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In-depth understanding of drivers of maternal behavior change in the context of an  
ongoing maternal nutrition intervention in Uttar Pradesh, India

By

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Master of Public Health

Behavioral, Social, and Health Education Sciences

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In-depth understanding of drivers of maternal behavior change in the context of an ongoing maternal nutrition intervention in Uttar Pradesh, India

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An abstract of  
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Rollins School of Public Health at Emory University  
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2020

## ABSTRACT

In-depth understanding of drivers of maternal behavior change in the context of an ongoing maternal nutrition intervention in Uttar Pradesh, India

**Background:** Maternal nutrition is one of many contributors to maternal mortality rates in India. Of all the states in India, Uttar Pradesh is one of the highest populated states in India and has some of the poorest maternal and child health outcomes. Undernutrition can lead to adverse outcomes throughout the lifespan. In pregnant women, poor nutrition can lead to complications during birth and mortality, and result in long-term developmental effects for the child. To address this challenge, Alive & Thrive (A&T) with the help of IPE Global, aimed to strengthen interpersonal counseling, micronutrient supplement provision, and community mobilization through the government antenatal care (ANC) platform in Uttar Pradesh, India. However, there is limited knowledge on key factors that influence women's adoption of key nutrition-related practices (i.e. diet diversity, ANC attendance, iron and calcium supplement intake, and weight monitoring). In order to strengthen the program implementation strategy, there is a need to gain further insight into women's perspectives and experiences with the maternal nutrition program in Unnao and Kanpur Districts in Uttar Pradesh, India.

**Objective:** The purpose of this qualitative study was to examine women's experiences and perspectives on key nutrition-related practices during pregnancy to identify key facilitators and barriers that affect behavioral adoption.

**Methods:** The study sample consisted of one high and one low performing block in each of the two program districts. A total of 24 semi-structured interviews were conducted with pregnant women who were in their 6-8<sup>th</sup> month of pregnancy. Data was analyzed through a thematic analysis approach. After forming codes, a codebook was developed and applied to relevant sections of each transcript. Using concepts from the Capability-Opportunity-Motivation (COM-B) framework, codes for each indicator were categorized accordingly. They were then identified as either a facilitator or barrier for each maternal nutrition behavior.

**Results:** Key facilitators for maternal behavior change included family support, ANC transportation that is provided to take pregnant women to the ANC checkup site, home visits from frontline workers (FLWs), and accurate message recall from the frontline workers, specifically individualized and contextualized counseling that takes into account potential barriers and conveys the importance/ benefits of practicing maternal nutrition behaviors. Barriers included lack of transportation to get to ANC checkup site, household responsibilities/ work duties, crowding at ANC checkup site, inconsistent provision of supplements, aspects of food insecurity, financial strain, and delayed timing of messages.

**Conclusions:** The findings from this study can help identify areas of program improvement and address potential issues that may influence program effectiveness. Additional training and supervision may be merited to help ensure that FLWs are delivering accurate messages at the appropriate time points in pregnancy. Provision of supplemental materials and details to enhance recall of key messages may aid in the success of maternal nutrition programs. Supply chain, quality of ANC, food insecurity, and poverty remain as structural barriers that were beyond the scope of this intervention, but are critical to program success.

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## CHAPTER ONE: Introduction and Rationale

Malnutrition is a widespread issue, affecting a range of subpopulations- babies, children, adolescents and women throughout India. Poor maternal nutrition a key determinant of women's health outcomes before, during, and after birth. It is important during the span of pregnancy that women have access to healthy foods, eat nutrient-rich foods and consume micronutrient supplements to maintain a nutritional status that is supportive of the fetus as well as the mother (World Health Organization, 2016a); (Herman et al., 2014). While malnutrition is associated with various health issues for all age groups, it can be particularly problematic for pregnant women and women of reproductive age in low and middle income countries (Black et al., 2013). Associated health outcomes with undernutrition include anemia, low BMI, and nutrient deficiencies, all of which can contribute to adverse health outcomes for both the mother and the fetus/newborn infant if they persist through the duration of the pregnancy period.

In South Asia, maternal undernutrition contributes to a variety of health outcomes. According to the National Family and Health Survey data, 22.9% of women in India have a body mass index (BMI) below normal level of 18.5kg/m<sup>2</sup>, leaving the mother vulnerable to birth complications and severe health problems such as low birth weight, preterm birth, and preeclampsia/eclampsia (NFHS-4, 2016) (Zongrone et al., 2018) (Katz et al., 2013). Anemia, another major indicator of health outcomes, exists in approximately 50% of women, both pregnant and non-pregnant women of reproductive age, which increases the likelihood of maternal and child mortality (NFHS-4, 2016) (Khaskheli et al., 2016). State-specific analysis revealed that Uttar Pradesh was amongst the highest affected by undernutrition. Compared to the other states in India, Uttar



Pradesh has the highest percentage of the population that is not receiving maternal and child-related health services, despite the high need (Awasthi et al., 2016).

