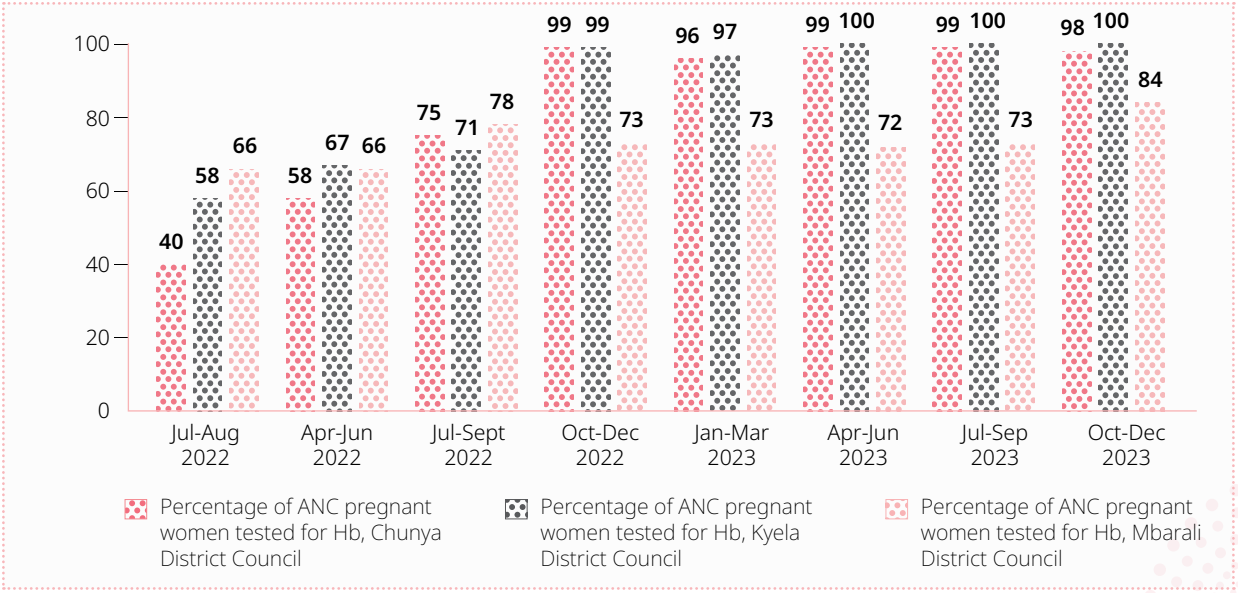
Overall, participants expressed satisfaction with the improved health services. They specifically highlighted the comprehensive nature of care provided throughout pregnancy and acknowledged that these improvements translated into better utilization of services, including subsequent ANC contacts.

> *If you compare current and past services, the current service is better. We couldn't talk much because the village was behind in services. Right now, there is an increase in maternity services. Currently, the seminars have increased, and the services have improved. For example, currently, vaccines are now even provided in remote areas through outreach services. Reaching more beneficiaries and those who cannot access a facility is a major improvement.*
>
> – **Male partner**
> (Chunya, Mbeya Region)

Hb screening during first ANC contact

The proportion of pregnant women tested for Hb levels during their first ANC contact drastically increased in both intervention districts compared with the control district of Mbarali (*see Figure 9*). In Kyela, screening rates rose from 58 per cent to 100 per cent, while Chunya experienced an increase from 40 per cent to 98 per cent.

Figure 9: Percentage trend of pregnant women tested for Hb during their first ANC contact intervention period



> *There are changes; for example, in the past, we did not measure blood pressure or Hb level at every contact, unlike now, when we measure at every contact.*
>
> – **Pregnant woman**
> (Kyela, Mbeya)

Adherence to IFA/MMS for more than 90 days

Overall, the proportion of pregnant women who adhered to either IFA or MMS supplementation for more than 90 days was substantially higher in the intervention districts than in the control district. Specifically, adherence rates reached 92.8 per cent in Kyela (where women received MMS) and 89.7 per cent in Chunya (where women received IFA), compared with 77.6 per cent in the control district of Mbarali (where women received standard IFA).

