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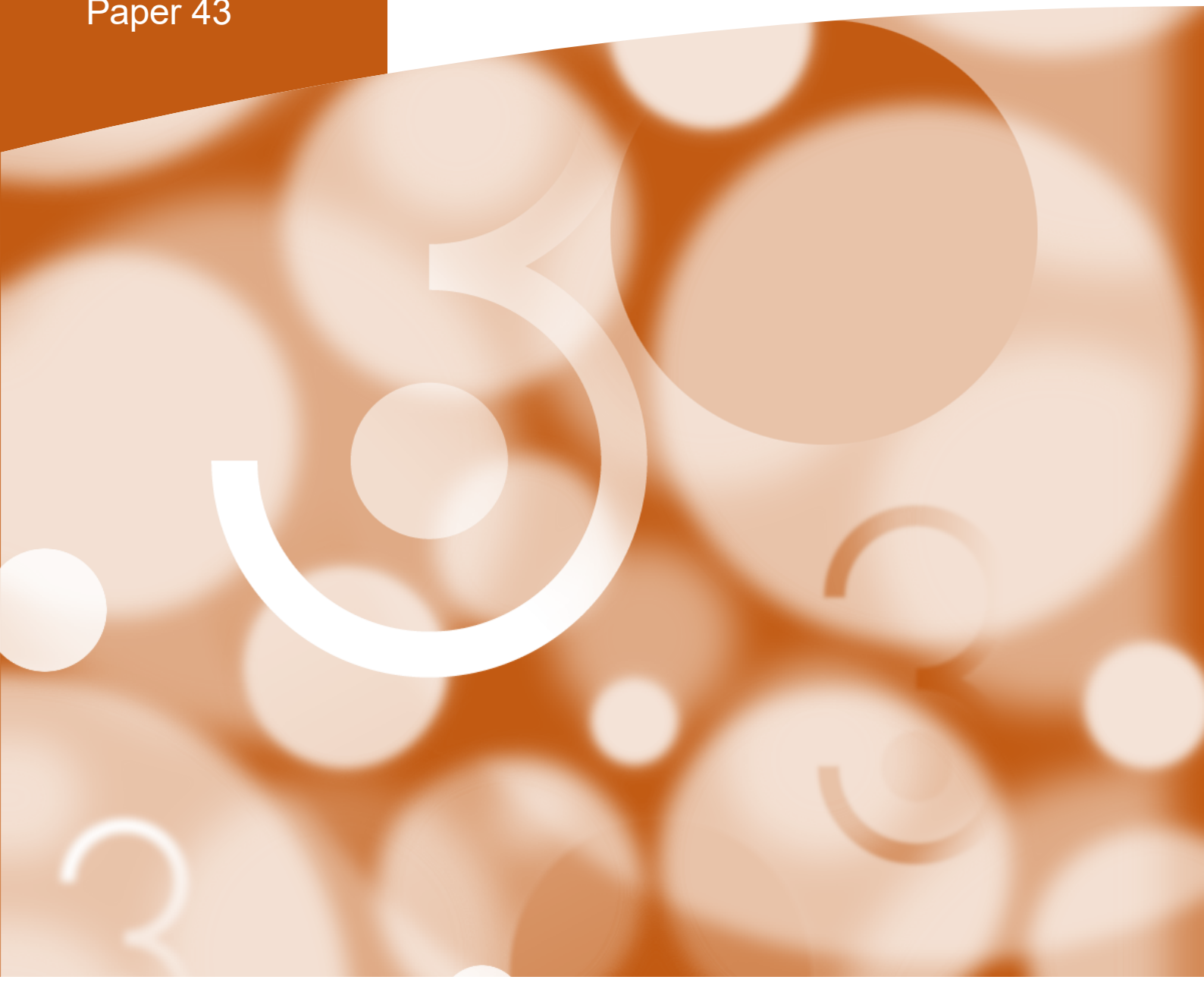
Quality improvement approaches to enhance Iron and Folic Acid Supplementation in antenatal care in Uganda

May 2021

Working Paper 43



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About this working paper

This paper, *Quality improvement approaches to enhance Iron and Folic Acid Supplementation in antenatal care Uganda*, outlines the findings of a study that investigated the implementation and the effectiveness of the quality improvement-related interventions to improve Iron and Folic Acid Supplementation uptake among pregnant women in Uganda.

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Quality improvement approaches to enhance Iron and Folic Acid Supplementation in antenatal care in Uganda

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Executive summary

Background

Anemia can have severe effects among pregnant women (e.g., puerperal sepsis) and on the unborn baby (e.g. low birth weight, preterm birth). In Uganda, anemia among women of reproductive age has been on the increase in the past decade. The Ministry of Health (MOH) recommends that pregnant women take iron and folic acid (IFA) tablets as one way of reducing pregnancy-related anemia and its effects among women: iron and folic acid supplementation (IFAS) is a national program. IFAS is delivered primarily through health facilities during antenatal care (ANC) clinics. However, compliance with the recommended IFAS among Ugandan pregnant women remains low with only 23% who take at least 90+ tablets during the whole pregnancy.

The Implementation Science Initiative (ISI) carried out an implementation science (IS) intervention in Uganda to improve the IFAS uptake among pregnant women. ISI came from a partnership among the University Research Co., LLC (URC) under the USAID's Regional Health Integration to Enhance Services in East Central Region (USAID RHITES-EC) project with the International Initiative for Impact Evaluation (3ie), the Society for Implementation Science in Nutrition (SISN) and researchers from Makerere University School of Public Health. Under the RHITES-EC mechanism, URC already provides technical assistance and support to the Government of Uganda using a quality improvement (QI) approach to strengthen health services.

As part of ISI, URC, the MOH, and their partners conducted a bottleneck assessment in 2018 to identify and prioritize bottlenecks within the IFAS system. The assessment revealed two major bottlenecks: inconsistent or poor-quality health education during ANC visits and stock outs of IFAS. To address these challenges, USAID RHITES-EC developed an intervention package, which included an enhanced support for QI, to improve IFAS-related health education and quantification. This intervention is referred to as "the QI-IFAS enhanced intervention."

An implementation research (IR) study was developed to specifically investigate the implementation and the effectiveness of the QI-related intervention for IFAS. As part of URC's work in the region, it is important to note that QI activities were implemented in both arms of the study. In the intervention arm, however, an IFAS enhanced QI was added. By utilizing an implementation science approach, the enhanced QI intervention included thorough documentation of processes of implementation as well as follow up of each bottleneck. A baseline study was conducted mid-2019 and an endline study in August 2020. The present report outlines the results of the endline study. It should be noted that the implementation of activities was affected by the Covid-19 pandemic restrictions between March and July 2020, which resulted in adaptations.

Methodology

The endline study investigated the status of two bottlenecks that were addressed through an enhanced support for QI. The QI-related intervention was carried out in two districts (Iganga and Buyende), with one comparison district (Busia). Quantitative and qualitative data were collected in the experimental and comparison districts as follows:

- IFAS-related health education received by pregnant women attending ANC (quantitative, targeted 370 exit interviews to mothers attending ANC in each study arm);
- Supply chain process for procurement and dispensing IFAS (qualitative, targeted 26 interviews in the experimental arm)
- QI processes, IFAS-specific (qualitative, targeted 26 targeted interviews, including with QI mentors).

The endline data has been compared to the baseline data between the two study arms to assess the effectiveness of the QI-related intervention.

Findings

Health education: The quality of health education was found to have improved substantially in the intervention arm as compared to the comparison arm. For example, mothers in the intervention arm had 3.6 times higher probability of receiving health education on IFAS ($p<0.001$) as compared to the comparison arm. The diversity of messages on nutritional care during pregnancy received by mothers also increased. The interviewees attributed this improvement to the QI processes that specially targeted improvements in IFAS-related health education. However, amidst the general improvements, health workers reported ongoing challenges, including a lack of health education job aids and a lack of standardized guidelines for health education.

Women's knowledge and perceptions: Women's knowledge on IFAS was reported to have generally improved although it remained low in both arms. The proportion of those who were not aware of the total number of tablets to take decreased from 69.7% to 56.3% in the intervention arm, and 84.1% to 69.2% in the comparison arm. Additionally, knowing the number of IFAS tablets one needed to take during pregnancy was found to be associated with one's level of education. Nonetheless, it was reported that the positive attitudes and perceptions among women towards IFAS remained high at endline.

IFA tablets availability: The intervention increased the probability of pregnant women receiving iron folate supplements during ANC. The magnitude of difference is 14.3%, according to the difference in difference estimate, with a confidence interval from 4.8% to 23.9%.

The interviewees attributed this improvement to the QI processes, especially the activities targeting the supply chain processes. Better quantification of drugs was noted, improved redistribution processes and quality control at health facility level. Mentorship, cross-facility learning sessions, and supervisions were noted as some of the QI activities that played a crucial role in these improvements. It should be noted that the supply chain interventions were implemented for four months, while—because of restrictions imposed on activities due to Covid-19, the health education activities were only implemented for two months. The difference in duration may have affected perceptions of their impact.

Conclusions and recommendations

According to the data analyzed in this report, QI-related intervention played a key role in improving the quality of health education and availability of IFAS. Nonetheless, it had a

lesser effect on women's knowledge of and perceptions towards IFAS use during pregnancy. Further exploration of why women of lower education levels had lower levels of IFAS related knowledge could be useful to find out if the materials and approach need to be adapted for low literacy populations. It would also be helpful to find out if a full four months of implementation for the health education activities would have had a greater impact on women's knowledge of and perceptions towards IFAS during pregnancy.

Because of QI's iterative nature and the learning by doing approach, these processes have the potential to improve systems functioning as was seen in this intervention. Recommendations for policymakers and implementers include the following:

- Quality health education is key in ensuring improved uptake of IFAS, therefore continued support of health workers to provide the needed health education is recommended.
- The development of ANC health education guidelines that include IFAS and other topics to serve as cues for providers would reinforce positive behavior.
- Maintaining adequate stocks of IFAS plays a key role in improvement of availability of and uptake of IFAS by the mothers.
- Proper quantification processes and promotion of redistribution of IFAS need to be maintained through ongoing mentorship and supervision activities carried out by districts.
- IFAS enhanced health education, better quantification and redistribution of IFAS within facilities were strengthened through the QI processes.
- The IFAS enhanced QI processes therefore can play a crucial role in improving uptake of IFAS and is therefore recommended for adoption by other districts.

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Acronyms

3ie	International Initiative for Impact Evaluation
ADHO	Assistant District Health Officer
ANC	Antenatal Care
CHW	Community Health Workers
CME	Continuous Medical Education
DHT	District Health Team
DHIS	District Health Information System
HC	Health Center
HIV	Human Immunodeficiency Virus
HUMC	Health Unit Management Committee
IEC	Information, Education and Communication
IFA	Iron and Folic Acid
IFAS	Iron and Folic Acid Supplementation
IR	Implementation Research
IS	Implementation Science
ISI	Implementation Science Initiative
JMS	Joint Medical Stores
LMICs	Low- and middle-income countries
MCH	Maternal and Child Health
MOH	Ministry of Health
NIE	Net Intervention Effect
NMS	National Medical Stores
ODK	Open Data Kit
OPD	Outpatient Department
PDSA	Plan-Do-Study-Act
PMTCT	Prevention of Mother-to-Child Transmission
PHC	Primary Health Care

QI	Quality Improvement
RHITES-EC	Regional Health Integration to Enhance Services in East Central Region
SD	Standard Deviation
SDA	Seventh Day Adventist
SISN	Society for Implementation Science in Nutrition
TASO	The AIDS Support Organization
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic and Health Survey
UNCST	Uganda National Council of Science and Technology
URC	University Research Co., LLC
USAID	United States Agency for International Development
WIT	Work Improvement Team

1. Introduction

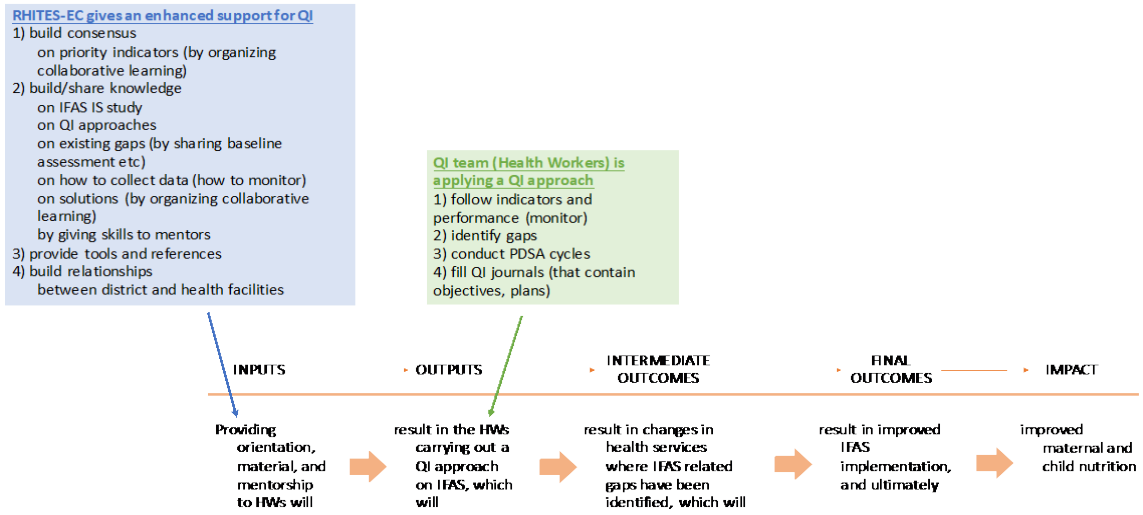
In Uganda, 32% of women of reproductive age are anemic. Between 2011 and 2016, anemia prevalence among women of reproductive age worsened, increasing from 23% to 32% (1,2). To prevent and control anemia, the Uganda National Anemia Policy (2002) stipulates that all pregnant women should be given supplementation of iron and folic acid (IFA) tablets. The Ministry of Health (MOH) in Uganda recommends that all pregnant women are counseled to ensure compliance with the recommended iron and folic acid supplementation (IFAS) intake (3, 4). Routine intake of the supplements is recommended to improve maternal health and pregnancy outcomes. This supplementation is provided at facility level usually through Antenatal Care (ANC) clinics attended by mothers. However, compliance with the recommended IFA tablets among pregnant women remains low with only 23% who take at least 90+ tablets according to Uganda health and demographic survey 2016 (5, 7, 8). In the Busoga region, less than 12% of the women are reported to have complied with the 90+ recommendation of IFA tablets intake. This could be partly explained by the fact that up to 40% of the women do not complete the four ANC visits. Also, late attendance with only 29% of the women attending ANC within the 1st trimester, plays a contributory role in undermining chances of receiving all the recommended IFAS tablets (5). In addition, evidence from studies conducted in Uganda (6) suggests that health education provided to pregnant women during ANC is not comprehensive, which affects the utilization of and adherence to IFAS. This also points to a gap in targeting messages during the ANC visits and the critical need to work towards enhancing the quality of IFAS-related health education provided during ANC services.

The University Research Co., LLC under the USAID RHITES-EC project partnered with the International Initiative for Impact Evaluation (3ie), the Society for Implementation Science in Nutrition (SISN) and Makerere University (School of Public Health) to improve the implementation of IFAS among pregnant women, through the Implementation Science Initiative (ISI). ISI takes an implementation science (IS) approach in which the implementation process is assessed, analyzed, and improved in an ongoing manner through an iterative process that is extensively documented.

In 2018, as part of ISI, a bottleneck assessment was conducted by URC, MOH and partners to identify and prioritize bottlenecks within the IFAS system. The assessment revealed two major bottlenecks: 1) inadequate provision of IFAS-related health education to the mothers (termed as uncoordinated health education); and 2) a weak drugs quantification process at health facility level resulting into unnecessary stock outs (termed as stock outs). Under the RHITES-EC project, URC supports the Government of Uganda by using a quality improvement (QI) approach that involves undertaking the Plan-Do-Study-Act (PDSA) cycle to strengthen health services in all districts where it works. To address the bottlenecks specific to IFAS, however, a comprehensive intervention package which includes an enhanced QI support for IFAS and an implementation science approach was designed to improve IFAS-related health education and supply systems. This study focuses on the enhanced support for IFAS through QI rather than the overall QI activities, but for brevity the IFAS-focused QI intervention is hereafter referred to as "the QI-related intervention".