### **Program Background**

Alive & Thrive is a global nutrition-focused initiative that aims to improve nutritional outcomes for mothers, adolescents, and children through intervention strategy and programmatic scale up. Alive & Thrive (A&T) collaborated with International Food Policy Research Institute (IFPRI), IPE Global, and the Government of India to assess the impact of a delivering a package of nutritional recommendations. Specifically, the recommendations for this cluster-randomized study included:

- Iron folic acid and calcium supplementation
- Dietary diversity counselling
- Breastfeeding counselling
- Weight gain monitoring
- Community mobilization

Emory University worked alongside IFPRI, A&T, and IPE Global to conduct a complementary qualitative study, that provided an opportunity to utilize in-depth interviews as a means of gaining information on program implementation at the district, block, village, and household level. The study included stakeholders such as government and program staff at the block level, frontline workers (FLWs) and their supervisors, medical professionals, community members, pregnant women, and the family members (husbands and/or mothers-in-law). The focus of this paper is on the pregnant women, who are at the core of the program efforts.

### **Problem Statement:**

Even with numerous programs and policies aiming to improve maternal nutritional practices, they remain ineffective often due to poor implementation. To address this public health problem, Alive and Thrive (A&T) is working with a data collection team at IPE Global to build the capacity of government services in delivering a package of evidence-based maternal nutrition interventions, identifying feasible approaches to achieve high coverage of pregnant women to improve diet diversity and adequate micronutrients, protein and energy intake, increase consumption of iron and folic acid (IFA) and calcium supplements, regular weighing and counselling, and counselling on early initiation of breastfeeding, during antenatal care (Bhutta et al., 2013). This package of evidence-based interventions aims to improve maternal and child nutritional status in Uttar Pradesh.

#### Theoretical Framework:

The COM-B framework, developed by Susan Michie and team, created a “behavior system” that considers capability, opportunity, and motivation, all of which are influenced by social and contextual factors. Michie et al. conducted a systematic review of literature to look at various behavior change frameworks to understand their contribution to intervention strategy (Michie et al., 2011). However, they determined a need for frameworks to meet three criteria: “comprehensiveness, coherence, and a clear link to an overarching model” (Michie et al., 2011). This led to the development of the behavior change wheel that encompasses the policy, programmatic, and individual factors that contribute to behavior change. In the middle of the behavior wheel lies the COM-B system, which is the capability, opportunity, and motivation (Michie et al., 2011). Each component was defined as follows: “Capability is defined as the individual's

psychological and physical capacity to engage in the activity concerned; Motivation is defined as all those brain processes that energize and direct behavior, not just goals and conscious decision-making; Opportunity is defined as all the factors that lie outside the individual that make the behavior possible or prompt it” (Michie et al., 2011). Looking at pregnant women’s motivation, willingness, knowledge, and ability to perform behaviors within her social and physical context is imperative to creating effective and sustainable change.

#### Purpose Statement

A quantitative evaluation will be conducted by IFPRI and Alive & Thrive to generate evidence of impact of a strengthened implementation strategy. To supplement this impact evaluation, there is a need for better understanding of key drivers of program access, participation, and behavior change for women. The purpose of the qualitative study is to understand the perspectives of pregnant women on seeking care and their maternal nutrition practices (listed below) and determine the associated components that make it more or less likely for them to perform them. In addition, this study will identify areas of program improvement to optimize support for women to reach the maternal nutrition goals.

#### Research Questions:

The key maternal nutrition behaviors and practices of focus (referred to as the recommended practices and the outcome of behavior change in this paper) include:

- Improving diet by consuming various types of nutritious foods
- Accessing antenatal care at multiple time points during pregnancy
- Weight gain monitoring over the period of pregnancy

- Consumption of iron folic acid supplements
- Consumption of calcium supplements

This study seeks to answer the following questions with the data collected from Unnao and Kanpur-Dehat in Uttar Pradesh, India:

1. What are the **maternal perceptions and experiences** with adopting program-recommended practices?
2. What are the **facilitators and barriers** to adopting key maternal nutrition behaviors?

**Significance Statement:**

This data aims to provide context to the data from the quantitative impact evaluation study and will specifically focus on women's perspectives and experiences with maternal nutrition in order to improve programmatic impact. The information gained from this evaluation will be used to improve programmatic design and provide lessons learned about how to scale up this package of maternal nutrition interventions to pregnant women in India and other countries with similar contexts. Ultimately, the focus on improving maternal nutrition program implementation is to improve maternal and child health and nutritional status in Uttar Pradesh.

## CHAPTER TWO: Literature Review

Maternal nutrition before and during pregnancy is known to be one of the major determinants of maternal as well as fetal outcomes (Abu-Saad & Fraser, 2010). Impact of poor maternal nutrition not only affects infant and early childhood outcomes, but it has long term effect on child brain development and the increased likelihood for serious chronic disease development (Wu et al., 2004) (Borge et al., 2017). Pregnant women with poor nutritional status themselves have poor outcomes such as difficult labor, post-partum hemorrhage, and increased maternal mortality (Lowensohn et al., 2016) (Ramakrishnan, Grant, et al., 2012).