Commonly reported reasons for taking/not taking IFA/MMS

The most frequently cited reason for non-adherence to IFA or MMS among pregnant women was side effects (20.5 per cent). Pregnant women taking IFA specifically mentioned the pill's smell and nausea as deterrents, with some also reporting vomiting, dizziness and exhaustion – issues similarly identified during the baseline assessment. Despite these challenges, pregnant women (particularly in Chunya) reported continuing IFA supplementation due to their awareness of its importance in reducing the risks of anaemia, miscarriage, spina bifida and cleft palate, representing an improvement in knowledge since baseline. In contrast, mothers in the control district of Mbarali reported using IFA but demonstrated limited understanding of side effect management. The primary factor promoting adherence to either IFA or MMS was education provided by facility-based HSPs and CHWs (25.8 per cent).

> *The only challenge is that one loses patience. When they swallow the pills, which trigger nausea or vomiting, they stop using them without knowing the consequences of stopping.*
>
> – **Pregnant woman**
> (Mbarali, Mbeya Region)

Very few women reported side effects from MMS, with only occasional mentions of a slight smell. However, a notable pattern emerged among pregnant women in Kyela: frequent transitions between MMS and IFA supplements, often in response to anaemia diagnosis. This practice stems from Tanzania's current anaemia treatment guidelines, which mandate IFA use for anaemia management. Consequently, women were switched from MMS to IFA during treatment periods, then returned to MMS once treatment concluded, with some individuals experiencing multiple transitions between the two supplements.

Family and male involvement in pregnancy

At the quantitative endline survey, male involvement supporting IFA or MMS use was reported by 79.7 per cent of women in intervention districts, compared with 44.3 per cent in the control district. Similar patterns emerged regarding family support for supplement use, with 47.5 per cent of women in intervention districts reporting such support versus 25 per cent in control districts. Participants cited positive progress in male involvement and support for uptake of ANC services. The FILTAR strategy deliberately integrated male involvement during early planning stages, recognizing it as a crucial factor influencing women's access to and adherence with ANC services, including early ANC contacts, micronutrient supplement use and consumption of diversified diets. Importantly,

pregnant women who attended ANC visits without partners received services without inconvenience – a notable improvement from baseline experiences where women reported being denied services if unaccompanied by partners, especially at first contact. Several participants expressed appreciation for their partners' active participation and support throughout the maternal healthcare journey.

> *His involvement is good because he has been accompanying me since the start of ANC services until the birth of our child. Even today, he was supposed to be here, but unfortunately, he had an emergency. So, I can say his involvement is good.*
>
> – **Lactating woman**
> (Kyela, Mbeya Region)

Sources of IFA/MMS messages

Results indicated that the majority of women across all councils received IFA or MMS information from HSPs at health facilities (97.9 per cent in Chunya, 95.4 per cent in Mbarali and 92.6 per cent in Kyela). Additionally, 22.5 per cent of respondents received educational messages from CHWs at the community level.

Objective 3: Health & nutrition behaviours and barriers among pregnant and lactating women

Dietary patterns of pregnant and recently delivered women

Intervention districts showed positive changes in healthy food consumption patterns. The proportion of women consuming at least one serving per day of dark leafy green vegetables increased from 37.1 per cent to 45.9 per cent. Similarly, the proportion of women who consumed at least one serving of fruits per day increased from 5.9 per cent to 31.5 per cent. However, the consumption of unhealthy foods either remained the same or increased slightly. The consumption of sugar-sweetened beverages remained the same, while that of fried foods away from home increased from 15.4 per cent to 20.9 per cent.

> *They told us to eat vegetables, fruits, meats, and root and tuber foods like cassava and banana. The ones who give us this information are the CHWs.*
>
> – **Lactating woman**
> (Kyela, Mbeya Region)

Proportion of pregnant women who received nutrition counselling from CHWs

The proportion of pregnant women who received nutrition counselling from CHWs, including counselling on dietary diversification and water, sanitation and hygiene (WASH) practices, increased consistently throughout each quarter of study implementation (*see Table 3*). Importantly, this counselling resulted in significant improvements in participants' understanding of maternal health and nutrition – rising from 66.7 per cent to 85.3 per cent in Chunya and from 62.6 to 86.4 per cent in Kyela.