The QI-related intervention aimed to address IFAS-related gaps at the ANC through an enhancement of the support given to health facility QI teams for the use of QI for IFAS. Figure 1 presents the logic model of the QI-related intervention. QI-related intervention activities were expected to result in QI teams testing changes towards addressing the IFAS gaps. These changes were expected to result in improved delivery of IFAS at the ANC clinics and thus improve maternal and child outcomes (Figure 1).

Figure 1: QI-related intervention logic model



Appendix A provides a more detailed description of each of these activities. The ISI team adapted the Hulscher (2002) framework for process evaluation on QI interventions to describe key features of the intervention (7).

Mid-2019, a baseline study was conducted to investigate the status of the two bottlenecks along with the QI activities. The results of this baseline can be found in a report- “a baseline Assessment Report: Quality Improvement Approaches to Enhance Iron and Folic Acid Supplementation in Antenatal Care in Iganga and Buyende Districts, Uganda, February 2020.” This report provides the results of the endline with analysis of the results. It should be noted that the Covid-19 pandemic affected the implementation of activities starting in March 2020. For a timeline of which activities were affected and adaptations that took place, see Appendix B.

2. Overall study aims

In this IR, the practice of interest is QI and there are two aims:

1) to investigate the implementation of QI.
2) to assess the effectiveness of QI in addressing bottlenecks in health education and in the supply system related to IFAS.

A process evaluation study was carried out to investigate the implementation of the QI-related intervention in terms of how and the extent to which the intervention was implemented, as well as the exposure and experiences of the participants.

An effectiveness study was carried out to assess the effectiveness of QI, which was measured through a comparison of the changes achieved over time in both arms of the

study. The present endline evaluation report serves as the effectiveness study and provides insights for the second aim of the overall study.

2.1 Key evaluation questions

The purpose of the endline study was to provide insights on the status of two major bottlenecks. Specifically, this endline study sought to determine the effect of enhanced support for QI on the following:

1. The nature and quality of IFAS-related health education received by mothers attending ANC between baseline and endline
2. Any changes in women's knowledge about, perceptions of the benefits of, or willingness to take IFAS
3. Any changes in availability of IFA tablets at health facilities providing ANC services, as well as the supply chain management processes for IFAS

3. Methods

3.1 Study design

3.1.1 Study setting

Under the IR, two arms were surveyed: a comparison arm where a standard support for QI was provided, and an experimental or intervention arm where the enhanced support for QI was provided. Table 1 illustrates the difference in the QI activities for the two study arms, based on the support provided.

Table 1: Comparison arm vs experimental arm for the QI activities

QI ACTIVITIES	IMPLEMENTERS	STUDY ARMS	
		Comparison arm	**Experimental arm**
QI performance review and work planning meetings	Health facility QI teams supported by URC/RHITES-EC staff and mentors	- Done quarterly - Performance indicators guide subsequent mentorship and coaching sessions - Not specifically focused on IFAS	- Done monthly - Subsequent mentorship and coaching done regardless of performance indicators - Deeper focus on IFAS
Mentorship and coaching sessions	URC/RHITES-EC staff and mentors	- Done when needed according to the performance indicators - Done by regional mentors	- Done monthly - Done by district team (better understanding of the environment; longer coaching)
Collaborative learning sessions	URC/RHITES-EC staff	- Sometimes, not specifically focused on IFAS	- Done bimonthly, focus on IFAS

3.1.2 Study site

Two districts were assigned to the experimental arm; one district was assigned to the comparison arm. Districts were selected based on similar district-level population characteristics (Table 2) and based on where URC/RHITES-EC was currently implementing its standard QI activities.

Table 2: Population projections of the study districts

Study arm	District	Number of health facilities providing IFAS	Estimated Population served	Estimated population of women of reproductive age (15-49 years old)
Experimental arm	Buyende	20	397,500	80,295
Experimental arm	Iganga	30	391,300	79,043
Comparison arm	Busia	25	373,200	75,386

3.1.3 Research Design

The IR study measured effectiveness of the QI-enhanced intervention by using a difference-in-differences approach. The comparison arm was selected purposively, although descriptive statistics at baseline found no significant differences in factors that might be associated with the outcomes of interest. The study uses longitudinal facility-level data due to the study's inability to track pregnant women over time, as well as the natural attrition that occurs when women in later gestational periods no longer access ANC services. To the extent possible, we attempt to control for these differences.

3.1.4 Sample size calculations

The exit interview respondents' sample was determined by the difference in means formula (10).

$$(\pi_1-\pi_2)^2$$

$$n= (Z_{\infty/2}+ Z_\beta)^{2X}[\pi_1(1-\pi_1) + \pi_2(1-\pi_2)]$$

where;

n= Sample size required in each arm per district

$Z_{\infty/2}$= Depends on desire significance level 1.96 (at 95% CI)

Z_β= Depends on desired power 0.84 (power of 80%)

π_1= Current proportion 0.6 (proportion of women who attend at least 4+ ANC visits used as a proxy for the study outcomes)

π_2=QI support contribution 0.70 (10% increase)

Adjusting for a 10% non-response, the total sample size targeted was 370 in each of the study arms.

3.2 Sampling

3.2.1 Selection of health facilities for Phase I (quantitative data collection)

The selection criteria included public sector health facilities with a minimum of 100 women attending their first ANC visit during the financial year of 2017/2018. Researchers purposively selected a sample of 10 health facilities from each of the three districts with the highest numbers of ANC attendances for inclusion to offset potential attrition that may occur over time. At these facilities, researchers conducted ANC exit interviews with each woman who consented to be interviewed until the predetermined sample size for each of the facilities was reached (Table 3).

Table 3: Distribution of sample size

District	Health facility type	Health facility freq	Sample size of study participants	
			Baseline	Endline
Busia (comparison arm)	HC II	1	10	10
	HC III	7	188	187
	HC IV	1	114	114
	Hospital	1	57	55
Buyende (intervention arm)	HC II	5	53	53
	HC III	4	78	77
	HC IV	1	25	25
Iganga (intervention arm)	HC II	1	18	7
	HC III	7	99	110
	HC IV	1	16	16
	Hospital	1	79	78
Total sample size		**30**	**737**	**732**

3.2.3 Selection of interviewees for qualitative data collection

Researchers selected interviewees based on their involvement in the procurement and dispensing process of IFAS, which included frontline health workers such as medical and clinical officers, midwives, and nurses. In addition, pharmacy technicians, records officers, and stores personnel that support the supply chain were also interviewed. Because the qualitative interview guides focused on understanding the changes created through the QI-related intervention implemented, these interviews were conducted only in the intervention arm. Tables 4 and 5 present the categories of health workers interviewed and the number of interviewees by level of health facility, respectively.

Table 4: Interviewees for the qualitative interviews

Category of Interviewees	Number of Interviewees
District health team (DHT) members	3
Mentors	6
ANC personnel	10
Stores Personnel	7
Total	**26**

Table 5: Number of interviewees by health facility level

Level of health facility	Number of Interviewees
District health office	3

Hospital	4
HC IV	5
HC III	9
HC II	5
Total	**26**

3.3 Data collection

The data collection process was led by URC/RHITES-EC staff and supported by researchers from Makerere University School of Public Health.

3.3.1 Data collection tools

The research team conducted structured exit interviews with pregnant women attending ANC clinics to understand the quality of health education, women's knowledge and motivation for intake of IFA tablets, and the availability of IFA in the selected health facilities. The semi-structured interviews with health workers explored the QI processes, health education for IFAS, and IFAS supply chain processes and tracking procedures. Table 6 presents the data collection tools for each research objective related to the assessment of QI effectiveness.

Table 6: Data collection tools

Study population (Phase)	Methods	Tools	Content
1.To determine the nature and quality of IFAS-related health education received by pregnant women attending ANC			
Pregnant women attending ANC	ANC exit interviews (survey)	Questionnaire (Appendix B)	- Services during pregnancy - Support to attend ANC - Transportation and cost - Health education received - Products received and tests - Satisfaction with services - (rating)
2. To determine women's knowledge on intake of IFAS and motivation to take the IFA tablets			
Pregnant women attending ANC	ANC exit interviews (survey)	Questionnaire (Appendix B)	- Motivation to attend ANC - Support to attend ANC - Knowledge about IFAS recommendations - Plan to take IFAS - Minimum number of IFA tablets to take during pregnancy - Number of IFA tablets to receive during ANC
3. To describe changes to the IFAS supply chain and health education following the QI-related intervention.			
District health team	Semi-structured interviews	Interview guide for DHT members (Appendix D)	- Changes in ordering for IFAS at district level - Changes in in-facility IFAS requisitioning process - Changes in quality assurance for IFAS at facility level - Changes in accounting for IFAS at facility level - Changes in preparing pregnant women for IFAS - Changes in dispensing IFAS to pregnant women at facility level
QI mentors	Semi-structured interviews	Interview guide for Mentors (Appendix E)	
ANC personnel	Semi-structured interviews	Interview guide for ANC personnel (Appendix F)	
Stores personnel	Semi-structured interviews	Interview guide for supply chain/stores personnel- IFA supply interviews (Appendix G)	

3.3.2 Data collection: Quantitative, August 2020

The researchers from Makerere University led the training of the research assistants responsible for administering the exit interviews to pregnant women at the health facilities. The three-day training (July 28 to 30, 2020) involved role playing to ensure that the research assistants were familiar with the interview questions. URC led the data collection process, which involved providing the research assistants with supervision and onsite mentorship to ensure quality data collection. The researchers provided remote support for data collection and the data cleaning process. The data was collected using

the ODK collect software managed and supported by URC.

3.3.3 Data collection: Qualitative, August 2020

URC provided training and field support to the research assistants responsible for the qualitative data collection (August 10 to 11, 2020). The interviews were recorded using audio recorders and later transcribed verbatim into text.

3.4 Data analysis processes

3.4.1 Quantitative data

Open Data Kit was used for data collection. Following data collection, the quantitative data were cleaned and exported into Excel and then analyzed using STATA 15. For the main study outcomes, difference in differences (DiD) estimation was used to measure the impact of the intervention on IFAS outcomes. Logistic regression modeling was used to control for factors associated with IFAS uptake and potential differences in baseline values. Simple models were used to obtain crude odds ratios, corresponding p-values and estimates for the DiD. Because factors such as maternal age, education, occupation, gestation age, early ANC attendance, and partner support have been found to influence IFAS uptake outcomes, adjusted models were fitted while controlling for these factors. Given that the data were collected in a repeated studies design, we evaluated the distribution of factors in the four different groups of respondents, namely: (1) women in the intervention group at baseline, (2) women in the comparison group at baseline, (3) women in the intervention group at baseline, and (4) women in the control at endline. We used ANOVA for continuous responses and chi-square analysis of association for the categorical variables. For secondary outcomes and causal mechanisms, researchers used descriptive statistics.

The main outcomes of interest (receipt of IFAS during ANC, women's knowledge of the importance of IFAS, women's knowledge of the correct number of tablets to take) were selected based on the theory of change and expected results of the intervention. The underlying hypotheses were that improvements in health managers and health workers ability to manage supply chain processes and delivery quality education about IFAS during ANC, along with women's improved knowledge of and understanding the importance of IFAS would result in increases in the coverage and quantity of IFAS and improve pregnant women's knowledge/understanding about IFAS. They were measured as follows (See Appendix E for the full instrument):

- What is the minimum number of iron and folic acid tablets that you should take during this pregnancy? Response options: 30, 60, 90, or I don't know;
- During this ANC visit, did you receive health education about the following – the importance of iron and folic acid supplements?
- During this ANC visit were you given the following – folic acid, iron tablets, ferrous sulphate/fumarate (iron) + folic acid?

Social demographics such as religion, marital status, formal education attained, and primary occupation aligned to outcomes of the respondents at both baseline and endline.

3.4.2 Qualitative data

All transcripts were read several times to ensure familiarity with the data. An open coding process was led by one of the researchers (MT) and supported by a qualitative analysis software, MAX QDA for Macs (Version 11.2.5). The coding of all the 26 transcripts was undertaken, at which point saturation was reached. After the open coding, a process of grouping and regrouping of the codes was undertaken guided by the objectives of the study.

3.5 Ethical considerations

The study protocol was approved by the TASO ethical review board (TASO REC/015/19-UG-REC-009) and the Uganda National Council of Science and Technology (UNCST-HS396ES). In addition, permission to undertake the study was obtained through the local district authorities in each of the study arms. Informed written consent was obtained from all the respondents and strict confidentiality was adhered to at the time of data collection, analysis and sharing of findings.

4. Findings

4.1 Sociodemographic characteristics

The sociodemographic factors for the intervention and comparison samples were comparable for pregnant women's formal education and marital status but different for religion and occupation **(Table 7)**. The differences in occupation could have been due to measurement challenges relating to defining a peasant farmer versus a full-time housewife. In rural places, most housewives also work on the farms. Differences in religion reflect the population of the respective districts. In the intervention district of Iganga, most of the population is Muslim, while the comparison district is majority Christian. The difference of proportions of religions between intervention and comparison arms at baseline and endline were, however, not significant.

Table 7: Descriptive statistics of sampled pregnant women and key baseline and endline outcomes for both study arms

Factor	Baseline		Endline		p-value of diff
	Intervention Freq (%)	Comparison Freq (%)	Intervention Freq (%)	Comparison Freq (%)	
Religion					
Protestant	115 (32.9)	121 (32.6)	90 (24.6)	105 (28.8%)	<0.001
Catholic	68 (19.4)	102 (27.5)	76 (20.8)	97 (26.6%)	
Moslem	118 (33.7)	59 (15.9)	132 (36.1)	54 (14.8%)	
Pentecostal	45 (12.9)	79 (21.3)	57 (15.6)	104 (28.6%)	
SDA	3 (0.9)	5 (1.3)	7 (1.9)	2 (0.5%)	
Others	1 (0.3)	5 (1.3)	4 (1.1)	2 (0.5%)	
Primary Occupation					
Salaried worker	12 (3.4)	16 (4.4)	26 (7.1)	16 (4.4)	0.024
Business	55 (15.7)	76 (20.9)	66 (18.0)	76 (20.9)	
Fulltime housewife	94 (26.9)	113 (31.0)	92 (25.1)	113 (31.0)	
Peasant farmer	159 (45.4)	133 (36.5)	168 (45.9)	133 (36.5)	
Others	30 (8.6)	26 (7.1)	14 (3.8)	23 (6.3)	
Marital status					
Married	302 (86.3)	290 (78.2)	333 (91.0)	324 (89.0)	0.735
Cohabiting	17 (4.9)	49 (12.4)			
Separated	7 (2.0)	7 (1.9)	6 (1.6)	5 (1.4)	
Single	22 (6.3)	27 (7.3)	26 (7.1)	34 (9.3)	
Widowed	2 (0.6)	1 (0.3)	1 (0.3)	1 (0.3)	
Formal Education					
Primary	172 (49.1)	161 (43.4)	188 (51.4)	192 (52.7)	0.826
Secondary	78 (22.3)	90 (24.3)	130 (33.9)	127 (34.9)	
Tertiary	5 (1.4)	6 (1.6)	12 (3.3)	10 (2.7)	
Vocational	4 (1.1)	0 (0.0)	2 (0.5)	5 (1.4)	
None	84 (24.0)	105 (28.3)	34 (9.3)	30 (8.2)	

4.2 The nature and quality of IFAS-related health education received by pregnant women attending ANC between baseline and endline

4.2.1 Health education practices at facility during ANC

The intervention increased the likelihood of receiving health education (adjusted OR=3.61, CI from 2.33 to 5.58). The difference in differences was statistically significant (<0.001). A calculation of marginal effects indicates that the treatment group was 30.3 percentage points more likely to have received health education than the comparison group (CI=20.5 – 40.0 pp, see Table 8).