While programs and policies have attempted to reduce poor maternal and child outcomes, these issues are common among women and children throughout India (Ramakrishnan, Lowe, et al., 2012). In India, incidence of low birth weight newborns is one of the highest at nearly 20% (Bharati et al., 2011). Undernourished women may lack not only protein energy consumption but also micronutrients in their diet. Bhutta et al. conducted systemic review of the effectiveness of various interventions on maternal and child undernutrition and survival in 2008 and found that focusing on improving diet through micronutrient supplements is a critical way to improve maternal health outcomes (Bhutta et al., 2013).

South Asia has among the highest for anemia rates of anemia globally (Stevens et al., 2013). In India alone, over 50% of pregnant women are anemic (National Family Health Survey, 2016.) Anemia during pregnancy is associated with significantly higher risk of low weight births, pre-term birth, and perinatal and neonatal mortality (Rahman et al., 2016). World Health Organization recommends that all pregnant women should take

supplemental iron and folic acid throughout pregnancy to decrease the incidence of maternal anemia, puerperal sepsis, low birth weight, and preterm birth (World Health Organization, 2012) (Bharati et al., 2011). It is estimated that focused, large scale supplementation programs can reduce maternal anemia by one-third to one-half over a decade, demonstrating how program efforts to target this issue can impact long term change (Sanghvi et al., 2010).

Another crucial supplement that contributes to the wellness of the mother and the baby is calcium. Calcium intake by pregnant woman is inversely related to hypertensive disorders during pregnancy (pre-eclampsia, eclampsia, gestational hypertension) (Imdad et al., 2011). WHO recommends calcium supplement during pregnancy in all developing countries where calcium intake is low, particularly in women at a high risk of developing pre-eclampsia (World Health Organization, 2016b).

Micronutrient deficiencies are prevalent in pregnant women in developing countries and are associated with several adverse outcomes for both the mother as well as in the newborn (Gernand et al., 2016). Although supplementation is one way to incorporate consumption of necessary nutrients, food intake is also a contributor. The emphasis of consuming a variety of food groups, in order to maintain a balanced diet, is another indicator of nutritional health (Moursi et al., 2008). Diet diversity, determined by a simple count of food groups consumed in a 24-hour period, is a surrogate measure of nutrient density and therefore, used as an intervention to improve dietary intake and mitigate micronutrient deficiency, anemia of pregnancy, and improve maternal and child outcomes (Moursi et al., 2008). Beyond consumption of food, knowledge to do so is needed (Yeneabat et al., 2019). In a study conducted by Daniel et al. showed that

pregnant women provided with dietary education gained on average 2.1 kg higher weight than their counterparts who were not advised on diet (Daniel et al., 2016). However, awareness of the food intake and the appropriate quantity needed is not always guaranteed to initiate behavior change. Low- income countries face structural issues such as transportation, consistent food/ agricultural source, food costs, and food availability (Nair et al., 2016).

To ensure health indicators are being met, and to receive advice or treatment if that is not happening, pregnant women are advised to use antenatal services (Kuhnt & Vollmer, 2017). Antenatal (ANC) clinic visits are opportunities to assess pregnant woman's health, take their blood pressure, monitor weight gain, reinforce health advice including on diet diversity and compliance with micronutrient supplements, and address any concerns they may have. WHO recommends at least four antenatal visits during the course of pregnancy (World Health Organization, 2016b). However, in 2015, only 26.4% of mothers in Uttar Pradesh had actually utilized antenatal care services four or more times (NFHS-4, 2016).

While these health outcomes are well-documented, maternal undernutrition remains a pervasive issue due to the combination of aspects characteristic of low-income countries, such as poverty, food access issues, high rates of disease, poor sanitation, and low educational attainment (Ahmed et al., 2012).

Beyond health outcomes, programs have to consider socio-contextual factors that surround maternal nutrition. The cultural context dictates food norms, key actors (i.e. her husband and her mother-in-law), and their decision-making power related to food decisions (i.e. the meals cooked in the house) and financial decisions (i.e. food that is

purchased for the household) (Simkhada et al., 2010) (Jejeebhoy, 2002). Together, the interplay of factors may influence the pregnant woman's potential for performing maternal nutrition behaviors in each household. When looking at the household level to understand eating habits and the family dynamic in Nepal (Morrison et al., 2018), which shares many cultural norms India, it was evident that the mother-in-law had both a direct and indirect influence on the daughter-in-law's food consumption, such as food quantity, the types of foods they consumed, and the frequency in which they consumed food. In addition, consideration of individual factors such as the type of information the pregnant women receives, how she feels about the information presented to her, and her perceived and actual ability to act on the instructions given to her is also a contributor to behavior (Bianchi et al., 2016).