Table 3: Proportion of pregnant women who received nutrition counselling

Indicator	District	Oct–Dec 2022	Jan–March 2023	April–June 2023	July–Sep 2023	Oct–Dec 2023
Proportion of pregnant women who received nutrition counselling from CHWs at least once in the past three months	Chunya	49%	84%	86%	75%	94%
	Kyela	69%	70%	89%	84%	95%
Proportion of pregnant women who received counselling on dietary diversification and WASH practices	Chunya	54%	83%	88%	85%	93%
	Kyela	79%	81%	86%	89%	99%

Objective 4: IMAN Project outcomes of acceptability, fidelity, sustainability and scalability

Acceptability

A six-item section investigated MMS acceptability patterns among pregnant and recently delivered women in Kyela. Each acceptability item was scored on a scale of 1–5, with 1 indicating complete disagreement and 5 indicating complete agreement with the statements. These individual scores were summed to produce a composite index ranging from 6 to 30, with a mean of 24.4 and a median of 25. Scores were categorized into two groups: low-to-medium acceptance and high acceptance (≥25). Results showed that the majority of respondents (51.1 per cent) reported high acceptance of MMS (*see Table 4)*. There was no notable variation in the proportion of women in agreement across sociodemographic characteristics.

> *I can say that what led to the change is MMS; MMS has brought about a very big change. First, during the period of using [IFA], pregnant women were delayed in seeking care, despite being given education. They delayed so they could avoid the side effects of [IFA]. Some pregnant women were starting ANC at five- or six-month gestation to avoid using [IFA] for a long time. But currently, mothers start early (8–12 weeks) because they are given MMS, and they don't experience any challenges. Witnesses have declared that MMS is better than [IFA] even in pregnancy outcomes and have asked to continue receiving MMS instead of [IFA].*
>
> **– Health service provider**
> (Kyela, Mbeya Region)

Table 4: Proportion of women who reported high MMS acceptability, across background characteristics

	Low to medium	High	p-value[1]
Age categories			
15-19	14 (35.9)	25 (64.1)	0.0404
20-29	75 (54.0)	64 (46.0)	
30-39	38 (46.3)	44 (53.7)	
40-49	6 (50.0)	6 (50.0)	
Education level			
No education	5 (71.4)	2 (28.6)	0.3687
Primary	84 (48.3)	90 (51.7)	
Secondary	37 (46.3)	43 (53.8)	
Tertiary	7 (63.6)	4 (36.4)	
Marital status			
Married/cohabiting	114 (49.6)	116 (50.4)	0.8863
Single/unmarried	19 (45.2)	23 (54.8)	
Employment status			
Unemployed	33 (26.0)	36 (26.9)	0.201
Employed	3 (2.4)	0 (0.0)	
Self-employed	91 (71.7)	98 (73.1)	
Wealth quintiles			
Lowest	23 (39.7)	35 (60.3)	0.2870
Second	37 (57.8)	27 (42.2)	
Middle	11 (37.9)	18 (62.1)	
Fourth	30 (49.2)	31 (50.8)	
Highest	32 (53.3)	28 (46.7)	
Total	**133 (48.9)**	**139 (51.1)**	

[1] *Pearson chi-square test of association*

Fidelity

Fidelity is defined as the degree to which an intervention was implemented as prescribed in the original protocol or as intended by the programme developers (Proctor et al., 2011). The IMAN Project demonstrated high implementation fidelity at multiple levels. At the community level, CHWs maintained adherence to key components of the training manual throughout implementation. Similarly, at the facility level, HSPs conducted counselling, antenatal screenings and provided services in accordance with stipulated national guidelines. This included delivering IFA supplementation as

> *Service providers started doing home visits some time ago. They can even visit us three times a week, and when they come, they ask us about the supplement tablets that we were given at the facility and whether we are facing any challenges. For example, if the tablets are causing any discomfort, they help us learn how to use them properly.*
>
> – **Pregnant woman**
> (Kyela, Mbeya Region)

per national guidelines and MMS according to WHO global guidelines. However, the treatment of anaemia was provided as per the national guidelines, which require pregnant women to receive two IFA tablets if they have a haemoglobin concentration below 11d/dl.