Table 8: Health Education Adjusted Model Estimates

Any health education	Odds Ratio	Robust Std. Err.	z	P-value	[95% Conf.	Interval]
Treatment dummy	0.51	0.082	-4.16	<0.001	0.37	0.70
Time dummy	0.59	0.093	-3.33	0.001	0.43	0.80
Treatment effect	**3.61**	**0.803**	**5.77**	**<0.001**	**2.33**	**5.58**
Age of Mother (Yrs)	0.99	0.009	-0.71	0.476	0.98	1.01
Education Level						
Primary	1.11	0.180	0.67	0.502	0.81	1.53
O level	1.22	0.226	1.09	0.275	0.85	1.76
Vocational/Tertiary	0.96	0.353	-0.10	0.922	0.47	1.98
A level	0.93	0.382	-0.17	0.864	0.42	2.08
ANC Visits						
2	0.92	0.148	-0.55	0.584	0.67	1.26
3	0.96	0.152	-0.23	0.817	0.71	1.31
4 or more	1.15	0.220	0.72	0.469	0.79	1.67
Occupation						
Housewife	1.14	0.193	0.79	0.428	0.82	1.59
Peasant Farmer	1.22	0.201	1.19	0.233	0.88	1.68
Salaried Worker	1.06	0.315	0.20	0.844	0.59	1.90
Others	1.37	0.351	1.22	0.224	0.83	2.26
Early ANC	0.96	0.135	-0.32	0.753	0.73	1.26
Partner support	1.41	0.192	2.53	0.011	1.08	1.84
_cons	1.54	0.523	1.26	0.208	0.79	2.99

The positive treatment effects are driven by both intervention districts experiencing an increase in reported receipt of any health education: Buyende district improved from 42.5% to 67.1%, while Iganga improved from 50.0% at baseline to 64.0% at endline. The comparison group, Busia district, experienced a reduction in the proportion of pregnant women reporting to have received any health education from 63.3% at baseline to 50.8% at endline (see Table 9).

Table 9: Health education and messages received by mothers attending ANC clinics

	Intervention			**Comparison**				
Mother received Health Education messages on:	**Baseline N (%)**	**Endline N (%)**	Estimate of Change **%**	**Baseline N (%)**	**Endline N (%)**	Estimate of Change %	NIE* %	95%CI
Any health educ. during ANC	163 (46.7)	239 (65.3)	18.6	235 (63.3)	185 (50.8)	-12.5	31.1	(23.8 - 38.4)
Importance of IFA consumption	81 (49.7)	197 (82.4)	32.7	121 (51.5)	114 (61.6)	10.1	22.6	(15.3 - 29.9)
IFAS side effects	34 (30.9)	108 (45.2)	14.3	87 (37.0)	42 (22.7)	-14.3	28.6	(21.4 - 35.9)
Duration of IFAS consumption	49 (30.0)	168 (70.3)	40.3	80 (34.0)	86 (46.5)	12.5	27.8	(20.1 - 35.1)
How to take IFA	86 (52.8)	201 (84.1)	31.3	120 (51.1)	126 (68.1)	17.0	14.3	(7.1 - 21.6)
Where to obtain IFA	82 (50.3)	179 (74.9)	24.6	107 (45.5)	102 (55.1)	9.6	15.0	(7.7 - 22.3)

* NIE, is the Net Intervention effect (difference in intervention arm from baseline to endline, minus difference in comparison arm from baseline to endline)

Qualitative research results support the quantitative results about improved health education. As a result of the QI activities, health education sessions improved, according to health workers interviewed. With enhanced knowledge about the importance of IFAS and improved skills in health education, health workers increased the number of health education sessions offered and emphasized IFAS. As one health worker explained,

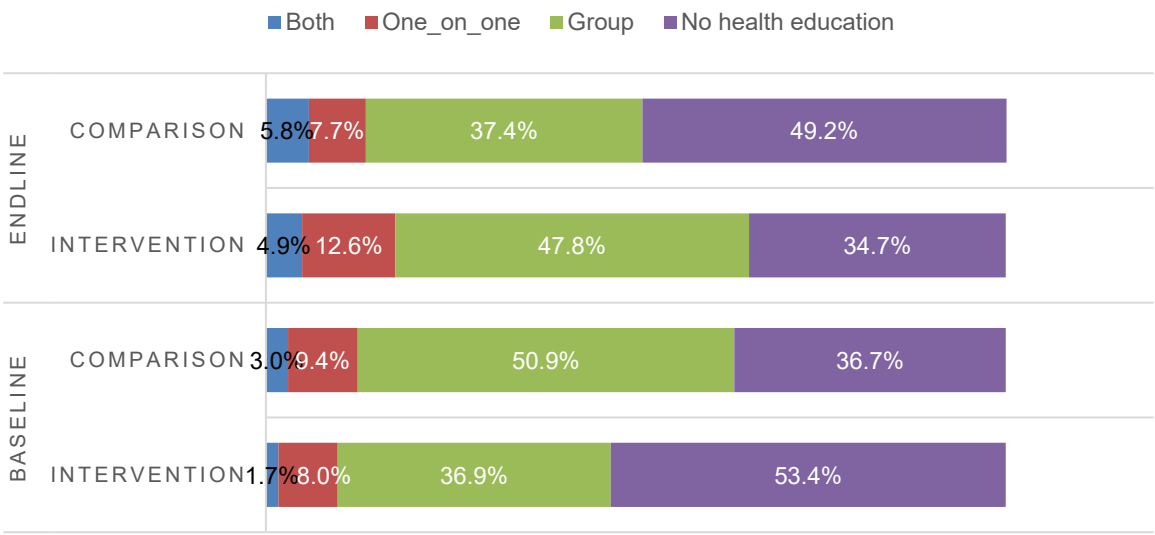
> We've educated them (the clients) on the importance of IFAS and we, as health workers, are now giving them enough tablets for at least one month. — (ANC personnel 1)

Pregnant woman are recommended to take at least 90 tablets during pregnancy, therefore giving them at least 30 tablets monthly, which would provide adequate time for them to complete the recommended dosage.

4.2.2 Modes of health education for IFAS messages

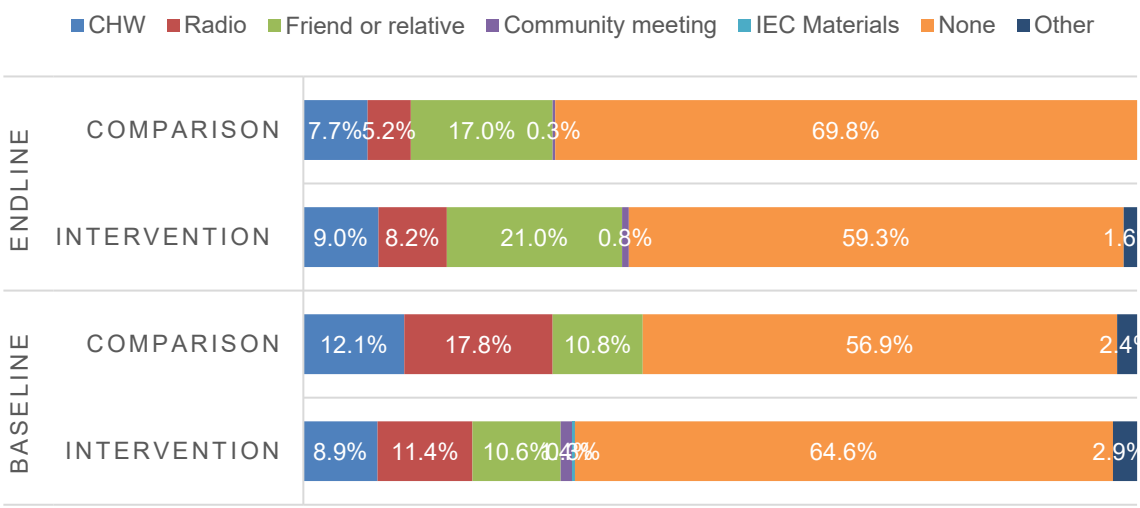
In the intervention districts, the proportion of IFAS messages disseminated through all modes—one-on-one counseling, groups sessions, or both—at ANC clinics improved (Figure 2**)**. By contrast, performance on this indicator declined in the comparison district.

Figure 2: Modes used to pass on IFAS messages according to study arm



There was a small but statistically significant improvement with other sources of IFAS messages in both intervention and comparison arms of the study **(**Figure 3**)**. Unfortunately, however, the proportion of pregnant women who reported receiving any messages from radios reduced in both study arms. The health facilities remain as the main source of health messages, which underscores the importance of the RHITES-EC approach and suggests a need for further programming to intensify other sources of health education messages, especially through radio and CHWs.

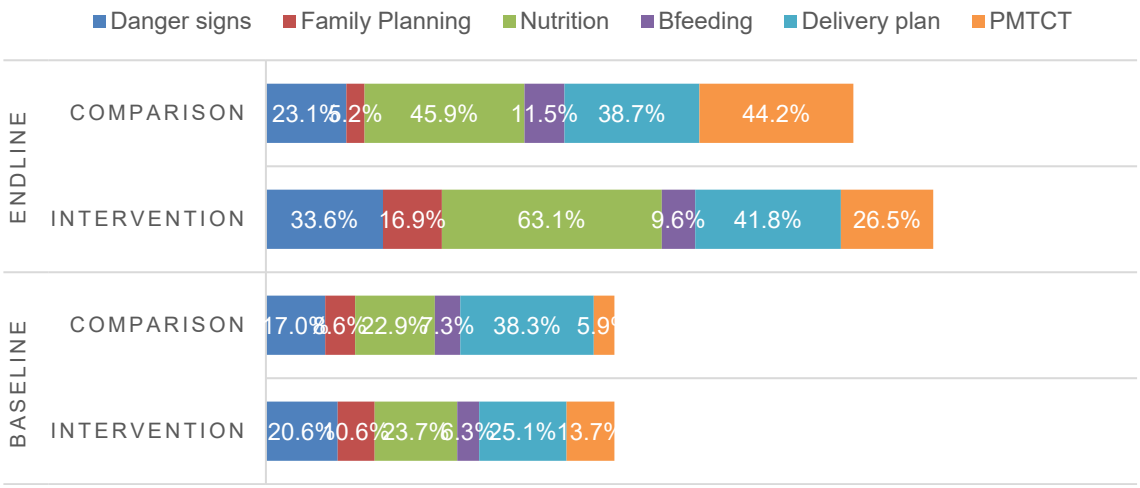
Figure 3: Other sources of messages on IFAS messages according to study arm



4.2.3 Health education topics discussed with health provider during current ANC visit

The proportion of other health topics that pregnant women discussed with health providers increased in both study arms (Figure 4**)**. Maternal nutrition-related messages increased by more than two-fold in both study arms, although information on breastfeeding and family planning was not delivered consistently.

Figure 4: Health topics discussed with health workers in intervention and comparison arms at baseline and at endline



The qualitative findings reinforce the findings that there were improvements in information conveyed about importance of IFAS during ANC counseling. Along with general nutritional advice, they learned about how IFAS contributes to the prevention of anemia and its effects on fetal growth, planning for conception, and about how to manage side effects that might arise from IFA tablets—for example, by taking the tablets at night to avoid nausea. According to the health workers interviewed, fewer pregnant women presented with acute or severe malnutrition at ANC clinics at the end of the study. As one health provider explained,

> We tell them not to be in a hurry to conceive. First take time, then if you have planned, maybe this time around you take this folic acid for three months, then you can conceive — (ANC personnel 3)

Health workers identified some challenges with health education, however. According to health workers interviewed, ANC clinics do not have demonstration materials such materials as flip charts, pictorials, and videos, which would improve the quality of the sessions. Additionally, health workers noted that the Ministry of Health has not issued standardized ANC health education guidelines, which would be useful for health workers to ensure all topics are covered.

> I wish with time they could maybe get us some videos and we show (them to) pregnant women; (then) they may embrace the IFAS tablets more. — (ANC personnel 10)

> If we (health workers) would have some health education guidelines like from the Ministry that would be good, because sometimes we are not sure of what to do. — (ANC personnel 8)

4.2.4 Pregnant women's perceptions of the health education and experiences with health providers during current ANC visit

In the intervention arm, there were improvements in how pregnant women perceive the health education and services received at health facilities (Table 10). Compared to baseline, pregnant women reported greater satisfaction with the time spent with health workers, the quality of health education, and the attitudes of health workers. However, there was no improvement in perceptions of length of waiting time in either the intervention or comparison arms.

Table 10: Pregnant women's level of satisfaction with health education services received

Factor	***Intervention***			***Comparison***		
Mother satisfaction with:	***Baseline Mean (95%CI)***	***Endline Mean (95%CI)***	p-value	***Baseline Mean (95%CI)***	***Endline Mean (95%CI)***	p-value
Waiting time	3.7 (3.6-3.8)	3.8 (3.7-3.9)	0.671	3.8 (3.7-3.9)	3.7 (3.6-3.8)	0.536
Time spent with health worker	2.9 (2.8-3.0)	3.5 (3.4-3.7)	<0.001	3.3 (3.2-3.5)	3.5 (3.3-3.6)	0.584
Quality of health education received	2.9 (2.7-3.0)	3.5 (3.4-3.7)	<0.001	3.4 (3.2-3.5)	3.4 (3.3-3.6)	0.712
Health workers attitude towards you	4.1 (4.1-4.2)	4.5 (4.4-4.5)	0.014	4.1 (4.1-4.2)	4.4 (4.4-4.5)	<0.001
Availability of iron and folate tablets at facility	3.6 (3.5-3.7)	4.5 (4.4-4.6)	<0.001	3.7 (3.6-3.8)	4.4 (4.3-4.5)	<0.001

Note: P-values are based on within-group hypothesis testing of baseline and endline estimates.

4.3 Women's knowledge about perceptions of the benefits of, or willingness to take IFAS

4.3.1 Pregnant women's knowledge of IFAS

There was no statistically significant effect of the intervention on the awareness of mothers on the number of minimum IFAS of tablets a mother should take during pregnancy after adjusting for the other factors, p=0.313 (Table 11). The adjusted odds ratio was 0.74, with the confidence interval spanning 1.0 (CI: 0.41 - 1.33), therefore reinforcing the finding that the intervention had no effect on this outcome.

Table 11: Awareness of Minimum Number of Tablets according to Women's Education-- Adjusted Model Estimates

Awareness of Minimum number of IFAS tablets	Odds Ratio	Robust Std. Err.	z	P>z	[95% Conf.	Interval]
Treatment dummy	1.95	0.484	2.70	0.007	1.20	3.17
Time dummy	3.61	0.819	5.65	0.000	2.31	5.63
Treatment effect	**0.74**	**0.221**	**-1.01**	**0.313**	**0.41**	**1.33**
Age of Mother (Years)	0.99	0.012	-0.68	0.497	0.97	1.02
Education Level						
Primary	2.47	0.637	3.49	0.000	1.49	4.09
O level	3.10	0.860	4.08	0.000	1.80	5.34
Vocational/Tertiary	5.37	2.495	3.61	0.000	2.16	13.35
A level	4.54	2.399	2.86	0.004	1.61	12.79
ANC Visits						
2	1.80	0.371	2.83	0.005	1.20	2.69
3	2.37	0.469	4.37	0.000	1.61	3.49
4 or more	2.52	0.592	3.93	0.000	1.59	3.99
Occupation						
Housewife	0.84	0.166	-0.90	0.366	0.57	1.23
Peasant Farmer	0.83	0.162	-0.97	0.330	0.56	1.21
Salaried Worker	0.70	0.261	-0.96	0.338	0.34	1.45
others	0.30	0.115	-3.15	0.002	0.14	0.63
Early ANC	0.75	0.133	-1.62	0.105	0.53	1.06
Partner Support	0.73	0.134	-1.69	0.091	0.51	1.05
_cons	0.04	0.021	-6.45	0.000	0.02	0.11

Furthermore, the majority of pregnant women in both arms did not know the total number of IFAS tablets to take during pregnancy at endline. The proportion of those who were not aware of the total number of tablets to take decreased from 69.7% to 56.3% in the intervention arm, and from 84.1% to 69.2% in the comparison arm. Women who were able to report the correct amount of 90+ days increased in both study arms. The increase was associated with pregnant women's education level **(**Table 12**),** but not with

gestational age. Pregnant women who had visited ANC clinics many times or who had higher gestational ages were not more knowledgeable.