Uttar Pradesh is one of the most populated states in India and has some of the poorest health outcomes. Compared to the other states in India, Uttar Pradesh has the highest percentage of the population that is not receiving maternal and child-related health services, despite the high need (Awasthi et al., 2016). A study in Uttar Pradesh assessed consumption of various nutrients during pregnancy (Sahu et al., 2015). Findings revealed that several nutrients were lacking in the pregnant women diet, including protein, iron, calcium, vitamin A, and folic acid (Sahu et al., 2015). The low nutrient intake contributed to low birth weight outcomes, which increases the likelihood of issues during delivery (Sahu et al., 2015). The women whose infants had a lower birth weight were underweight themselves, and had low hemoglobin levels in comparison to the mothers who had normal weight babies (Sahu et al., 2015). The mothers of the normal weight babies had consumed higher amounts of all the nutrients, demonstrating the



importance of nutrient intake in regards to weight gain during pregnancy (Sahu et al., 2015). Women's consumption of supplements was low with only 13% of pregnant women in Uttar Pradesh consuming IFA for the recommended period of 100 days compared to 30% national average (NFHS-4, 2016). Additionally, only 5.9% of women received full antenatal care in Uttar Pradesh compared to 21% for all of India (NFHS-4, 2016). The variabilities and rates and gaps in the maternal nutrition-related behaviors demonstrate a great need for programs to focus on specific contributors to these health outcomes. Emphasis on consuming a variety of healthy, nutrient-rich foods in maternal nutrition education projects is necessary to for multi-faceted improvement in maternal health and birth outcomes.

The pregnancy period is a time in which behavior change can have a drastic impact on maternal, infant, and child health outcomes (World Health Organization, 2016b). Addressing health outcomes, related behavioral outcomes, and socioecological aspects is essential to improve program approach and impact.

The COM-B framework allows for consideration of these contextual and environmental factors during analysis while focusing on behavior change. A study conducted in Guatemala assessed pregnant women's intentions related to use of gas stoves in rural areas and utilized the COM-B framework during analysis. In the phase where the COM-B concepts were used, the findings revealed that other people within the household promoted the use of the gas stove (Thompson et al., 2018). Using the COM-B framework allowed the researchers to consider the pregnant woman within the family dynamics (Thompson et al., 2018). The application of the framework that considers the role of individual, interpersonal, and social factors allows for clarity in many behavioral

aspects. Given the similarities in the population focus and the need to consider her within the household, the COM-B framework provides a unique opportunity to gather insight on behavioral, intervention, and individual-level factors.

#### Current study

Through in-depth interviews, with the insights provided from the pregnant women, this study's objective is to delve into the contributors to maternal nutrition practices and understand the reasons behind the gaps in adopting program recommended practices in Unnao and Kanpur-Dehat district. Using the components of the COM-B model will help guide and inform the main goals of this study with the consideration of individual and environmental factors that enable or prevent the adoption of the maternal nutrition behaviors. Lastly, this study will focus on the issues that exist when providing nutritional messages from the pregnant women's perspective, since they are the demand side of the services. Looking at all of these aspects concurrently to understand the facilitators and barriers to maternal nutrition practice adoption, this study will uniquely contribute to the current knowledge base, provide a snapshot of nutritional health in two districts in Uttar Pradesh, give insight to communication strategy and message delivery, and will inform the improvement and effectiveness of future organizational impact.

## **CHAPTER THREE: Student Contribution**

### **Program Overview**

Maternal nutrition efforts are necessary in India, and specifically Uttar Pradesh, India where some of the poorest health outcomes exist. To address this public health problem, Alive and Thrive (A&T) is working with IPE Global to build the capacity of government services in delivering a package of evidence-based maternal nutrition interventions, identifying feasible approaches to achieve high coverage of pregnant women to improve diet diversity and adequate micronutrients, protein and energy intake, increase consumption of iron and folic acid (IFA) and calcium supplements, regular weighing and counselling, and counselling on early initiation of breastfeeding, during antenatal care (ANC). This package of evidence-based interventions aims to improve maternal and child nutritional status in Uttar Pradesh.

A project titled, “ Evaluate a Feasibility Study of Integrating Maternal Nutrition Interventions in Existing Reproductive, Maternal, Newborn and Child Health Services in Uttar Pradesh, India: A cluster-randomized evaluation” sought to determine the impact of combining a package of services and recommendations, alongside the government antenatal services, and how this translates in Unnao and Kanpur-Dehat districts in Uttar Pradesh, India. International Food Policy Research Institute (IFPRI) is conducting a quantitative program evaluation from both pre/post cross-sectional surveys and a nested cohort study to examine program impact and integrate maternal nutrition interventions aimed at improving maternal and child health. Emory University collaborated with IFPRI and A&T to conduct a qualitative study to understand the program delivery and implementation.

**International Food Policy Research Institute (IPRI)**

The International Food Policy Research Institute (IFPRI) is focused on creating evidence-based policies that provide solutions towards decreasing rates of poverty, hunger, and malnutrition in developing countries.

**Alive and Thrive (A&T)**

Alive and Thrive (A&T) is a global nutrition initiative funded by the Bill & Melinda Gates Foundation, Irish Aid, UNICEF, and the Tanoto Foundation. Their focus is on improving maternal, child, and infant nutrition outcomes through system-strengthening and capacity building in African and Asian countries by developing solutions and disseminating tools.

**IPE Global**

IPE Global is an international development consultancy group that partners with governments, non-profits, and multilateral/bilateral agencies to provide support to planning programs, designing policies, and strengthening health systems.

**Study Overview**

For the endline evaluation process, IFPRI wanted to conduct a longitudinal nested cohort study that would aim to follow a subsample of women from the beginning of pregnancy until after delivery. The qualitative study sought to elaborate on the quantitative data to identify facilitators and barriers that contributed to the outcomes of the maternal nutrition program: diet diversity, consumption of iron folic acid (IFA) and

calcium supplements, weight gain monitoring, and intention to breastfeed. The larger study conducted interviews with government and block staff, frontline workers, medical professionals, community members, pregnant women, and their husbands and/ or mothers-in-law to gain an understanding at each program level in order to consider the supply and demand side.