Sustainability

Participants felt that project interventions were likely to be sustainable due to strategic integration with existing systems. The project effectively leveraged existing healthcare reporting systems (DHIS2), procurement channels (MSD) and human resources to deliver interventions. Engagement and involvement of key community stakeholders, including local leaders and male partners, were seen as a strong sustainability factor for maintaining project gains. However, new tools that have not been integrated into existing systems were seen to increase the workload among service providers and were deemed unlikely to be sustained long-term.

Scalability

Participants expressed optimism regarding the project's scalability, particularly concerning the increasing demand for maternal health services and high MMS acceptability. They anticipated a rise in demand based on the perceived benefits of MMS and its positive reception among both HSPs and programme recipients. This projected increase in demand underscores the need for sustainable supply and MMS availability to meet the growing needs of expectant mothers. Participants also emphasized the importance of timely availability of MMS to facilitate seamless implementation without interruptions.

> *The purchase was done well, and we have never had a shortage. For example, we now have a machine that uses both batteries and electricity, unlike in the past when we had one that used electricity only. Procurement systems continued through the existing MSD ordering process for normal procurement.*
>
> – **Health service provider**
> (Chunya, Mbeya Region)

CHAPTER 5 Discussion

Results from both the quantitative endline survey and qualitative endline assessment highlighted the implementation research study's effectiveness and sustainability in delivering a modified maternal care package, including IFA or MMS. This intervention successfully increased coverage of adequate, equitable and quality maternal nutrition services at both community and facility levels.

Enabling environment for maternal nutrition services

A supportive enabling environment for RCH service providers and CHWs is key to ensuring high-quality care and services for pregnant women. The availability of guidelines and tools in RCH clinics helps establish standard operating procedures (SOPs) that guide and simplify the revision of maternal health services during ANC contacts within facilities. However, the study revealed an evident struggle among HSPs in identifying guidelines and tools, indicating non-usage of most available resources. This underutilization can be attributed to the heavy workload faced by HSPs, which constrains their time to review, internalize and apply the guidelines intended for the operationalizing high-quality RCH services. At the community level, all CHWs were equipped with flipcharts, and some were also provided with radios to facilitate their work.

Although two RCH HSPs from each health facility received IMAN training, only a few remained present in their respective RCH clinics. A significant proportion of trained HSPs were reassigned to other sections within health facilities, leaving new staff in RCH clinics without training on IMAN interventions. Furthermore, trained HSPs had not received any routine refresher training on maternal health and nutrition since the last training provided by the project. In addition to non-adherence to guidelines, this personnel turnover and lack of refresher training could potentially compromise the quality of services over time.

The project successfully improved the availability of essential resources, including IMAN-related guidelines, supplements (MMS or IFA), Hb machines and MUAC tapes. This improvement encompassed availability of iron-containing supplements and user-friendly equipment, notably Hb machines compatible with cuvettes. These machines, introduced during the study, also featured a battery option, ensuring their functionality even without electricity – a critical feature that guaranteed the reliability of Hb testing throughout the project duration, as evidenced by the proportion of pregnant women who underwent Hb testing during each ANC contact. Despite quarterly fluctuations in MMS adequacy across health facilities, the overall usage trend indicated improved availability, ensuring their reliable provision to pregnant women during ANC visits.

Supportive supervision at facility and community levels to monitor the quality of care provided by the RCH HSPs and CHWs was not conducted as planned. While four supervisions were conducted by various stakeholders during the

project implementation period (October 2022 to December 2023), these were not conducted quarterly as scheduled. This oversight created a gap that could potentially compromise the quality of services by allowing extended periods without quality monitoring.

ANC services uptake and adherence

Early ANC booking remains a national challenge in Tanzania, with only 34 per cent of pregnant women nationwide and 45.1 per cent in Mbeya Region initiating ANC in the first trimester. However, the study's intervention districts showed significant and steady improvement throughout implementation. The quantitative endline survey showed progress in early ANC booking across intervention districts while the control district showed no change. Chunya district council's improvement was particularly notable, with early ANC booking rates more than doubling from 20 per cent at baseline to 49.4 per cent at endline, nearly reaching the target of 50 per cent. Kyela district also improved from 26 per cent at baseline to 35.1 per cent at endline. Both intervention districts now exceed the national proportion of pregnant women who initiate early ANC contacts, highlighting the benefit of the interventions.