Table 12: Pregnant women's knowledge of the number of IFA tablets to take during current pregnancy according to level of formal education and study arm

Study Arm	Round of data	Mother's education level	What is the minimum number of IFA tablets that you should take during this pregnancy? 30	60	90	Don't know
Intervention	Baseline	None (N=84)	7.1%	8.3%	8.3%	76.2%
		Primary (N=172)	7.6%	6.4%	12.8%	73.3%
		O-Level (N=78)	3.8%	16.7%	20.5%	59.0%
		A-Level (N=7)	14.3%	14.3%	14.3%	57.1%
		Tertiary (N=5)		40.0%		60.0%
		Vocational (N=4)	25.0%		50.0%	25.0%
		Total (N=350)	**6.9%**	**9.7%**	**13.7%**	**69.7%**
	Endline	None (N=34)		8.8%	17.6%	73.5%
		Primary (N=188)	1.1%	6.9%	35.1%	56.9%
		O-Level (N=124)	2.4%	4.8%	38.7%	54.0%
		A-Level (N=6)			50.0%	50.0%
		Tertiary (N=12)	16.7%	8.3%	41.7%	33.3%
		Vocational (N=2)			100.0%	
		Total (N=366)	**1.9%**	**6.3%**	**35.5%**	**56.3%**
Comparison	Baseline	None (N=105)	1.0%		4.8%	94.3%
		Primary (N=161)	4.3%	3.7%	7.5%	84.5%
		O-Level (N=90)	3.3%	10.0%	12.2%	74.4%
		A-Level (N=9)			22.2%	77.8%
		Tertiary (N=6)	16.7%		33.3%	50.0%
		Total (N=371)	**3.2%**	**4.0%**	**8.6%**	**84.1%**
	Endline	None (N=30)		3.3%	6.7%	90.0%
		Primary (N=192)	0.5%	2.1%	30.2%	67.2%
		O-Level (N=119)	0.8%	1.7%	29.4%	68.1%
		A-Level (N=8)			25.0%	75.0%
		Tertiary (N=10)			50.0%	50.0%
		Vocational (N=5)			20.0%	80.0%
		Total (N=364)	**0.5%**	**1.9%**	**28.3%**	**69.2%**

O-Level- Lower secondary school, A-Level-Advanced secondary school

4.3.2 Pregnant women's perceptions of the benefits of, or willingness to take IFAS

Pregnant women's positive attitudes towards taking IFAS was high in both study arms and in both study rounds. Up to 88.0% and 82.5% of pregnant women confirmed willingness to take IFAS throughout pregnancy at baseline among intervention and comparison arms, respectively. A similar situation was observed at endline with 85.8% and 78.8% of the pregnant women in intervention and comparison arms, respectively, willing to take IFAS throughout pregnancy **(Figures 5)**. There was an increase in the proportion of pregnant women who acknowledged the role of ANC health education in helping them appreciate the importance of taking IFAS.

Figure 5: Reason why pregnant women will take IFAS throughout pregnancy

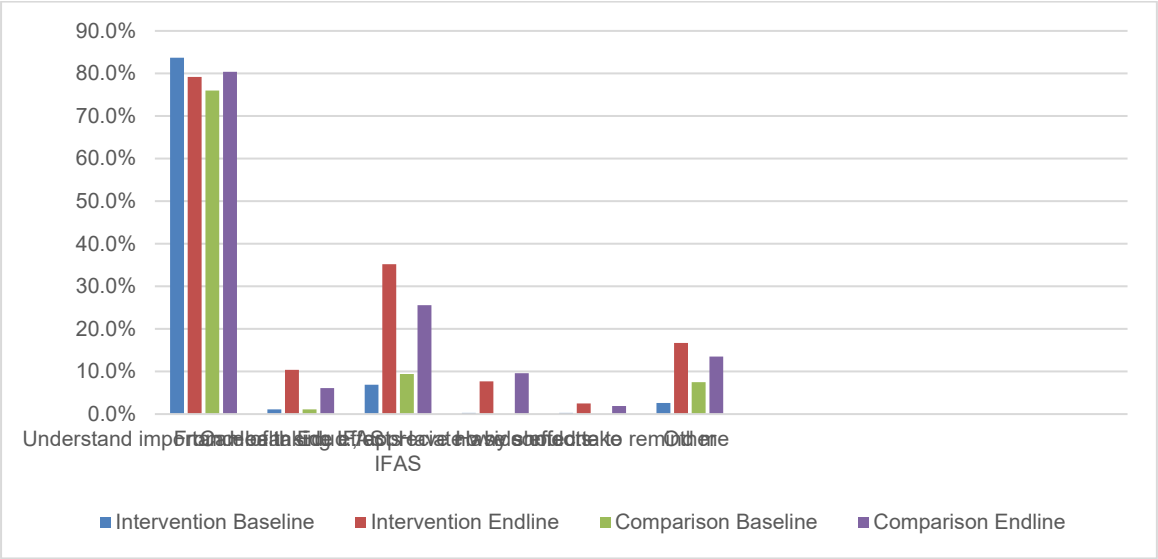
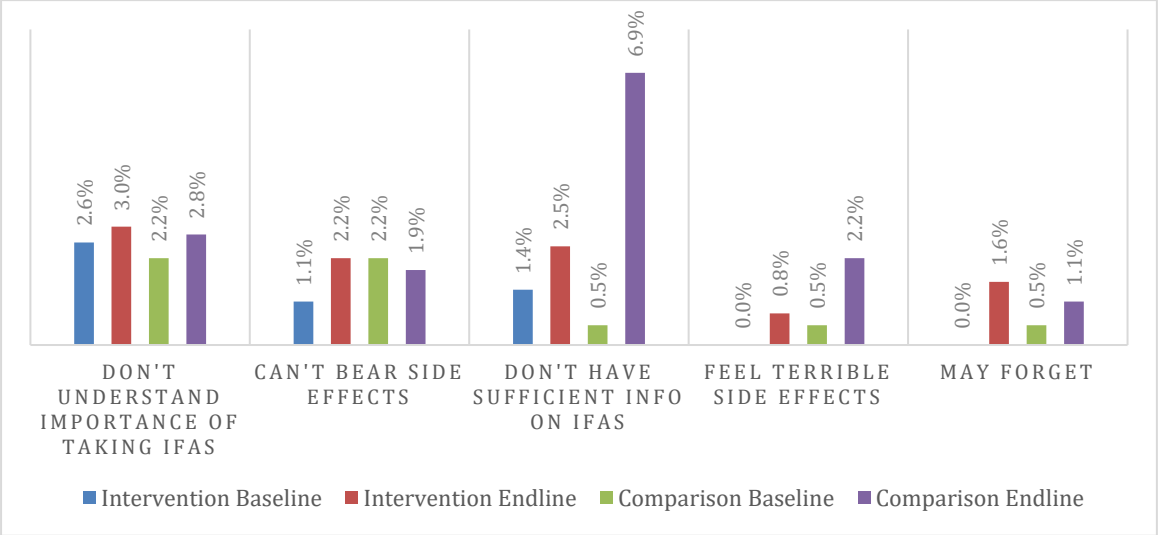


Figure 6: Reason why pregnant women will not take IFAS throughout pregnancy



4.4 Availability of IFA tablets at health facilities providing ANC services and the supply chain management processes for IFAS

4.4.1 Provision of IFAS, other medicines and interventions during ANC

The intervention increased the probability of pregnant women receiving iron folate supplements during ANC (Table 13). A significant difference in difference was observed, with women in the intervention group having 2 times the odds of receiving IFA supplements after adjusting for other factors (adjusted OR= 2.04 CI (1.27, 3.30))

Table 13: Receiving Iron Folate Supplements Adjusted Model Estimates

Received iron folate supplements	Odds Ratio	Robust Std. Err.	Z	P>z	[95% Conf.	Interval]
Treatment dummy	0.70	0.112	-2.22	0.026	0.51	0.96
Time dummy	3.51	0.594	7.40	0.000	2.52	4.89
Treatment Effect	**2.04**	**0.501**	**2.92**	**0.003**	**1.27**	**3.30**
Age of Mother (Yrs)	0.99	0.011	-1.24	0.215	0.97	1.01
Education Level						
Primary	0.77	0.131	-1.54	0.123	0.55	1.07
O level	0.67	0.133	-2.03	0.043	0.45	0.99
Vocational/Tertiary	1.94	0.854	1.51	0.132	0.82	4.60
A level	1.03	0.504	0.06	0.955	0.39	2.69
ANC Visits						
2	1.03	0.184	0.16	0.876	0.72	1.46
3	1.15	0.204	0.81	0.416	0.82	1.63
4 or more	1.25	0.265	1.04	0.298	0.82	1.89
Occupation						
House Wife	1.33	0.253	1.51	0.131	0.92	1.93
Peasant Farmer	1.18	0.218	0.91	0.365	0.82	1.70
Salaried Worker	0.82	0.245	-0.65	0.514	0.46	1.47
Others	0.83	0.230	-0.66	0.507	0.49	1.43
Early ANC	0.79	0.124	-1.52	0.129	0.58	1.07
Partner support	0.62	0.084	-3.52	0.000	0.48	0.81
_cons	1.55	0.573	1.17	0.241	0.75	3.20

In marginal effects, women from the treatment group were 14.3 percentage points more likely to receive IFAS than the comparison group (CI= 4.8% to 23.9%).

Pregnant women in the comparison arm of the study, however, were more likely to have received deworming tablets at ANC than women in the intervention arm. This discrepancy could be explained by the targeted child health mentorships that were conducted in all high-volume facilities in the comparison district towards and during the

endline data collection. These comprehensive mentorships included health education and quality of care, including the importance of deworming and nutrition assessments. The immediate positive impact of these mentorships may have affected results, since healthcare workers normally implement changes immediately following mentorship.

Table 14: Medicines and services received by pregnant women during ANC visit according to study arm

Item	*Intervention*			*Comparison*				
	Baseline	Endline	Estimate of Change	Baseline	Endline	Estimate of Change	NIE	95%CI
	N (%)	N (%)	%	N (%)	N (%)	%		
Folic Acid	24.6	21.6	-3.0	38.3	22.5	-15.8	12.8	7.7 to 17.9*
Iron tablet	6.0	2.2	-3.8	3.8	1.4	-2.4	-1.4	-5.9 to 3.1
Iron folate tablet	40.0	80.6	40.6	47.2	74.7	27.5	13.1	8.4 to 21.5*
Anti-malarial	12.6	63.9	51.3	18.1	72.3	54.2	-2.9	-8.0 to 1.0
Deworming tablet	9.1	40.2	31.1	3.2	56.3	53.1	-22.9	-25 to -18.3*
Tetanus Toxoid	8.3	39.1	30.8	1.6	35.4	33.8	-3.0	-6.9 to 0.9
Vitamin A	0.3	4.4	4.1	2.2	4.4	2.2	1.9	-2.4 to 6.2
Other	14.0	39.9	25.9	5.7	13.7	8.0	17.9	13.6 to 31.5*

*Statistically significant at <0.001

A look at the number of IFA tablets taken by pregnant women by the time of the survey depicted a modest improvement in the number of pregnant women in the 3rd trimester who had taken 90+ tablets in both study arms **(Table 15)**. In the intervention arm, the proportion increased from 17.5% to 24.9% while in the comparison arm, it increased from 6.9% to 16.9%.

Table 15: Number of IFA tablets taken since getting pregnant according to trimester and study arm

			Number of IFA tablets mother has taken during current pregnancy			
Gestation Age	Study Arm	Data wave	0-30	31-60	61-90	90+
1st trimester	Intervention	Baseline	94.4%	5.6%		
		Endline	94.4%	5.6%		
	Comparison	Baseline	87.0%	8.7%		4.3%
		Endline	96.8%	3.2%		
2nd trimester	Intervention	Baseline	75.4%	10.8%	2.3%	11.5%
		Endline	77.0%	13.7%	8.7%	0.6%
	Comparison	Baseline	73.8%	16.9%	6.3%	3.1%
		Endline	78.0%	18.5%	2.3%	1.2%
3rd trimester	Intervention	Baseline	47.5%	19.0%	16.0%	17.5%
		Endline	27.2%	28.4%	19.5%	24.9%
	Comparison	Baseline	47.9%	27.7%	17.6%	6.9%
		Endline	28.8%	33.1%	21.3%	16.9%

4.4.2 Changes in dispensing IFAS to pregnant women at facility level

Pregnant women received IFAS mainly at ANC clinics at the beginning and end of the study. Health workers in the ANC, however, reported that they requisitioned for more tablets from the stores compared to before the QI intervention. This translated into giving pregnant women more tablets. Additionally, due to improved health education, clients' knowledge on IFAS importance was enhanced, which led to increased adherence, therefore the more reason to give more tablets. Cases of pregnant women missing IFAS were no longer common and they received at least 30 tablets that covered a minimum of a month. As noted by interviewees, improvements in ordering translated into increased availability of IFAS and limited cases of stock outs:

> We now give them thirty tablets for a month. Those days we could get only 5 tins from the store that is 5000 tablets, so we couldn't give all the 30 to each mother. That would be the end and we start writing (prescriptions) for them to go and buy (for themselves). But now since we are well stocked, that one (writing prescriptions) we have stopped. — ANC personnel 6

> Pregnant women are willing, and they take it actually because they now know the reason as to why they should take the IFAS — ANC personnel 5

Equally important, many health workers also noted that having improved their own knowledge of the importance of IFAS made it easier to change their behavior and willingly give pregnant women all the tablets and explain the importance of IFAS. Health workers running the ANC clinics reported that they had a better recognition of the importance of addressing stockouts ad supply issues, while at the same time improving their knowledge and that of their clients on the importance of IFAS. Previously, rationing

was used as a means of ensuring that all pregnant women received some tablets, a practice that the health workers now perceived as negatively affecting pregnant women. However, DHT members that were interviewed noted that it was mainly the midwives whose capacity and appreciation of the need to dispense IFAS was improved. Other carders who may from time to time work in the ANC clinic were perceived to be lacking in knowledge and appreciation of the importance of IFAS.

> We had knowledge gaps on issues concerning IFAS, because we knew that due to our supply of fewer IFAS that we could economize so that every mother gets, without putting in mind that however much we economize we will be affecting the pregnant women negatively. So, we got to know that every mother is supposed to take IFAS almost throughout pregnancy, we were also just reluctant at counting all 30 tablets, but now we know its importance — QI Mentor 1

> I think midwives have improved a lot, but the nurses and then a few other midwives, as long as she has got only Fansidar and Mebendazole on her table, she continues with ante-natal. I ask them when they submit their HMS 105 report, that's how I came to know that it could be that some midwives and nurses, when they are on duty, they don't take it to be a priority. As long as she has the Fansidar the Mebendazole, she can run an ante-natal clinic — DHT member 2

Despite these observed improvements, in a few circumstances of stock outs, pregnant women were still asked to purchase IFAS. Additionally, the packaging of IFAS tablets in tins was perceived by the health workers working in the ANC clinics as creating more work. The IFAS tablets are packaged in tins containing a set number of tablets, which then needs to be repackaged by the health workers when dispensing to mothers. The health workers noted that if IFAS tablets would be pre-packaged as 30 tablets, the dispensing process would be made easier.

> Yea, when we run out, we request the patients to buy. We request the patients to buy IFAS for themselves — ANC personnel 3

> That packing element, it's a bit burdensome, you find that we take a lot of time counting the tablets for the pregnant women — QI mentor 2

4.4.3 Changes in ordering for IFAS at district level

Ordering of IFAS is mainly done through the pre-existing system as described in the baseline report; it has remained very much the same. The main supplier of IFAS being the national medical stores (NMS). The ordering follows two main approaches, the push and pull. On the one hand, the push approach is used to regularly push fixed quantities of drugs and supplies including IFAS to lower level facilities i.e. HCIII and HCII. On the other hand, the pull system allows higher-level facilities, HCIV and hospitals to quantify their needs based on consumption levels but still within a fixed budget. Challenges that were initially identified included frequent stock outs, receiving IFAS that is nearing expiry dates, and a limited budget.