### **Role of Student in Project:**

My role, with the help of a local research assistant, was to conduct semi-structured, in-depth interviews with pregnant women and their husbands in the selected high and low-performing blocks in order to understand perceptions and experiences of the maternal nutrition program. Specifically, the objective was to identify facilitators and barriers that promote or dissuade pregnant women from practicing the recommended behaviors, and how household and community members contribute to their practices. The study findings will help further clarify the programmatic impact on the ground level, inform the recommendations and program modification to address barriers, and potentially contribute to scaling up to other areas in Uttar Pradesh and India.

IFPRI introduced the study aims and associated research questions, which were modified to the scope of the analysis of this paper. I developed an interview guide, provided qualitative training to the research assistants, guided the data collection with the pregnant women, and led the data analysis for this study.

### **Methods**

#### *Study Setting and Population*

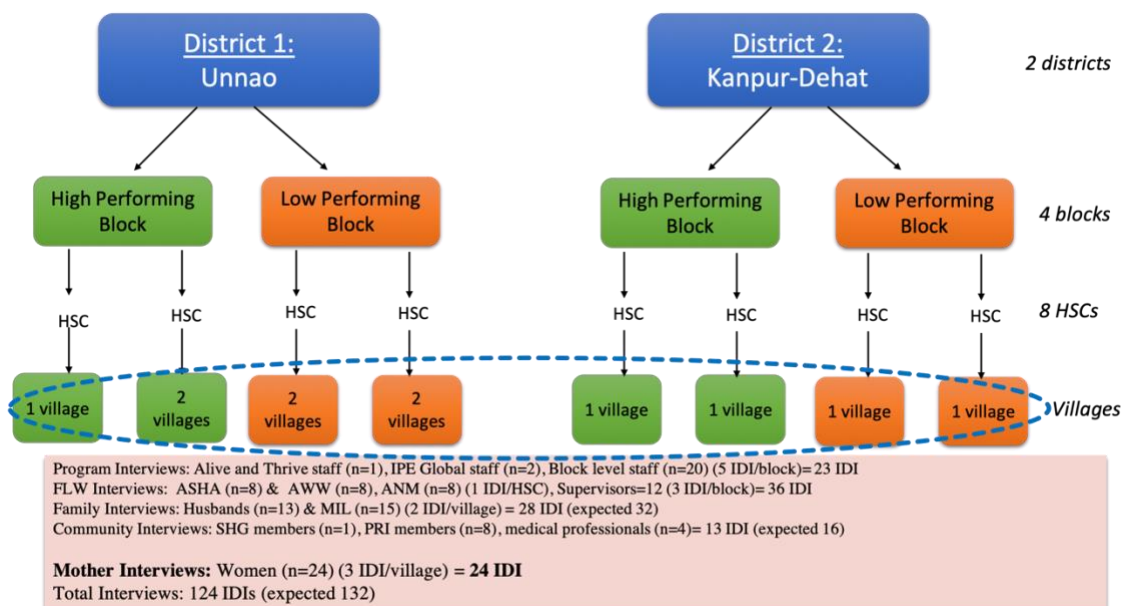
The pregnant women were located in two districts- Unnao and Kanpur-Dehat. The districts are composed of 13 blocks, of which a high performing and low performing

block was determined through analysis of existing monitoring data provided by A&T. The determination of high and low performing blocks was calculated by assessing the indicator increments and assigning each with a value of 10%. Within each district, the average score per month for each block was compared, out of which the highest and lowest performing blocks were chosen. The highest score was defined as the highest performing block while the lowest score defined the low performing block. Since there was a high and low performing block identified within each district, a total of four blocks composed the study population.

Following this process, a total of five women were randomly selected from study registry list within each of the four blocks. All of the women had to be from distinct villages, so random selection was repeated until this was the case. Since the data was de-identified for privacy purposes, the team had to reach out to IPE Global for the names and addresses for all of the selected women. Each village had assigned frontline workers (FLWs), so after the pregnant women information was provided, the assigned FLW name was also provided. A health subcenter is associated with each village, and within each subcenter are the FLW supervisors and medical professionals. The study required that the pregnant women be a part of two different subcenter (3 women in one subcenter and 2 in another subcenter) to ensure there was no overlap in FLW interviews. The program staff, government staff, medical professionals, and community members were identified through information provided IPE Global and/ or pregnant women's interview information based on where and with whom she sought care.