The majority of women reported that education from HSPs was the reason they were able to attend ANC early. This is a testament to the effectiveness of HSP and CHW training on communicating the importance of early ANC booking. In contrast, the absence or lack of support from the father of the child was the predominant reason cited for late ANC attendance. Currently, all ANC facilities require male partner accompaniment for a woman's first ANC visit. While well-intentioned, this requirement may need revision to prevent it from becoming a barrier to early ANC booking.

WHO's 2016 ANC Guidelines recommend a minimum of eight ANC contacts for a healthy pregnancy experience to reduce maternal morbidity and mortality. During the baseline survey, only 7.38 per cent of pregnant women reported attending more than three ANC contacts, falling significantly short of even Tanzania's previous national guideline of four minimum contacts. The intervention produced substantial improvements in ANC contact frequency across intervention districts. Approximately 97 per cent of pregnant women in Kyela and 91.2 per cent in Chunya achieved optimal ANC contacts (4+), representing increases of 84.2 per cent and 78.4 per cent respectively. Although only 12.5 per cent of recently delivered women attained eight or more ANC contacts, nearly 19 per cent of women in Chunya and 23 per cent in Kyela achieved more than seven ANC contacts. These results are indicative of the applicability of the WHO ANC model in Tanzania.

WHO also recommends routine testing of Hb levels for pregnant women during their first ANC contact in all RCH facilities to enhance maternal outcomes. However, in resource-limited settings, this service is rarely offered consistently. The study enhanced the availability of essential commodities and supplies (such as Hb machines and compatible cuvettes), which led to significant increases in the proportion of pregnant women tested for Hb levels during their first ANC contacts in intervention districts. This improvement underscores the importance of strengthening the enabling environment for HSPs to facilitate broader coverage of ANC services. The control district showed no change in Hb screening rates, demonstrating the need to advocate for improved Hb testing during first ANC contacts through enhanced availability and accessibility of Hb machines and cuvettes. Consistent Hb testing throughout pregnancy represents another essential component of quality ANC.

The study advocated for monthly testing at each ANC contact using supplementary tools provided by the project. Over 95 per cent of pregnant women attending ANC contacts underwent screening for Hb, demonstrating the feasibility of integrating Hb monitoring into routine ANC services without the need for significant policy changes or budgetary adjustments.

The proportion of pregnant women using either IFA or MMS for more than 90 days during pregnancy more than doubled following implementation of the research study. Improving adherence to IFA and MMS was the primary expected impact of IMAN implementation in intervention districts, providing clear evidence of intervention effectiveness. Overall, the proportion of pregnant women using either IFA or MMS for more than 90 days reached the highest levels in the intervention districts of Kyela (MMS – 92.8 per cent) and Chunya (IFA – 89.7 per cent) compared with the control district of Mbarali (IFA – 77.6 per cent). Although the control district also showed some improvement in IFA adherence, this resulted from a model that compelled pregnant women in that district to adhere to all ANC services through fear of punishment or fines. Despite HSPs and CHWs receiving IMAN training, most pregnant women reported receiving IFA/MMS information from HSPs, with only 22.5 per cent reporting CHWs as their information source. This disparity could be attributed to a potential lack of budget for CHW IMAN activities, limiting their outreach in the community. Improvement in this area is crucial, ensuring CHWs are adequately trained and motivated to conduct regular home visits to reach the target population effectively.

Health and nutrition behaviours and barriers among pregnant and lactating women

Male spouses of pregnant women played a significant role in reminding their partners about IFA or MMS uptake, according to 88.1 per cent of pregnant women from Chunya and 71.7 per cent from Kyela. This indicates the effectiveness of sensitizing male partners to engage in maternal well-being. Male counselling during ANC contacts likely contributed to this outcome, as evidenced by the control district where despite 81 per cent of pregnant women attending ANC contacts, only 44.3 per cent of male partners emphasized the importance of their partners adhering to IFA uptake. Advocating for increased male involvement in maternal well-being during pregnancy is essential for better maternal and newborn health outcomes.