At the endline, all of the interviewees noted an improvement in the stock levels. This was attributed to a better quantification process, which was learnt through the QI processes and increased supplies from NMS. Indeed, it was reported that more quantities of IFAS

were being ordered also because of the better appreciation of its importance in dealing with malnutrition. The interviewees also perceived the increased supplies from NMS as having stemmed from higher-level engagements that could have involved RHITES-EC, based on earlier assessments and increased supplies being delivered by RHITES-EC across different facilities. Additionally, a simpler and more efficient IFAS facility-to-facility redistribution process was noted. A positive relationship between facilities facilitated by collaborative learning sessions (part of QI) likewise eased the process of redistribution of tablets. Limited or no stock out was noted to consequently have a positive effect on health workers' motivation at work.

> Before this program came, we were really undergoing a very serious problem of… I can say malnutrition but specifically in this iron and folic line. First of all, we had issues with the delivery system that the amount of folic acid being brought wouldn't cater for the pregnant women and yet also this is one of the districts where we have very many people with malnutrition. So when you (RHITES-EC) came in, it helped us a lot in that first of all we had not actually appreciated the problem and therefore much as the iron and folic was insufficient in terms of supply, it didn't really hit our minds to think about it so much. Now when it comes to the rounds of making these orders, the DHO calls the in-charges and now they know what to plan for — DHT member 1

> For stock out, as I told you it is now knowing the consumption, the stock at hand, and the average monthly consumption, so we have known how to order, so for now I can see no stock outs — ANC personnel 10

However, challenges such as limited budgets continued, and some facilities noted that they were still receiving IFAS that was nearing expiry dates. Folic acid tablets were reported to be less compared to iron tablets in some of the facilities. Inter-facility redistribution alleviated some cases of temporary stock outs, which will be discussed in greater detail later. Transport challenges were also noted as sometimes affecting the redistribution process, especially if the facilities were far apart.

> There have been stock outs in some facilities. Sometimes you find that it's a general situation everywhere. In such situations, redistribution doesn't help much but you find that there are times when other facilities have more than enough, so redistribution has been very useful in such cases and we encouraged the in-charges to support each other. As you know the primary health care (PHC) envelope that is there is small, so, we keep monitoring and praying that the envelope becomes bigger — QI Mentor

> So, getting someone who can transport those things here is a little bit hard. So, at times, we have to go directly to the facility and then we get the IFAS that we need either on a boda-boda or you walk if you can. At times, a facility can tell you that they have, but then accessing it is somehow hard — Stores personnel 7

4.4.4 Changes in in-facility IFAS requisitioning process

Relatedly, in-facility requisitioning was about the requisitioning of IFAS from within each facility, for example, by the ANC department to the stores department or pharmacy for higher level facilities such as hospitals. The process through which this happened had

largely remained the same, with the responsibility of initiating requisitions being for the in-charge of the ANC department.

Overall, interviewees reported no in-facility requisitioning challenges. Some of the improvements noted included requisitioning for more tablets from the stores. The increase in stock available for increasing in-facility requisitioning was partly attributed to a nutrition project that supplied stocks of IFAS. The project was closing out which made leftover supplies more available. In situations of shortages, redistribution between facilities was encouraged, the more availability of IFAS owing to the project. Additionally, it was noted that the bureaucracies surrounding redistribution that initially needed approval at higher levels had been reduced. Facility in-chargers now had the full mandate to redistribute their stock based on their own assessment of prevailing stock levels and consumption needs.

> The changes I have noticed, they order much these days, those days, they could order like 1 or two tins but now we give them what they want, even four tins — Stores personnel 5

> Actually, these days we don't have any delays, the requesting facility just speaks to the facility in-charge, if we have, the in-charge authorizes me to give them, of course she first checks with me to be sure of our stock. Then the in-charge can tell me: 'don't give out, that quantity is not enough for us or give out its enough for us' — Stores personnel 3

However, one challenge continued to affect the in-facility requisitioning process. Some of the ANC personnel were noted to still have limited ability in correctly completing requisition forms. Nonetheless, the stores personnel noted that this was an ongoing area for improvement.

> Ok they don't actually, most of them don't know how to fill that requisition and issue voucher form, so when they come, I guide them: 'you put this here, you can put this there, how many tins do you want etc etc'… So, we are supporting them and the learning continues — Stores personnel 1

4.4.5 Changes in quality assurance for IFAS at facility level

Quality assurance for IFAS depicts the processes undertaken to ensure quality service delivery at the health facilities. As found at baseline, supervision and mentorship, proper and safe storage of IFA tablets continued. It was noted that in-facility processes to ensure quality service delivery improved during the project implementation period. Of particular importance, according to the interviewees, were improvements in documentation of clients' records and numbers of tablets dispensed, which impacted commodity availability.

> Before, you could find that we have got like sixty pregnant women, but the pregnant women recorded to have been given IFAS were like fifty and yet even the ten were also given but not recorded. So, we talked about data and also, we talked about dispensing, and now we have really improved, we know that importance of accurate date now. — ANC personnel 2

The mentorship processes facilitated by RHITES-EC that happened at facility level were highlighted as having contributed to this improvement by facilitating hands on learning. The interviewees noted that the support provided by RHITES-EC was critical in ensuring that the activities took place. Additionally, collaborative learning, reviewing of progress and receiving feedback were reported to have improved on the quality of services offered. Through these processes, health workers would identify their knowledge and skills gaps and draw plans to improve these respectively. This led to improvements in their knowledge and skills levels, which positively affected the delivery of health education and also the actual dispensing of IFAS to the pregnant women. Relationships between health workers and across facilities correspondingly improved, which also eased redistribution of IFAS between facilities as noted earlier.

> What has worked well is that staffs are involved, and mentors are ever going there to the facilities. So that thing alone has helped, and it has worked because when staff know that mentors are coming, they can update their journals and they become responsible about the IFAS project — DHT member 2

> And they (health workers) have come to know that monitoring these pregnant women while giving them ferrous and iron reduces the chances of those pregnant women becoming anemic. That's what they have come to know and that improved their work — DHT member 1

The health workers however noted that sometimes the QI processes were time consuming, which made it difficult to juggle the QI activities alongside the daily routines. Consequently, attention could be divided, and learning was affected at times. DHT members on the other hand noted that increased sessions of mentoring would be more beneficial to the health workers. Additionally, a call for a phased withdrawal of QI support was noted by the mentors as useful for creating a continuity plan.

> The disadvantage, at times, you find people are busy, so you get little time to share with the colleagues at times because you can find them, they are very busy. Again, you have to sit, either you wait until they finish, or they will not concentrate — QI Mentor3

> And also, they should continue checking on us to see whether we are still implementing, however much the project has ended. So, those reminders should still continue — ANC personnel 3

4.4.6 Changes in accounting for IFAS at facility level

Related to the quality assurance was the accounting of IFAS at facility level. This meant the different checks and balances put in place to ensure IFAS use was accurately documented. The process included documentation, monitoring of stock levels, and scheduled reporting. These processes have not changed as compared to the baseline situation; however, improvements were noted.

As presented in the quality assurance sub-section, documentation was reported to have improved. Similarly, mentors reported real time and accurate data capture. In addition, the use of requisitions across facilities when undertaking inter-facility redistribution was simplified to reduce delays brought about by several layers of approval as reported by the stores personnel. The improved records and documentation were described as

having eased the process of predicting consumption when undertaking quantification of IFAS and other drugs and supplies. The regular QI processes supported the health workers to appreciate more the importance of accurate data and enabled their skills building processes.

> When we went for training, we came back and I held a meeting with the staff here. We talked about dispensing IFAS in that meeting, we had to look at data because this was a gap. We used to dispense at and forget to record in the register, now we are doing well in that area —- ANC personnel 7

Not recording IFA tablets dispensed at other departments was noted as a persistent challenge by the mentors. The interviewees recounted the difficulty of having different data capture points that are not centralized. In addition, it was found that the use of IFAS by different departments could be contributing to temporary stock outs and therefore a call for more stock given that different departments use it was made.

> Yes, they still have a challenge of recording all the IFAS used, because you find that other departments like OPD also use IFAS —- QI-mentor

5. Discussion

In the discussion we provide a reflection on the key findings according to the objectives. We reflect on health education, women's knowledge on IFAS and IFAS availability and supply chain management processes.

To assess the effectiveness of the QI interventions in improving **health education**, endline data has been compared to the baseline data between the two study arms. Additionally, qualitative interviews were undertaken only in the intervention arm to better understand the changes related to health education. Generally, there was an improvement in the health education practices when the intervention and comparison arms were compared.

According to health workers interviewed, the QI measures that were implemented improved the quality of health education. Their self-reported knowledge and skills in undertaking health education improved, although this apparent improvement was not verified by an external skills assessment. The perception of improvement may have been the result of how the QI initiatives prioritized the quality of health education by integrating IFA specific and general nutrition messages during the sessions, among others. Indeed, healthcare workers mentioned their increased appreciation of the need to have IFAS-focused health education sessions. The intervention presented an opportunity for enhancing health education, particularly on topics that are usually not given adequate attention.

Relatedly, the **knowledge of pregnant women** on the benefits of IFAS and their willingness to take IFAS was noted to have increased. For example, there was an improvement in the respondent's perceptions of health education and the IFAS/ANC services provided in the intervention arm versus the comparison arm, although the improvement was modest, especially among women of lower education status. This could be attributed to the short period of implementation since significant changes often require longer periods of implementation.

In addition to the health education sessions undertaken at the health facilities, the health education messages were reinforced by other sources of information, these included radios and community health workers. Nonetheless, it is worthwhile noting ANC health education sessions remained the dominant source of information on IFAS for the pregnant women, this points to the critical role that ANC plays in ensuring uptake of IFAS. However, challenges of limited Information, Education and Communication (IEC) materials and non-standardized health education guidelines were reported. Such materials could be useful in further strengthening how health education is carried out.

IFAS availability significantly improved in the intervention arm compared to the comparison arm. Further, the intervention increased the probability of receiving iron folate supplements by women attending ANC. The results appear to be the result of improved interdepartmental linkages for improved stock monitoring and forecasting to maintain stock of iron-folate supplements. Within the health facilities in the intervention arm, supply chain management processes such as ordering and dispensing of IFAS and redistribution were noted to have improved. QI processes such as mentorship and coaching sessions, and collaborative learning sessions were found to be useful in improving these supply chain management processes. Collaboration between facilities provided an avenue for learning but also supporting each other in times of scarcity of commodities, thereby making this an important behavior to maintain. The intervention addressed bottlenecks within inter-district and inter-facility redistribution of IFA tablets based on guidance provided by NMS during the national core team meetings. However, transportation challenges limited redistribution of IFAS, thereby putting in question continuity of these useful collaborative networks between facilities.

There was no significant effect of the intervention to the **awareness of mothers on the minimum number of tablets a mother should take during pregnancy**. The apparent lack of intervention impact could be the result of activities in the comparison district at the time of the endline data collection, specifically targeted comprehensive prevention of mother to child transmission (PMTCT) and child health mentorships that were conducted in all high-volume (HC III – hospitals). These comprehensive mentorships included information about comprehensive, quality ANC services, including the importance of IFAS for pregnant women.

6. Limitations of the evaluation design and its implications

6.1 Internal validity

6.1.1 Comparability of the two study arms

The intervention and comparison arms were comparable on most sociodemographic parameters except for pregnant women' occupation and religion. The differences in occupation were between fulltime housewives and peasant farmers, which could have been due to challenges of validity of the questions used. Indeed, it is difficult to define the differences between a peasant farmer and a full-time housewife in rural places because most full-time housewives are as well peasant farmers. Differences in religion was attributed to a larger proportion of Moslems in the intervention arm. This was due to the fact that the intervention was carried out in a Moslem dominated district of Iganga.

6.1.2 Response bias

There was a low risk of bias as non-response was only 1% (730/738) of the sample size. Previously, there was an existing nutrition project providing supply of additional stock of IFA tablets in one of the experimental districts, i.e., Iganga district. It is unlikely that the existence of the nutrition project that supported with the supply of additional IFAS in one of the experimental districts influenced responses of the pregnant women on receiving IFA tablets during ANC as this kind of support was only known by health workers in the health facilities.

6.2 Limitations of the evaluation

6.2.1 Unobserved selection bias

It is likely that there was risk of bias due to selection of health facilities with the highest number of ANC attendances in the study districts as the women found at these health facilities may be more motivated than those with low attendances. Nonetheless, the focus of the QI-related intervention was more aligned towards improving health provider service delivery rather than women attending ANC clinics at these health facilities. Therefore, it is unlikely that the observed effects in IFAS service delivery in terms of health education and IFAS supply systems were due to selection bias. However, given that RHITES-EC led the data collection process, respondents and interviewees could have been more inclined to indicate more positives than negatives. To reduce this the effect of this kind of bias, care was taken to ensure that respondents and interviewees felt comfortable to provide more truthful information during the consenting process. In addition, all of the research assistants used to collect the data were not RHITES-EC employees.

6.2.2 Limitations due to cohort design

As described in previous sections, the study was unable to track pregnant women due to using a facility-based sampling scheme, a shorter observation period, and natural attrition that occurs when women give birth. Therefore, the average treatment effects are estimated using cross-sectional data that are longitudinal at the facility level. An individual longitudinal design would lead to stronger causal attribution. We explored stratifying the sample to women who were more likely to have been interviewed at base and endline, but sample size loss did not permit robust estimation.

6.2.3 Meeting the time-invariance assumption

For a DiD quasi-experimental approach to produce valid treatment estimates, the evaluation strategy must meet a key assumption about parallel time trends between treatment arms and no unmeasured time-invariant differences affecting outcomes. There were no data collected that could help establish this assumption was met. There were other interventions occurring that may have affected comparison group outcomes. During the endline data collection, PMTCT and Child Health mentorships were conducted for healthcare workers within all high-volume facilities in Busia district (comparison arm). These comprehensive mentorships include health education (quality, key messages), deworming and micronutrient supplementation of ANC women. These activities may have affected results since healthcare workers normally implement change ideas immediately a mentorship is conducted.

6.2.4 Limitations of data collection and availability

The study included control variables in the regression analysis for many but not all variables associated with increased IFAS consumption that were identified during the literature review, because not all data were collected or easily available. The following were not included: diagnosis of anemia during pregnancy, household wealth, number of children pregnant woman has, fear of side effects of IFAS, existence of social support, sex of household head, and paternal education level. In the case of household wealth, occupation was used as a partial proxy.

Other than the facility and district-based respondents, pregnant women engaged at baseline were not followed up and targeted during IR and the end-line assessment. Outcomes could potentially have differed if the same group were enrolled and followed up throughout the study.

The study did not control for related activities implemented by implementing agency, especially within the comparison arm. Integrated facility level activities continued between baseline and at end-line assessment across intervention and comparison arms.

7. Conclusion and Recommendations

7.1 Conclusions

The QI-IFAS enhanced intervention improved the nature and quality of IFAS-related health education received by pregnant women attending ANC clinics. Due to improvement in health education at facilities, pregnant women were able to better appreciate the reason why they should take IFAS and their knowledge about the total number of IFA tablets to be taken during pregnancy significantly increased. This contributed to improvements in the mother's knowledge levels, thereby enabling the IFAS uptake and improved adherence.

Similarly, IFAS stock levels, supply chain processes such as documentation and record keeping improved. The pregnant women thereby benefited by having more tablets available for them on one hand and the health workers were more motivated by improved availability of IFAS to dispense to pregnant women. The interviewees attributed these improvements to three aspects of the QI-IFAS enhanced related intervention:

1. The is learning-by-doing approach that enabled health workers to improve on their knowledge and skills levels.
2. It's collaborative nature that facilitated activities such as re-distribution of IFAS across facilities.
3. The sharing of experiences across facilities which enabled sharing of best practices across facilities and enabled the building of collaborative networks between health facilities.