**Figure 1**

*Study Design Breakdown by Block, HSC, Village*



## Data Collection

Prior to the data collection period, the Emory team was part of the interviewing and selection of the research assistants that would conduct the interviews in the field. The semi-structured interviews were conducted using an interview guide that was developed by one of the three Emory team researchers (Neha) who also was part of the interview process, and the interviews were led by a local research assistant who could speak the variation of Hindi that was the main language in the village. The interview guide domains included daily activities, food habits, their knowledge and attitudes towards the key indicators, their experience with FLWs, and their household dynamics. Using a mobile recording device, the interviews were recorded after receiving permission from the participant. While the interview was going on, interview points and observations were also noted down to help contextualize the transcripts at a later point. The interviews were

transcribed and translated into English by a contractor hired in India, and then was quality checked by the Emory team members who understood Hindi. Transcripts were then imported into MAXQDA for coding and analysis. Data were analyzed through thematic analysis, after which a codebook was developed. Codes were developed for each indicator. The codes were then assigned to the corresponding COM-B component, after which these were identified as a facilitator or barrier.

Topics such as their understanding of the key practices being assessed, the importance of each, their frontline worker interactions, and their husband and/or mother-in-law role in their food consumption will be covered in these interviews. The interview guides were translated to Hindi, the local language, and will be assessed for quality translation.

The researcher who was part of the pregnant women interviews also took part in the husband interviews. As part of an Emory University student team, other students, Natalia Poveda and Ahad Bootwala, conducted interviews with block program staff, community front line workers, medical professionals, and mothers-in-law. A total of 124 interviews were completed during the data collection period. The focus of this thesis is to understand the program impact on the household level and the surrounding factors that influence the practice of the recommended behaviors from the pregnant women's perspective through the analysis of the 24 interviews.

### *Ethics*

This qualitative study received Institutional Review Board approval from Emory University on May 31, 2019. Additionally, the parent study, "Evaluate a Feasibility Study



of Integrating Maternal Nutrition Interventions in Existing Reproductive, Maternal, Newborn and Child Health Service” was given survey re-approval by Suraksha Independent Ethics Committee (SIEC) on October 27, 2018. Before beginning any of the interviews, the pregnant women were informed of the study’s purpose, the efforts to keep responses confidential, their ability to drop out of the interview at any point with now repercussion, and the deletion of audio recordings after data analysis through the translated informed consent. After the pregnant woman responded, the informed consent form was signed and dated. The participant’s identities were not associated with their recordings. The audio files were only accessible to those on the team.

## CHAPTER FOUR: Journal Article

### Abstract

Maternal nutrition is one of many contributors to maternal mortality rates in India. Undernutrition can lead to adverse outcomes throughout the lifespan. In pregnant women, poor nutrition can lead to complications during birth and mortality, and result in long-term developmental effects for the child. To address this challenge, Alive & Thrive (A&T) with the help of IPE Global, aimed to strengthen interpersonal counseling, micronutrient supplement provision, and community mobilization through the government antenatal care (ANC) platform in Uttar Pradesh, India. The purpose of this qualitative study was to examine women's experiences and perspectives on key nutrition-related practices during pregnancy to identify key facilitators and barriers that affect behavioral adoption. A total of 24 semi-structured interviews were conducted with pregnant women who were in their 6-8<sup>th</sup> month of pregnancy. Data was analyzed through a thematic analysis approach using concepts from the COM-B framework. Key facilitators for maternal behavior change included family support, ANC transportation that is provided to take pregnant women to the ANC checkup site, home visits from frontline workers (FLWs), and accurate message recall from the frontline workers, specifically individualized and contextualized counseling that takes into account potential barriers and conveys the importance/ benefits of practicing maternal nutrition behaviors. Barriers included lack of transportation to get to ANC checkup site, household responsibilities/ work duties, crowding at ANC checkup site, inconsistent provision of supplements, aspects of food insecurity, financial strain, and delayed timing of messages. The findings from this study can help identify areas of program improvement and address potential issues that may influence program effectiveness.

## **In-depth understanding of drivers of maternal behavior change in the context of an ongoing maternal nutrition intervention in Uttar Pradesh, India**

### **Background**

Maternal undernutrition has been well-recognized as significant global health issue, and the issue has persisted despite numerous programmatic efforts to address the issue (Swaminathan et al., 2019). Poor maternal nutrition is a key determinant of women's health outcomes before, during, and after birth. It is important during the span of pregnancy that women have access to healthy foods, eat nutrient-rich foods that benefit the mother and the child, consume micronutrient supplements, and breastfeed at the time of birth (World Health Organization, 2016); (Herman et al., 2014).

In South Asia, maternal undernutrition contributes to a variety of health outcomes. According to the National Family and Health Survey data, 22.9% of women in India are underweight (body mass index or BMI  $18.5\text{kg}/\text{m}^2$ ), leaving the mother vulnerable to birth complications and severe health problems such as low birth weight, preterm birth, and preeclampsia/eclampsia (NFHS-4, 2016) (Zongrone et al., 2018) (Katz et al., 2013). Approximately 50% of pregnant and non-pregnant women of reproductive age are anemic, which increases the likelihood of maternal and child mortality (NFHS-4, 2016) (Khaskheli et al., 2016). State-specific analysis revealed that Uttar Pradesh was amongst the highest affected by undernutrition. Compared to the other states in India, Uttar Pradesh has the highest percentage of the population that is not receiving maternal and child-related health services, despite the high need (Awasthi et al., 2016). Only 13% of pregnant women in Uttar Pradesh consumed IFA for the recommended period of 100 days compared to 30% national average (NFHS-4, 2016). Additionally, only 5.9% of

women received full antenatal care in Uttar Pradesh compared to 21% for all of India (NFHS-4, 2016). The variabilities and rates and gaps in the maternal nutrition-related behaviors demonstrate a great need for programs to hone in on specific contributors to these health outcomes.