The IMAN Project trained both CHWs and HSPs on providing nutrition counselling at community and health facility levels respectively. Consequently, the proportion of women consuming vegetables, roots and tubers at least once daily increased from 50 per cent to 73 per cent in intervention districts. However, unhealthy food consumption showed a slight increase, suggesting future counselling interventions should place additional emphasis on the risks of unhealthy and ultra-processed foods to maternal nutrition. CHWs reported low rates of nutrition counselling delivery, with only 65 per cent in Chunya and 38 per cent in Kyela districts reporting such activities. These limited performance metrics potentially contributed to the insignificant changes in the dietary patterns of pregnant women. Given CHWs' historically proven importance as a vital link between communities and health facilities, implementing comprehensive follow-up mechanisms – such as monitoring, supervision, and capacity building – remains critical for increasing their performance and reporting rates.

Notably, nearly 13 per cent of participants were adolescents (aged 15–19 years). Despite

relative inexperience with pregnancy and facing greater financial barriers, many adolescents demonstrated higher early ANC booking rates (37.7 per cent) and higher adherence rates to IFA or MMS (86.8 per cent) compared with older counterparts. The presence of teenage pregnancy highlights the significance of developing affordable and accessible nutritional interventions specifically targeted towards adolescents to support their unique nutritional needs, reproductive health and developmental requirements.

IMAN Project outcomes of acceptability, fidelity, sustainability and scalability

WHO recommends using iron-containing supplements during pregnancy as one of the 16 interventions aimed at improving maternal nutrition and contributing to better pregnancy outcomes. While IFA has been the commonly consumed supplement for years, WHO also recommends MMS use in research contexts. The widespread acceptance of MMS during this project stands out as a significant outcome, with both HSPs and the community recognizing its benefits in enhancing maternal and child health outcomes. At baseline, many pregnant women reported side effects from IFA intake, which hindered acceptability and adherence. These findings then guided the selection of MMS for trial in this study, likely influencing its high acceptability since most MMS attributes matched their preferences.

> *MMS is good because it helps us increase our blood and contributes to the growth of the baby in the womb. In terms of taste, these yellow tablets (MMS) taste and smell good, similar to vitamin B complex tablets. I really like their smell and taste because they are pleasant, unlike the red tablets that immediately make you feel nauseous when you put them in your mouth.*
>
> – **Lactating woman**
> (Kyela, Mbeya Region)

Participants discussed additional considerations needed to ensure the sustainability of the project results: adequate and capable human resources for health at all levels of health facilities, political will, proper exit strategy in terms of implementation handover as the project phases out, and proper reporting and dissemination of lessons learned for future programming. The strong emphasis on scalability reflects a forward-looking approach to ensure that the project can meet the evolving demands of the community while maintaining quality and effectiveness in service delivery.

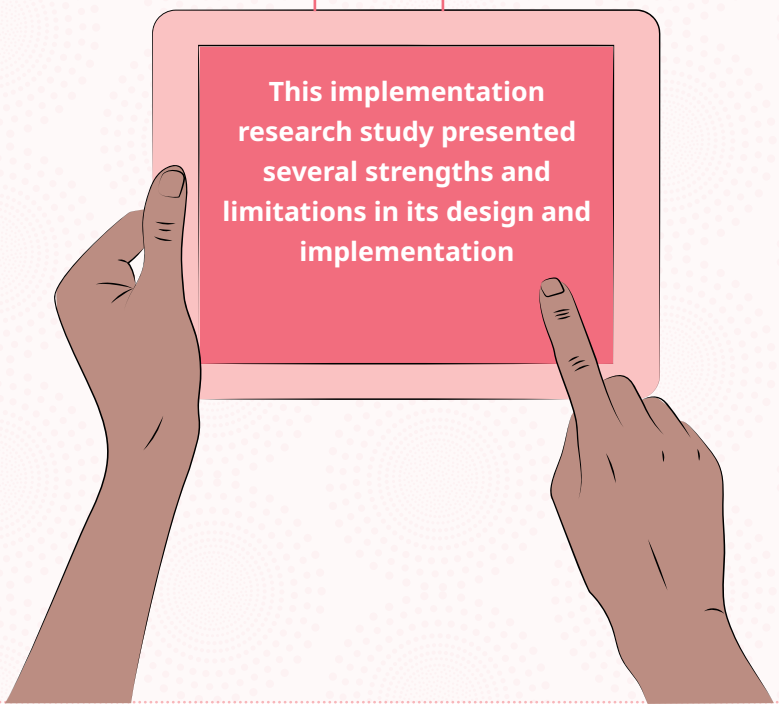
Strengths and limitations

Strengths

- Government leadership through TAG guidance and recommendations
- Ownership and involvement of subnational teams (LGAs/ Regions) from the beginning
- Strategic partnership between government, institutions, academia, research, NGOs and CBOs
- Adoption of WHO ANC guidelines (e.g., eight ANC contacts, Hb screening at each ANC contact)
- Use of existing systems (supply chains and information)
- Demand creation supported by maternal nutrition SBCC "Campaign-in-a-Box"