7.2 Recommendations

We recommend that improvements in health education sessions be a critical part of QI interventions targeting to improving maternal health outcomes in general. ANC clinics were found to be a critical source of information for pregnant women, therefor ensuring that the right information is available and is provided will be a great way of harnessing

the ANC opportunity. Some of the key areas to focus on for improvement as regards health education for IFAS included:

1. Tailoring health education based on the gestational period of the pregnancy. This will ensure that mothers are receiving relevant and specific information to enable them to have a healthy pregnancy and the intended maternal outcomes.
2. Ensuring the availability of demonstration materials and the development of standardized ANC health education guidelines would be beneficial to the whole ANC experience for both pregnant women and the health workers. This could be done by partners in close collaboration with the ministry of health through the district health office.
3. Further understanding of why women of lower education levels had lower levels of IFAS related knowledge needs to be explored more. This could be related to the materials and language used, adapting them for their literacy levels may be helpful.

In terms of IFAS availability and supply chain processes, we recommend continued building of capacity among health workers to ensure sustained supply of IFAS and other commodities. IFAS enhanced QI processes were found to enabled health workers to better quantify their need but also to build collaborations for redistribution as a means of dealing with short term shortages. Such QI processes are recommended for adoption in neighboring districts and beyond. To improve the QI processes that were implemented in this project, these specific areas need more attention.

1. A continued mentoring of ANC personnel to enable them to correctly complete requisition forms as well as pay critical attention to keeping accurate records. Since ANC personnel are not usually trained in such skills as compared to stores personnel, special attention to them is essential. This is so because they play a key role in the whole quantification and IFAS availability process.
2. Secondly building responsiveness within the entire system will be critical in sustaining interventions such as redistribution of IFAS across facilities and districts. Neighboring facilities and districts need to continue these collaborative efforts by leveraging on existing transportation means and opportunities. This will be useful in sustaining the collaborative efforts. Such collaborative networks are indeed recommended to other districts within region and the country.

Despite the benefits of the QI-IFAS enhanced intervention, there were nonetheless some challenges, primarily because it was sometimes perceived as time consuming by the health workers. Therefore, it is advisable to keep time limits for the sessions while still promoting learning by doing within a positive and motivating environment. Overall, however, health workers' attitudes were positive. Because of the intervention's success in improving IFAS availability and utilization, this approach can be recommended for other districts in Uganda.

Appendix A: Initial description of the QI strategies

Experimental arm (Enhanced support for QI)	**Comparison arm (Standard QI support)**
Bi-monthly mentorship and coaching sessions: Health workers' capacity will be strengthened to provide quality IFAS services and ANC at large. The sessions will focus on working with the health facility teams to identify the barriers and simple solutions to streamline the health systems. The mentoring and coaching will follow QI principles and steps to ensure barriers are addressed with well documentation of QI projects.	***Facility performance review and onsite QI coaching:*** Routine integrated data-driven and targeted onsite coaching will be conducted to translate all district/project priorities and action plans into site level activities. District-based mentors will facilitate facility teams to identify ANC service delivery performance gaps and institute changes to meet desired targets using QI approaches. Where site level improvement in ANC performance is registered and sustained, cross-cutting change ideas will be propagated in other facilities by the district mentors. The project will provide onsite refreshments determined by duration of coaching exercise.
Monthly health facility performance review and QI work planning meetings*:* The health workers will be supported with refreshments as an 'enabler' to conduct monthly QI meetings. The teams will assess their performance and identify other change ideas for further improvement or standardize those yielding good results.	***Quarterly internal performance review and work planning meetings:*** Quarterly data will be reviewed to identify facility-level and district-level performance. Deep-dive into the data will identify factors that contributed to the improvement/decline in performance at facility level. Opportunities for integrating support to address gaps and cascade good performance during subsequent quarters will be highlighted.
Collaborative learning networks: To set a learning platform for ISI, the project will support quarterly collaboratives to facilitate peer-to-peer learning and harvest best practices. The bottleneck inventory will be updated after such sessions as well.	***Quarterly district performance review and learning meetings****:* Quarterly district-level data will be collected through DHIS2 and shared during integrated district performance review meetings to guide district and subsequent facility level programming and support. Ideas will be generated to support the poor performing facilities and sustain the good performance in others. District-based mentors and purposely selected facility staff (from the good performing facilities) will constitute the district-based mentors.

Experimental arm (Enhanced support for QI)	Comparison arm (Standard QI support)
Bi-weekly data management and reporting: Health facility-specific data on IFAS will be collected on a regularly basis (bi-weekly). The data will be used to inform progress and provide immediate feedback to health workers. This will trigger the use of data in identifying gaps in IFAS service delivery and addressing them.	
IFA stock monitoring and re-distribution*:* Learning from the RHITES EC experience of monthly stock monitoring and re-distribution to prevent and avoid stock outs, the same approach will be used with specific focus on IFAS.	

Appendix B: QI implementation activities and timelines

IFAS bottleneck area	Activity	Timeline
Baseline Assessment	Baseline data collection	23rd July to 09th August 2019
	Review of QI processes	21st to 30th October 2019
	Data analysis and report writing(Baseline)	03rd October to 31st November 2019
	ANC attendances at 5442 pregnant women, 39% received IFA tablets & 35% of Health facilities in the intervention arm with stock out of IFA for 7+ days	Oct-19
	Study aim 1: QI implementation	
IFA supply system	Orientation of district stakeholders and health workers on IFAS IS study, IFAS protocols, priority IFAS bottlenecks, QI approaches, principles and methods (first IFAS collaborative learning session)	26 and 28 Nov 2019
	Prioritize areas for improvement, initiation of new QI projects and opening of Journals during the first collaborative learning session	26 and 28 Nov 2019
	ANC attendances of 5564 pregnant women, 51 % received IFA tablets & 25% of Health facilities in the intervention arm with stock out of IFA for 7+ days	Nov-19
	1st mentorship and coaching sessions (Documented new QI projects onto the journals including baseline data points) & stock monitoring	11th to 20th December 2019
	Delivery of IFA from NMS (cycle 3)	16th to 20th December 2019
	ANC attendances at 6132 pregnant women, 67% received IFA tablets & 5% of Health facilities in the intervention arm with stock out of IFA for 7+ days	Dec-19
	1st QI performance review meetings in Buyende and Iganga (Review of QI team composition and functionality)	13th to 16th January 2020
	2nd QI mentorship and coaching sessions in Iganga and Buyende districts(assessed root causes of the supply system IFA stock outs and non-adherence to dispensing protocols, mentored health workers quantification of IFAS needs reconstitution or formation of WITs at ANC involving key staff such the unit In charge, Midwife and inventory officer to lead the implementation of	20th to 24th January 2020

IFAS bottleneck area	Activity	Timeline
	the IFAS QI to address the bottlenecks and stock monitoring	
	Shortage of stock of IFA supplies in 9 of the 10 health facilities in Buyende district	20th to 24th January 2020
	Highest ANC attendances at 7020 pregnant women, 88% received IFA tablets & 15% of Health facilities in the intervention arm with stock out of IFA for 7+ days	Jan-20
	2nd IFAS and Nutrition Collaborative Learning Session for health workers in Iganga and Buyende districts (Peer-to-peer learning of tested changes)	06th to 07th February 2020
	2nd QI performance review meetings in Buyende and Iganga	10th to 13th February 2020
	Supported re-distribution of Iron and folic tablets from Iganga district to Buyende district and to each of the 10 health facilities. Each of the 10 health facilities received 9 tins (@1000 tablets)	10th to 13th February 2020
	Assessed experiences of health workers through use of the self-evaluation questionnaire	10th to 13th February 2020
	Delivery of IFA from NMS (cycle 4)	17th to 21st February 2020
	3rd QI mentorship and coaching sessions and stock monitoring	24th to 28th February 2020
Health education	Collected baseline data for health education indicators beginning July 2019 to February 2020 (In February only 26% of documented health education sessions at ANC included IFAS messages and 12% of pregnant women attended Health education sessions)	24th to 28th February 2020
	ANC attendances of 6189 pregnant women, 81% received IFA tablets & 15% of Health facilities in the intervention arm with stock out of IFA for 7+ days	February 2020
	3rd QI performance review meetings in Buyende and Iganga	9th to 12th March 2020
	4th QI mentorship and coaching sessions on health education (opening of new QI journals on health education) and stock monitoring 20 intervention health facilities	23rd to 27th March 2020
	ANC attendances at 6075 pregnant women,96% received IFA tablets & 0 % of Health facilities in the intervention arm with stock out of IFA for 7+ days (In 4th Week of March, 62% of documented health education sessions at ANC included IFAS	Mar-20

IFAS bottleneck area	Activity	Timeline
	messages and 31% of pregnant women attended Health education sessions)	
	Government of Uganda strict restrictions on transport and social distancing due to COVID-19 - All QI activities were postponed (including third collaborative learning session, QI performance review meetings and mentorship and coaching and resumed implementation on 25th May 2020)	26th March - 04th June 2020
	ANC attendances at 6227 pregnant women, 94% received IFA tablets 10 % of Health facilities in the intervention arm with stock out of IFA for 7+ days (In 5th week of April, 47% of the documented health education sessions at ANC included IFAS messages and 17% of pregnant women attended Health education sessions)	Apr-20
	5th QI Mentorship and coaching sessions in 20 intervention health facilities and stock monitoring	25th to 29th May 2020
	Each health facility was provided with a copy of the topics with corresponding key IFAS messages to guide them in planning and delivering key messages	25th to 29th May 2020
	Delivery of IFA from NMS (cycles 5&6)	25th to 29th May 2020
	ANC attendances at 5938 pregnant women, 100% received IFA tablets & 0 % of Health facilities in the intervention arm with stock out of IFA for 7+ days (In 4th week of May, 58% of the documented health education sessions at ANC included IFAS messages and 37% of pregnant women attended Health education sessions)	May-20
	4th QI performance review and work planning meeting in 20 intervention health facilities	8th to 12th June 2020
	Supported redistribution of IFA from Iganga to Buyende district and to 6 of the 10 health facilities in Buyende district (70 tins@ 1000 tablets)	8th to 12th June 2020
	Assessed experiences of health workers through use of the self-evaluation questionnaire	8th to 12th June 2020
	6th QI mentorship and coaching sessions in 20 intervention health facilities and stock monitoring	22nd to 26th June 2020
	3rd IFAS and Nutrition Collaborative Learning Session for health workers in Iganga and Buyende districts	28th June to 2nd July 2020

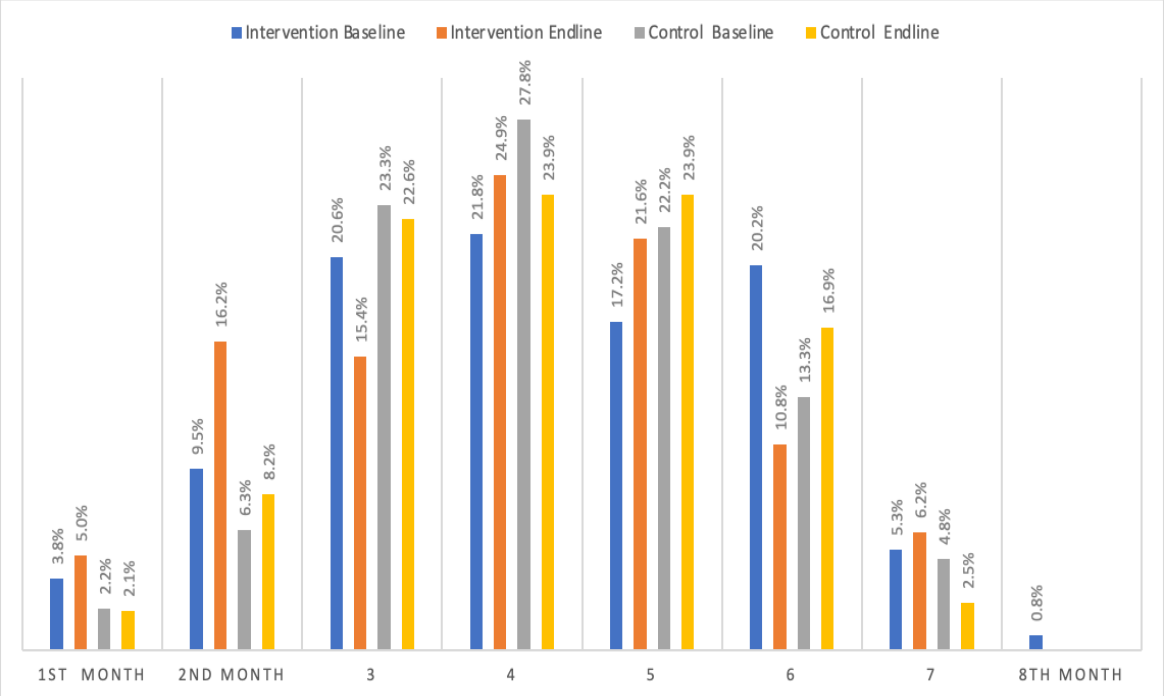
IFAS bottleneck area	Activity	Timeline
	ANC attendances at 7377 pregnant women , 100% received IFA tablets & 0 % of Health facilities in the intervention arm with stock out of IFA for 7+ days (In 4th week of June, 43% of the documented health education sessions at ANC included IFAS messages and 56% of pregnant women attended Health education sessions)	Jun-20
	5th QI performance review and work planning meeting in 20 intervention health facilities	06th to 09th July 2020
	7th QI mentorship and coaching sessions in 20 intervention health facilities and stock monitoring	13th to 17th July 2020
	Used the self-evaluation questionnaire to assess the how and extent to which the intervention was delivered, health worker experiences, their interaction, engagement and participation through which QI activities led to change	13th to 17th July 2020
	In 2nd week of July, 54% of the documented health education sessions at ANC included IFAS messages and 66 % of pregnant women attended Health education sessions	13th to 14th July 2020
Endline Assessment	**Study aim 2: Effectiveness of QI intervention**	
	Training of data collectors	28th to 30th July 2020
	Baseline data collection	3rd to 21st August 2020
	Data cleaning and transcription	24th August to 01st September
	Data analysis and report writing	1st to 30th September 2020

Appendix C: Enablers associated with IFAS uptake

ANC seeking practices

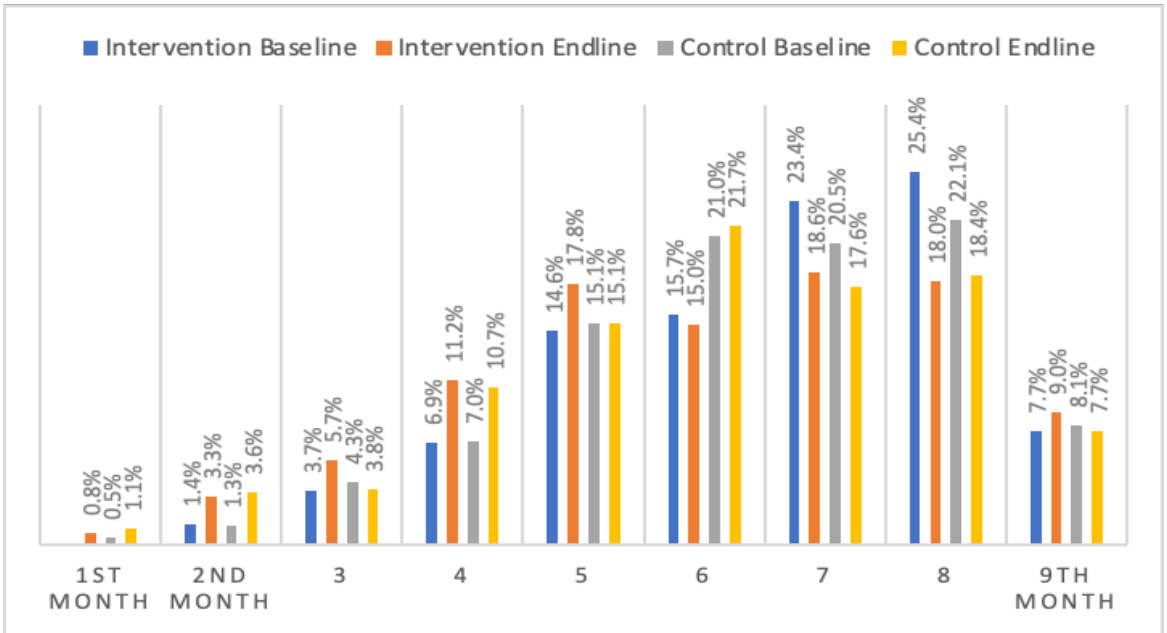
The mean (SD) gestation age at which pregnant women reported to have first sought ANC for the current pregnancy was 4.3 (1.6) and 4.0 (1.6) months in the intervention arm 4.2 (1.4) and 4.2 (1.4) in comparison arm at baseline and endline, respectively. The group differences in means between baseline and endline were not significant (p=0.429). However, within group differences in proportions were significant (p=0.014) for the intervention arm, implying an improvement in early care seeking within the intervention arm (Figure C1).