### **Program Background**

Alive & Thrive is a global nutrition-focused initiative that aims to improve nutritional outcomes for mothers, adolescents, and children through intervention strategy and programmatic scale up. Alive & Thrive (A&T) collaborated with International Food Policy Research Institute (IFPRI), IPE Global, and the Government of India to assess the impact of a delivering a package of nutritional recommendations. Specifically, the recommendations for this cluster-randomized study included: iron folic acid and calcium supplementation, dietary diversity counselling, breastfeeding counselling, weight gain monitoring, and community mobilization.

Emory University worked alongside IFPRI, A&T, and IPE Global to conduct a complementary qualitative study, that provided an opportunity to utilize in-depth interviews as a means of gaining information on program implementation at the district, block, village, and household level. The study included stakeholders such as government and program staff at the block level, frontline workers (FLWs) and their supervisors, medical professionals, community members, pregnant women, and the family members (husbands and/or mothers-in-law). The focus of this paper is on the pregnant women, who are at the core of the program efforts. A total of 124 in-depth interviews were conducted, of which 24 were with pregnant women, included in the present analysis.

## **Methods**

### **Study Design**

This study took place in Uttar Pradesh, India, specifically in two districts: Unnao and Kanpur-Dehat. A sample of 24 pregnant women within the sixth to eighth month of pregnancy were interviewed.

Data was collected in on high and one low performing block in each of the program districts. The categorization of “high” and “low” were done through analysis of the existing program monitoring data. After that, a health sub-center and village were chosen. Pregnant women were randomly selected from the nested cohort study registry list. For each low and high performing blocks, along with the registry of PW, 5 women were randomly selected. Then, it was verified whether or not they were from different villages, which is why some required us to go to another village. If each woman were not from different villages, the random sampling reattempted. Once the 5 women are selected, IPE Global provided the names and location of their households. Five women were chosen to anticipate any issues of availability of the women for interviewing. Of the five women, three were interviewed per village.

### **Ethical Approval**

The Emory Institutional Review Board (IRB) granted approval on May 31, 2019. The parent study, “Evaluate a Feasibility Study of Integrating Maternal Nutrition Interventions in Existing Reproductive, Maternal, Newborn and Child Health Service” was given survey re-approval by Suraksha Independent Ethics Committee (SIEC) on October 27, 2018.

Before each interview, informed consent was obtained before every interview. The study purpose, the voluntary participation, and the effort to maintain confidentiality was stated in Hindi. Permission was also taken before recording the interviews, and they were informed that the recordings would be deleted after the completion of data analysis.

### **Data Collection**

Twenty- four in-depth interviews were completed using a 21-item qualitative instrument, which was created to understand the maternal nutrition behaviors as well as the contextual factors that influence it. The interview guide was written in English and later translated into Hindi. The guide included several domains including daily activities, food habits, their knowledge and attitudes towards the key indicators, their experience with FLWs, and their household dynamics, specifically with husbands and mothers-in-law. The interview guide domains were derived from discussions with the IFPRI team where they outlined priority areas for the evaluation study as well as topics from the quantitative research that needed further clarification and contextualization with qualitative data. The tools were reviewed by local research assistants who verified that the meaning of the questions was captured in Hindi.

The interview guides were piloted and modified as needed.

The semi-structured interviews were conducted by a local research assistant who was familiar with the variation of Hindi that was spoken by the majority of women in the rural areas where the program was implemented. The researcher took notes on the interview and added questions in when ended. Example questions include: “During your visit with the (AWW, ASHA, ANM, caregiver) please share your thoughts on the quality of your visit.” and “Can you describe your experience accessing ANC services?”

Interviews were conducted in the participant's residence. The interviews varied in length, ranging from 25 – 60 minutes. The interviews were recorded using the voice recording application on cell phones. The audio files were then emailed to an in-country research team who translated and transcribed the interviews into English. After the transcripts were sent to the Emory team. For quality control, the researchers randomly selected several transcripts and reviewed them with the audio files to ensure accurate translation and good quality transcription of the interviews.

### **Data Analysis**

Data came from 24 in-depth interviews with pregnant women between the 6<sup>th</sup> and 8<sup>th</sup> month of pregnancy. Using MAXQDA, codes and themes were derived through the analysis of each transcript to determine the facilitators and barriers relevant to each behavioral outcome. Because breastfeeding counselling was providing information about what to do after the baby is delivered, it was excluded from the analysis. These codes were categorized into the relevant category within the COM-B framework.

### **Framework**

Michie et al. conducted a systematic review of literature to look at various behavior change frameworks to understand their contribution to intervention strategy (Michie et al., 2011). However, they determined a need for frameworks to meet three criteria: “comprehensiveness, coherence, and a clear link to an overarching model”(Michie et al., 2011). This led to the development of the behavior change wheel that encompasses the policy, programmatic, and individual factors that contribute to behavior change. In the middle of the behavior wheel lies the COM-B system, which is the capability, opportunity, and motivation (Michie et al., 2011). Each component was

defined as follows: “Capability is defined as the individual's psychological and physical capacity to engage in the activity concerned; Motivation is defined as all those brain processes that energize and direct behavior, not just goals and conscious decision-making; Opportunity is defined as all the factors that lie outside the individual that make the behavior possible or prompt it” (Michie et al., 2011). Findings were derived from the codes that would be placed under the appropriate COM-B factor to elucidate key facilitators and barriers.