Limitations

- Requirement of longer-term systems strengthening evaluations to measure structural change
- Difficulty in attaining ideal situations at health facilities to include comprehensive ANC services
- Anaemia treatment protocol requiring beneficiaries to switch from MMS to IFA
- Logistics challenges with importation, which limited the availability of MMS at some points of care
- Data quality concerns, especially those recorded in supplementary tools



CHAPTER 6

Conclusion and recommendations

The IMAN Project led to increased uptake of positive behaviours among pregnant women accessing health services. Notable improvements included more timely ANC contacts within 12 weeks of gestation, improved utilization of MMS/IFA and other health services, and reduced barriers to ANC service utilization. The intervention districts of Kyela (using MMS) and Chunya (using IFA) demonstrated significant improvements compared with the control district of Mbarali, with increased coverage of adequate, equitable and quality maternal nutrition services, especially at the health facility level.

The newly generated evidence provided insights into the barriers hindering IFA uptake and adherence ahead of the country's planned transition to MMS. Evidence shows that addressing bottlenecks that constrain IFA uptake and adherence also helps ensure higher MMS uptake and adherence. Hence, the demonstrated added benefits of MMS provide Tanzania with sufficient evidence to opt to transition from IFA to MMS.

As demonstrated by the IMAN Project, simultaneously addressing systemic barriers and strengthening health systems can significantly increase MMS adherence, supporting the case for transitioning from IFA to MMS. MMS demonstrated higher acceptability among women due to fewer side effects, and offered similar benefits on anaemia prevention as IFA, with additional advantages of reducing fetal deaths, low birth weight and preterm births. Furthermore, the broader nutrient profile of MMS can address gaps in dietary diversification among pregnant women, which was observed to be high due to poor economic status. A key strength of the IMAN Project was its focus on strengthening systems rather than merely comparing supplement products (MMS or IFA).

As such, the following recommendations are proposed for improving maternal nutrition in Tanzania:

Strengthen the health care system, by investing in infrastructure, human resources and logistics for efficient delivery of supplements and comprehensive maternal care through ANC services.

Integrate MMS into the essential drugs list for ANC to enhance adherence and ensure consistent supply. Maintain a limited supply of iron supplements for anaemia treatment.

Establish the WHO-recommended eight ANC contacts as the standard for pregnant women nationwide, accompanied by complementary interventions. This standardized approach ensures consistent and comprehensive maternal care throughout pregnancy, leading to improved health outcomes for mothers and newborns.

Increase the number of HSPs at all levels of health facilities, while providing frequent refresher courses on maternal nutrition service delivery. This initiative aims to reduce waiting times, alleviate workloads and maintain quality of care. Enhanced staffing levels will enable healthcare facilities to sustain effective delivery of intervention packages without compromising quality.

Explore innovative methods to motivate CHWs to prioritize community work over health facility duties, which hamper their community activities. Improving the quality of services offered by CHWs and increasing their reporting rate will enhance the overall effectiveness of nutrition counselling during pregnancy.

Integrate IMAN Project supplementary data collection tools into existing HMIS to streamline processes, minimize duplication and alleviate the workload burden on HSPs. This integration enhances efficiency, promotes sustainability and facilitates the generation of accurate and comprehensive health data for informed decision-making and programme evaluation.

Government decisions based on IMAN Project results

The abovementioned results generated from the IMAN Project was presented during the national TAG meeting held on 13 December 2024. As a result, the Government of Tanzania, through the MoH, approved the scale-up of best practices from the IMAN Project, including the transition from IFA to MMS supplementation for pregnant women in Tanzania. As a next step, the TAG requested the development of a national roadmap and costed action plan to guide the systematic nationwide scaling-up of the IMAN initiative.

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