Figure C1: Gestation age for first ANC as reported by pregnant women for current pregnancy



However, the majority of the pregnant women interviewed at ANC clinics were in their 3rd trimester (Figure C2) The mean (SD) gestation age for pregnant women was 7.1 (7.1) at baseline and 6.1 (1.9) at endline (p=0.01) for the intervention arm, and 6.4 (1.7) at baseline, 6.1 (1.9) at endline (p=0.034) for the comparison arm. These findings indicate significant improvement in the composition of ages for both study arms where pregnant women of lower gestation ages were coming for ANC. However, the gains between intervention and comparison arms were not statistically significant (p=0.098), which suggests a large and persistent gap in timely ANC care seeking. Continued effort should be made to encourage early ANC; if this were to occur, the curve in Figure C2 would flatten, with all gestational ages almost equally represented in the ANC clinics.

Figure C2: Gestation age of pregnant women attending ANC at baseline and at endline in both the intervention and comparison study arms



Additionally, there was neither any significant improvement in frequency of ANC care-seeking nor any changes in the composition of gestational ages of pregnant women attending ANC. Over 75% of the pregnant women were attending ANC either for the first, second or third time for the current pregnancy and were mainly in the second or third trimesters for both study arms (Table C1). Achieving the target number of eight ANC visits per pregnancy is a tall order that will need a concerted effort beyond facility based interventions. Community health workers should be encouraged to rally pregnant women for early ANC seeking and for increased frequency of ANC visits.

Table C1: Average number of ANC visit and gestational ages of study participants at baseline and endline in both study arms

Study Arm	***Round of data***	***What number is current ANC visit?***	***How many months pregnant are you now?***
		Mean (SD)	***Mean (SD)***
Intervention	*Baseline (N=347)*	*2.6 (1.5)*	*6.5 (1.7)*
	Endline (N=365)	*2.4 (1.5)*	*6.1 (1.9)*
Comparison	*Baseline (N=371)*	*2.5 (1.3)*	*6.4 (1.7)*
	Endline (N=363)	*2.5 (1.4)*	*6.1 (1.8)*
p-value of diff		*p=0.714*	*p=0.517*

Table C2: Other factors of care such as mode of transport, costs and persons who accompanied pregnant women to hospital were assessed.

Method of transport to facility, n (%)						
Boda Boda bicycle	11(3.1)	22 (6.0)	0.002	30 (8.1)	18 (4.9)	<0.001
Boda boda motorcycle	175 (50.0)	133 (36.3)		200 (53.9)	136 (37.4)	
On foot	90 (25.7)	133 (36.3)		108 (29.1)	167 (45.9)	
Own bicycle	46 (13.1)	55 (15.0)		21 (5.7)	28 (7.7)	
Own motorcycle	15 (4.3)	18 (4.9)		11 (3.0)	12 (3.3)	
Taxibus	10 (2.9)	4 (1.1)		1 (0.3)	2 (0.5)	
Private car	1 (0.3)	1 (0.3)		0 (0.0)	1 (0.3)	
Others	2 (0.6)	2 (0.3)		0 (0.0)	0 (0.0)	
Cost of transportation (UGX), mean (SD)	1076.8 (1355.3)	949.5 (1542.0)	0.242	1069 (1294.9)	831.0 (1435.8)	0.019
Consider cost of transport affordable, n (%)						
Yes	287 (82.0)	235 (64.2)	<0.001	316 (85.1)	270 (74.2)	<0.001
No	63 (18.0)	131 (35.8)		55 (14.8)	94 (25.8)	

Appendix D: Additional analyses on the health education at facilities

While there were large variations by health facility, the majority of the health facilities in the intervention arm reported an increase in health education sessions **(Table D1 and D2)**. Poor performing facilities at baseline benefitted from the enhanced quality improvement activities in the intervention facilities.

Table D1: Proportion of pregnant women who received health education by health facility

		Proportion of pregnant women *who received health education during the current ANC visit*		
	Health Facility	*Baseline*	*Endline*	*p-value*
Busia	*Buhehe HCIII (N=16)*	*81.3%*	*37.5%*	
	Bulumbi HCIII (N=35)	*85.7%*	*22.6%*	
	Busia HCIV (N=113)	*59.3%*	*63.4%*	
	Busime HCII (N=10)	*100.0%*	*100.0%*	
	Busitema HCIII (N=37)	*67.6%*	*40.5%*	
	Buteba HCIII (N=29)	*24.1%*	*88.5%*	
	Lumino HCIII (N=26)	*76.9%*	*83.3%*	
	Lunyo HCIII (N=36)	*33.3%*	*32.4%*	
	Masafu General Hospital (N=56)	*69.6%*	*20.0%*	
	Mbehenyi HCIII (N=13)	*92.3%*	*62.5%*	
	Busia District (N=371)	***63.3%***	*50.8%*	***p=0.001***
Buyende	*Bukungu_HCII (N=9)*	*55.6%*	*100.0%*	
	Buyende Bugaya HCIII (N=18)	*44.4%*	*44.4%*	
	Buyende HCIII (N=18)	*0.0%*	*29.4%*	
	Irundu HCIII (N=28)	*14.3%*	*62.1%*	
	Kagulu HCII (N=16)	*68.8%*	*62.5%*	
	Kakooge HCII (N=13)	*76.9%*	*61.5%*	

	Kidera HCIV (N=25)	*40.0%*	*96.0%*	
	Namulikya HCII (N=6)	*0.0%*	*37.5%*	
	Ngandho HCII (N=7)	*100.0%*	*100.0%*	
	Nkondo HCIII (N=13)	*76.9%*	*92.3%*	
	Buyende District (N=153)	***42.5%***	*67.1%*	***p=<0.001***
	Bugono HCIV (N=16)	*50.0%*	*93.8%*	
	Bulamagi HCIII (N=12)	*66.7%*	*100.0%*	
	Bunyiiro Govt HCIII (N=11)	*9.1%*	*90.9%*	
Iganga	*Iganga Hospital (N=79)*	*30.4%*	*35.9%*	
	Iganga TC HCIII (N=16)	*56.3%*	*0.0%*	
	Nakalama HCIII (N=8)	*12.5%*	*100.0%*	
	Nambale HCIII (N=14)	*85.7%*	*83.3%*	
	Namungalwe HCIII (N=17)	*100.0%*	*91.3%*	
	Namusisi HCII (N=15)	*80.0%*	*85.7%*	
	Nawandala HCIII (N=8)	*75.0%*	*92.3%*	
	Iganga district (N=196)	***50.0%***	*64.0%*	***p=0.004***

Table D 2: Medicines and services received by pregnant women during the current ANC visit according to gestation age and baseline (endine) study arms

Study Arm	Gestation Months	Folic acid	Iron tablet	Iron Folate tablet	Anti-malarial	De-worming tablet	Tetanus toxoid	Vit. A	Other
Intervention	1st			(33.3)	(33.3)		(100)		
	2nd	40 (41.7)	(8.3)	60.0 (41.7)	(33.3)	(41.7)	(75.0)	(8.3)	(50.0)
	3rd	(41.7)	7.7 (0.0)	46.2 (52.4)	30.8 (47.6)	(33.3)	7.7 (38.1)	7.7 (4.8)	(23.8)
	4	(39.0)	4.2 (2.4)	41.7 (70.7)	25.0 (61.0)	12.5 (31.7)	4.2 (53.7)	(2.4)	12.5 (34.1)
	5	2 (12.3)	3.9 (1.5)	43.1 (86.2)	9.8 (72.3)	13.7 (55.4)	9.8 (41.5)	(6.2)	17.6 (50.8)
	6	14.5 (18.2)	10.9 (3.6)	36.4 (90.9)	7.3 (65.5)	1.8 (43.6)	12.7 (43.6)	(3.6)	16.4 (43.6)
	7	6.1 (16.2)	4.9 (2.9)	46.3 (86.8)	12.2 (73.5)	9.8 (42.6)	8.5 (38.2)	(4.4)	12.2 (38.2)
	8	12.4 (15.2)	6.7 (1.5)	36.0 (86.4)	12.4 (59.1)	12.4 (36.4)	7.9 (30.3)	(4.5)	12.4 (40.9)
	9th	22.2 (24.2)	3.7	25.9 (78.8)	11.1 (63.6)	7.4 (27.3)	3.7 (9.1)	(3.0)	25.9 (30.3)
	Total	**9.7 (23.1)**	**6.0 (2.4)**	**40.0 (69.7)**	**12.6 (56.5)**	**9.1 (34.6)**	**8.3 (47.1)**	**0.3 (4.1)**	**14.0 (34.6)**
Control	1st	(50.0)		50.0 (50.0)	50 (25.0)		(25.0)		(25.0)
	2nd	20 (38.5)		60.0 (61.5)	(38.5)	(23.1)	(53.8)		20.0 (23.1)
	3rd	6.3 (28.6)	6.3 (7.1)	56.3 (64.3)	18.8 (50.0)	(78.6)	(64.3)		12.5 (7.1)
	4	11.5 (25.6)	(2.6)	53.8 (84.6)	15.4 (76.9)	3.8 (61.5)	3.8 (61.5)	(7.7)	11.5 (20.5)
	5	12.5 (29.1)	5.4 (1.8)	53.6 (76.4)	17.9 (80.0)	1.8 (60.0)	1.8 (54.5)	3.6 (1.8)	3.6 (9.1)
	6	25.6 (26.6)	5.1	38.5 (70.9)	19.2 (77.2)	3.8 (69.6)	1.3 (39.2)	2.6 (7.6)	3.8 (11.4)
	7	18.4 (12.5)	1.3	47.4 (79.7)	19.7 (81.3)	3.9 (46.9)	2.6 (21.9)	1.3	5.3 (9.4)
	8	15.9 (16.4)	3.7 (3.0)	48.8 (74.6)	23.2 (67.2)	2.4 (53.7)	1.2 (14.9)	1.2 (6.0)	3.7 (20.9)
	9th	30 (14.3)	6.7	40.0 (75.0)	(60.7)	6.7 (42.9)	(7.1)	6.7 (3.6)	10.0 (10.7)
	Total	**18.3 (26.8)**	**3.8 (1.6)**	**47.2 (71.0)**	**18.1 (61.9)**	**3.2 (48.5)**	**1.6 (38.0)**	**2.2 (3.0)**	**5.7 (15.2)**

Appendix E: Exit interview Questions

ANC EXIT INTERVIEW				
	Note: We are only interviewing women have come to attend ANC at the facilities			
INTRODUCTION Introduce yourself by reading out a loud the consent form to the participant. Obtain consent before proceeding with the interview. Record the following information and proceed with the interview for only those who consent.				
	Name of the Health Facility			
	Questionnaire No.			
	Time Interview Started:			
	Time Interview Ended:			
	District			
	Health Sub District			
	Sub County			
	Parish			
	Interview Date			
	Name of the Interviewer			
	Interview Completed			
	Interview Not Completed			
SECTION 1: A. SOCIAL DEMOGRAPHICS				
Qn No.	**QUESTION**	**Fill or Circle where applicable**		***GO TO Q.***
101	In what month and year were you born?	MONTH _____/_____		
		Don't know…….98		
		YEAR ___/____/_____/_____		
		Don't know…….98		
102	How old are you?	Age _____/_____		

103	What is your religion?	Protestant……1 Catholic…….……2 SDA…….…3 Muslim……...…4 Pentecostal …….5 Others (specify)_____99		
104	What is your marital status now?	Single ……1 Married…….2 Widowed…….3 Divorced…….4 Separated ……...5		
105	What is the highest grade of education that you completed?	Primary……1 O' Level …….2 A' level……...3 Tertiary…….4 Vocational…….5 None……....5		
106	*What is your primary (main) occupation?* ***(The occupation where the respondent spends most of her time)***	Salaried worker ……...1 Business……...2 Laborer . . . . . 3 Peasant farmer...…...4 House Wife…….5 Others (specify)_____99		
	Section:2 Services provided while pregnant			
In the next set of questions, I am going to be asking about your experiences of the services you have received while pregnant.				

201	How many months pregnant are you now? **(*Probe, or ask about the last normal menstrual period)***	Months _____ Don't know……98		
202	During this pregnancy, how many times have you come to the health facility for antenatal care (write down the number of times)			
203	What number of antenatal visit is this one? (write down the number of times)		***Skip to Qn 204 for women attending for the first time***	
204	How many months pregnant were you when you first received antenatal care during the pregnancy?	Months _____ Don't know……98		
205(7)	What motivated you to come for this ANC visit? Don't read the options, just probe- what else and circle all that apply)	Health worker told me to come back …1 I felt sick….....2 My partner encouraged me.....3 My relative/friend encouraged me….4 The VHT told me to come.....5 I find antenatal care useful.....6 I came to get FAs….....7 I came to make a delivery appointment…8 To get a mama kit….....9 To get other medicines.....10 Facility is near….....11		

		Others (specify)_____99		
206	Who accompanied you here for this ANC visit? ***Probe: Anybody else?*** **circle all mentioned**	No one..... 1 Husband ..... 2 Respondent's mother .....3 Respondent's father …..... 4 Mother-in-law..... 5 Father-in-law ……..... 6 Sister/sister-in-law ……..... 7 CHWs ..... 8 TBA..... 9 Friends……10 Others (specify)_____99		
207	Where do you attend most of your ANC from? (for only those who are attending for the 2nd or more times)	At this health facility….....1 Elsewhere….....2		
206	Why did you choose the place that you have most of your ANC visits from? ***Probe: Anything else?*** **circle all mentioned**	It's near home ..... 1 Doctor always there……..... 2 Facility always open …..... 3 Staffs respond to my questions……. 4 Facility always has necessary medicines……. 5 Not a long wait ..... 6 Staff treats women with respect…….7 Other (Specify) ……..... 99		
206 (b)	In the past months, considering the situation of covid-19 and the	Yes…..1 No…..2		

	restrictions, did you make changes to your ANC visit plan?			
(c)	If yes to (b) above, what changes are those?	I delayed my visit …….1 I cancelled my previous visit…….2 I came to the health clinic but could not receive any services ……3 I missed my ANC visit……4		
(d)	Why did you make the changes?	I was afraid of coming to the clinic ……1 Afraid to catch the disease….2 Following the government directive ……3 Transport to the health facility was difficult due to travel restrictions ……4 I had no money to come to the facility due to loss of income……5 I believed the ANC services were no longer available……6		
207	What mode of transport did you use to come for ANC today? ***PROBE: What type of transportation did you mainly use to get to the Place of ANC?***	Ambulance……..... 1 Private car ..... 2 Taxi/bus ..... 3 Boda-Boda Motorbike ..... 4 Own Motorcycle…….5 On foot ……..... 6 Boda-Boda Bicycle ..... 7 Own Bicycle…….8 Other (Specify) ……99		
208	How much did you pay for transport to reach this Health Facility today?	_____Ushs		

209	Did you consider the cost of your transport affordable for you and your family?	Yes ……1 No……2		
210	During this ANC visit, did you receive health education about the following?			
	Danger signs during pregnancy	Yes…….1 No…….2		
	How to feed yourself	Yes…….1 No…….2		
	The importance of Iron and Folic acid supplements	Yes…….1 No…….2		
	The side effects of Iron and Folic acid supplements	Yes…….1 No…….2		
	For how long you should take iron and folic acid supplements	Yes…….1 No…….2		
	On how to take Iron and Folic acid supplements	Yes…….1 No…….2		
	On where to get Iron and Folic acid supplements	Yes…….1 No…….2		
	Preparing for birth	Yes…….1 No…….2		
	Attending ANC	Yes…….1 No…….2		
	Vitamin A supplementation	Yes…….1 No…….2		
211	Did the messages have any new information that you had never heard before?	Yes ……1 No……2		
212	How were the messages provided to you? in a group with other women, or one-on-one with the health care provider?	Group…….....1 One on one…….....2		

212 (b)	Did you receive any messages on IFAS before Covid-19?	Yes …….1 No ……2 I don't remember …..99 Not applicable ….98		
(c)	Have you received any messages after relaxation of the Covid-19 lockdown?	Yes ….1 No …..2 I don't remember …99		
213	Could you please tell me roughly how many tablets of Iron and Folic acid you have taken since you got to know that you were pregnant	0-30.....1 31-60….....2 61-90….....3 90+-….....4		
214	What is the minimum number of iron and folic acid tablets that you should take during this pregnancy	30.....1 60….....2 90….....3 I don't know….....99		
215	Do you think you'll take iron folic acid throughout your pregnancy?	Yes ……1 No……2 I don't know….....99		
216	Why will you take or not take iron and folic acid supplements throughout your pregnancy (don't read the options-circle all that are mentioned **probe: Anything else?**	I understand the importance of taking it...1 I don't understand the importance of taking it…...2 I can bear the side effects…….....3 I cannot bear the side effects…….....4		
		From the health education I appreciate why I should take them…….....5 I didn't get sufficient information on its importance from the health education....6 I have no side effects…….....7		

		I feel terrible when I take them….....8		
		I have someone to remind me.....9		
		I may forget….....10		
		Other (Specify)……99		
217	Apart from the ANC clinic, where else did you get the information on Iron and Folic Acid supplementation?	Community health worker ……1		
		Radio…….2		
		Friend/Relatives ……4		
		Community meeting…….5		
		Other (Specify) ……....99		
		None……....9		
218	During this ANC visit were you given the following? ***Probe: and*** **Circle all mentioned**	Folic acid…….1		
		Iron tablets…….2		
		Ferrous Sulphate/Fumarate (Iron) +Folic Acid……3		
		Anti-malarial tablets……4		
		Deworming tablets for intestinal worms..5		
		Tetanus Toxoid Injection……6		
		Vitamin A….....7		
		Other (Specify)……....99		
219	During this visit, did you discuss the following with the health provider? ***Probe: and*** **Circle all mentioned**	Danger signs in pregnancy……1		
		Family planning……2		
		Nutrition…….3		
		Breast feeding……4		

		Delivery plans……5		
		RCT/ PMTCT……6		
219b	*Were the following tests/services done during this ANC visit?* ***Probe and Circle all mentioned***	HIV Test……1		
		Blood pressure ….....2		
		Anaemia test ….....3		
		Syphilis……4		
		Check for pallor…….5		
		Other (Specify).....99		
	What do you do when the heath facility does not have iron and folic acid in stock?	Buy from the nearby clinic…….1		
		Wait until next ANC visit…….2		
		Take balance from last visit ….3		
		Other (specify) ……99		
		None……....5		
Section 3: Rating the health facility Service received				
301	How long did you wait to see the health care provider?..... . (in minutes) Record actual time here if they recall, then circle the corresponding code	Less than an hour…….1		
		1-2 hours …….2		
		Above 2 hours …….3		
302	On a scale of 1 to 5, how would you describe your satisfaction with this waiting time?	Very dissatisfied……1		
		Dissatisfied……2		
		Fair……3		
		Satisfactory…….4		
		Very satisfactory…….5		
403	On a scale of 1 to 5, how would you describe the overall cleanliness of the health facility?	Very dirty…….1		
		Dirty…….2		
		Fair…….3		
		Clean……4		

		Very clean…….5		
404	On a scale of 1 to 5, how would you describe your satisfaction with the time given to you by the health provider during the health education sessions?	Very dissatisfied…….1		
		Dissatisfied…….7		
		Fair……2		
		Satisfactory……3		
		Very satisfactory…….4		
404	On a scale of 1 to 5, how would you describe your satisfaction with the quality of the health education sessions given to you by the health provider?	Very dissatisfied…….1		
		Dissatisfied…….7		
		Fair……2		
		Satisfactory……3		
		Very satisfactory…….4		
405	On a scale of 1 to 5, how would you describe the health providers' attitude towards you?	Very disrespectful…….1		
		Disrespectful…….2		
		Fair……3		
		Respectful……4		
		Very courteous and respectful…….5		
406	On scale of 1 to 5 how would you describe your satisfaction with the cost of services in this facility?	Very dissatisfied…….1		
		Dissatisfied……2		
		Fair……3		
		Satisfactory…….4		
		Very satisfactory……5		
407	On scale of 1 to 5 how would you describe your satisfaction with the availability of medicines in this facility?			
		Very dissatisfied…….1		
		Dissatisfied……2		
		Fair……3		
		Satisfactory…….4		

		Very satisfactory……5		
	On scale of 1 to 5 how would you describe your satisfaction with the availability of Iron and Folic acid tablets in this facility?			
		Very dissatisfied……1		
		Dissatisfied……2		
		Fair……3		
		Satisfactory…….4		
		Very satisfactory……5		
408	What is your observation about the arrival time of health workers on duty at this facility?	Always on time.....1		
		Sometimes on time....2		
		Sometimes late.....3		
		Never on time.....4		
409	What is your observation about the departure time of health workers from duty at this facility?	Always leave on time……1		
		Sometimes leave on time.....2		
		Most of the time leave early....3		
		Always leave early.....4		
410	On a scale of 1 to 5, how would you describe your overall satisfaction with the ANC services you received?	Very dissatisfied……1		
		Dissatisfied…….2		
		Fair……3		
		Satisfactory……4		
		Very satisfactory…….5		
412	In your opinion, how were the services in this facility?	Excellent 1		
		Good……..... 2		
		Average 3		
		Poor 4		
413	Can you tell me why you have ranked the services as indicated in Qn 412 above?	Doctor always there……..... 1		
		Facility always open ……..... 2		

	PROBE: What else? **circle all mentioned**	Staffs respond to my questions.... 3		
		Facility always has necessary medicines..4		
		Not a long wait 5		
		Staff treats women with respect…….6		
		Often doctor not there ……..... 7		
		Often facility is closed ……..... 8		
		Staff do not answer my questions 9		
		Facility does not have necessary medicines……10		
		Long wait to be seen ……11		
		Staff treat women poorly 12		
		Others(specify)…….. 99		
Thank you very much for your time				

Appendix F: District health team interview guide

INTRODUCTION. We are interested in finding out the district's experiences with the QI approach towards addressing Iron and Folic Supplementation bottlenecks at the ANC clinics. We generally would like to understand your perspective on this intervention, including the positive and some of the areas that may need improvement. These questions will help us improve this type of action, so we greatly appreciate your honest thoughts.

Questions.

1. Could you please share with us about your district's overall experience with the QI support for IFAS?
    a. What did you find worked well about the QI support for IFAS?
    b. What did not work so well?
    c. What would you like improved and how?
2. Let's talk about specific bottlenecks that the QI support was supposed to address.
    a. **Supply chain for IFAS**—please describe.
        · Overall, what worked well?
        · What did not work so well?
    b. **Health education for IFAS**—please describe.
        · Overall, what worked well?
        · What did not work so well?
    c. Could you please tell us **any other bottlenecks** that the QI support was supposed to address?
        · Overall, what worked well?
        · What did not work so well?
3. Please tell us about any reactions from health workers, mentors or other staff to the QI support for IFAS.
    a. What did workers and staff find beneficial for their jobs?
    b. Were there aspects that health workers/staff found to be unhelpful or difficult to implement?
    c. How did district leadership respond to any challenges that workers/staff faced with the QI support for IFAS?
4. Can you please talk about the collaborative learning sessions (sessions in which people from different facilities met and shared experiences and lessons) What do you feel are the main contributions of those events?
    a. What did you find worked well? (Could you provide some examples)
    b. What did not work so well? (Could you provide some examples)
    c. What would you like improved and how? (Could you provide some examples)
5. What about the quality improvement performance review meetings at the facility level? Have you received any feedback from the facilities about how they went?
    a. What worked well? (please provide an example)
    b. What did not work so well? (Could you provide an example)
    c. What would you like improved and how?
6. Are there any additional comments that you would like to make regarding the district's experiences with the QI approach? If so, please share, your perspective is very valuable to us.

Thank you so much for your time and insights. We greatly appreciate it.

Appendix G: QI Mentors interview guide

Quality Improvement Approaches to Enhance Iron-Folic Acid Supplementation in Antenatal Care Clinics in Iganga and Buyende Districts, Uganda

START TIME OF INTERVIEW _____:_____ AM / PM

INTRODUCTION. We are interested in finding out what your experiences were with the QI approach towards addressing Iron and Folic Supplementation bottlenecks at the ANC clinics. Our goal in this survey is not to evaluate your performance in any way but to understand your experiences of being a mentor/coach in this process. We generally would like to understand how you experienced the whole process, both the good and some of the areas that may need improvement.

Questions.

1. Could you please share with us about your experience of being a mentor/coach in the QI support for IFAS?
    a. Was it the first time you served as a QI mentor?
    b. Was it your first serving as a QI mentor for IFAS?
    c. What did you find worked well about the QI support for IFAS?
    d. What did not work so well?
    e. What would you like improved and how?
2. How would you describe the support you received from URC to enable you undertake your role as QI mentor for IFAS?
    a. Could you please tell us about the training you received for this role?
    b. Could you please tell us about other types of support you received from URC for this role?
    c. Overall, what worked well?
    d. What did not work so well?
    e. What would you like improved and how?
3. What did you find was difficult for the health workers to grasp?
    a. How did you approach this challenge?
4. Can you please talk about the collaborative learning sessions (sessions in which people from different facilities met and shared experiences and lessons) What do you feel are the main contributions of those events?
    a. What did you find worked well? (Could you provide some examples)
    b. What did not work so well? (Could you provide some examples)
    c. What would you like improved and how? (Could you provide some examples)
5. What about the quality improvement performance review meetings at the facility, how did they go?
    a. What did you find worked well? (Could you provide some examples)
    b. What did not work so well? (Could you provide some examples)
    c. What would you like improved and how? (Could you provide some examples)

Appendix H: ANC personnel interview guide

Quality Improvement Approaches to Enhance Iron-Folic Acid Supplementation in Antenatal Care Clinics in Iganga and Buyende Districts, Uganda

START TIME OF INTERVIEW _____:_____ AM / PM

INTRODUCTION

We are interested in finding out what your experiences were with the QI approach towards addressing Iron and Folic Supplementation bottlenecks at the ANC clinic. Our goal in this survey is not to evaluate your performance in any way but to understand your experiences with the way the QI intervention might have changed the IFA supply situation and how the changes were made. The last time we were here, you ably told us about the whole process of procuring and dispensing IFAS and about all those that are involved. Now we would like to follow up on how things have been since we last talked.

This interview will have two sections, we shall talk about the IFAS supply system and then the health education with a specific on IFAS. Now let's start with the supply system.

1. **IFA supply system** Could you please share with us how your ANC clinic is promoting the use of Iron and Folic Acid supplementation for pregnant women.
   i Have you noticed changes in these aspects of IFAS since December 2019
      a. Procurement (describe for us those changes)
      b. Ordering (describe for us those changes)
      c. Redistribution (describe for us those changes)
      d. Has anything changed in the way you order for IFAS within your facility?
   ii. Do you feel that you now have enough IFA tablets for the pregnant women when they come to ANC these days (say a week, month or quarter/year)?
      a. If so, how did you reach that point? (*Probe further on whether any quantification is done taking into consideration the ANC attendances and how it is done*)
      b. How about dispensing of IFA tablets to pregnant women attending ANC, have you made any change? *(Probe further on what tablets are given during pregnancy, how many tablets are dispensed and why?) If so, why were those changes made?*
   iii. Have you had stock out of IFA in the last 3 months?
      a) **If yes**, tell me more about that. How did you finally address the challenge as a unit or facility? *(Probe further on whether redistribution was considered or done and how it was done)*
      b) **If no**, how did you manage to be well stocked during those 3 months?
         a. Are there any specific mechanisms or changes that you put in place to avoid shortage of IFA or stock out at ANC or this health facility? If yes tell us more about the changes or processes, you went through to address the gap?
   iv. Has the QI process for IFAS changed your attitudes, skills and knowledge about IFA supply system in these areas?
      a. Procurement planning (**If yes**, share with me more about that, what was the change and how did it happen) Quantification (**If yes**, share with us

more about that, what was the change and how did it happen)

b. Dispensing (**If yes**, share with us more about that, what was the change and how did it happen)
c. Redistribution from and or to your nearby health facility (**If yes**, share with us more about that, what was the change and how did it happen)

v. Apart from what you have already told me, are there any other lessons from the quality improvement processes that you would like to tell me about.
   a. Or is there anything different or new you observed?

Health Education

2. Tell me more about the kind of information (health education) that you share at ANC clinics *(probes do you have any specific focus on IFAS, if yes what exactly do you focus)*
3. Have you had any changes in the way you plan and provide health education over time at the ANC clinic? *(Probes: How exactly did you go about implementing these changes? What would you say informed these changes?*
4. What was your experience like taking part in the quality improvement (QI) processes to improve the delivery of health education at ANC?
   1. Did the experience change your attitude towards the delivery of health education and IFA messages at ANC? If yes tell us more about the change in attitude?
5. What is that you liked about the support that you received through the Quality improvement processes?
   1. What is it that you did not like so much about the quality improvement process in regard to health education?
6. What would you like changed in the future about the quality improvement process in regard to health education at ANC?
   1. What would you like changed in future in the delivery of IFA messages at ANC?

Appendix I: Stores personnel interview guide

Quality Improvement Approaches to Enhance Iron-Folic Acid Supplementation in Antenatal Care Clinics in Iganga and Buyende Districts, Uganda

START TIME OF INTERVIEW _____:_____ AM / PM

INTRODUCTION

We are interested in finding out what your experiences are receiving IFA and distributing it to other frontline workers. Our goal in this survey is not to evaluate your performance in any way but to understand the IFA supply situation and possible improvements that have been made and how the changes were made. The last time we were here, you ably told us about the whole process of procuring and dispensing IFAS and about all those that are involved. Now we would like to follow up on how things have been since we last talked.

Stocks for IFAS

1. Could you please tell us some of the challenges you face in your facility with regards to these aspects of IFAS?
    1. Procurement
    2. In-facility ordering
    3. Redistribution of IFAS between facilities and districts
2. **Changes noticed or made**
    a. What are some of the changes that you have noticed or made since December 2019 at this facility in regard to IFAS procurement? (*Probes what would you say informed these changes, how exactly did you go about implementing these changes)*
    b. What are some of the changes that you have noticed or made at the ANC clinic in regard to IFAS in-facility ordering? (*Probes what would you say informed these changes, how exactly did you go about implementing these changes)*
    c. What are some of the changes that you have noticed or made at this facility in regard to IFAS redistribution of IFAS between facilities and districts (*Probes what would you say informed these changes, how exactly did you go about implementing these changes)*
3. In terms of IFAS, what is that you found useful with the quality improvement processes you received as a facility? ((Performance reviews, coaching and mentorship, learning sessions)
    1. What was less useful? ((Performance reviews, coaching and mentorship, learning sessions)
4. What would you propose to change in order to improve the QI processes for quantification and ordering IFAS from the National Medical Stores (NMS)?
    1. (Performance reviews, coaching and mentorship, learning sessions)

END TIME OF INTERVIEW _____:_____ AM / PM

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