### **Research Questions**

This study aimed to answer the following questions: What are the maternal perceptions and experiences with adopting program-recommended practices? What are the facilitators and barriers to adopting key maternal nutrition behaviors?

### **Results**

The results identified the key contributors to the capability, opportunity, and motivation of practicing each of the key behaviors: diet diversity, ANC checkup attendance, weight gain and weight gain monitoring, IFA supplement intake, and calcium supplement intake. The italicized text are quotes provided directly from the interviews. At the end of the results section, there is a summary table (see Table 1) that provides an overview of the facilitators and barriers that pregnant women cited.

#### **I. Diet Diversity**

##### *Capability: Diet Diversity*

The capability for the pregnant women to consume a diverse diet stems from the recalled knowledge that was provided by FLWs and medical professionals messages, either during the home visits or ANC checkups. The FLWs are important for the whole



program implementation process, as their primary role is to 1) deliver messages that explain the importance of the maternal nutrition during pregnancy 2) provide directions related to key behaviors, 3) give general support (i.e. going with women to appointments). The FLWs act as the essential link for providing services and outreach to women and their families. The FLW messages are fundamental to capability, and have the power to inform the pregnant women's knowledge base (i.e. the types and quantity of food to consume), nutritional intentions, and potential ability to meet the diet diverse outcome. However, the clarity, accuracy, and comprehensiveness of the messages received by the pregnant women by FLWs during their visits or ANC checkups influences the impact of counseling. When asked about the diet diversity advice they received from the FLW, some of the pregnant women shared that they were told only a few details of the key message, i.e. include some food types. However, these messages do not have much emphasis on the variety of foods that could be consumed or what to do if the food is not accessible:

“[FLW] said to eat nutritious diet to gain weight. Take milk, green leafy vegetables and fruits. Eat eggs to get strength.”

While this is providing the gist of foods that are important for the pregnant women to consume, it does not provide flexibility or means to adapt if they encounter issues getting to these foods. Comparatively, a comprehensive message might include awareness of limitations that might prevent the pregnant women from being able to have healthy food choices, i.e. availability of the food in the market depending on seasons, or general accessibility to the market itself. Hearing messages that include various food items that would still provide nutritional value increase the possibility that women will eat healthy, as the alternate options may be available at home even if they are not getting

food from the market:

“Research Assistant (RA): What does [the FLW] tell you about diet? What you should eat?”

Pregnant Woman (PW): Green leafy vegetables of five types, curd, milk, cottage cheese, fruits of yellow and orange color with pulp like banana, mango, carrots, some things according to season like pumpkin and jackfruit, and in breakfast boiled gram, red lentils, gram lentils and beans. Those who eat non-vegetarian food eat meat, but I am vegetarian, so she told me to drink 2 glasses of milk- because of this I had to add one glass of milk in my diet.”

Most of the interviewees revealed that FLW information provided a combination of a few aspects in the aforementioned messages, with women reporting a small portion of the food items with no alternatives, or having the food with alternatives with no rationale. Through the pregnant women’s responses, it was apparent that some FLWs seemed to be aware of the importance of individual specific advice, so even though some of the recommended foods involve meat, the FLW provided the alternate vegetarian option in order for others to still get the same benefits.

Food choices are also influenced by the availability of recommended foods, because of what is sold in the market. Since the pregnant women are primarily receiving the food information from the FLW, it is imperative that they give messages including all relevant details at the time they see the pregnant women.

“RA: When [the FLW] told you about the diet, did she tell you what to eat?”

PW: Yes, she said that I should be having fruits, milk, eggs and fish. Whatever I can eat among these.... So whatever is possible for me, I have that. It is not possible to have fruits every day in the village. If it was a city, then it would have been possible.”

Not only does this message only cover a few of the food groups, she also references the difficulty in getting fruit to eat regularly, discussed in the opportunity section below.

FLWs providing other options for foods that women could consume to be healthy, as well as including the specific list of various kinds of food that may be more accessible to her, increases the likelihood for successful behavior influences/ change to move towards a pregnancy with nutritious food consumption.

Another important factor of that strengthens the pregnant women's capability is the consistency of the FLW presence (in both home visits and ANC checkups), so if the FLW and pregnant women meet frequently, and messages are delivered, then the pregnant women are benefitting from hearing messages repeatedly (increasing ability for women to account for specific details). The benefits are further strengthened if the information provided includes the components of comprehensive messages referenced above. The same pregnant woman who was able to report a more complete message shared that she met with FLW often, saying:

RA: How many times have you met ASHA for your current pregnancy?

PW: I meet her every day... She talks to me and explains information daily.

One pregnant woman mentioned that FLW had increased frequency in home visits since she became pregnant:

“She comes to me often. She starts visiting my home when she came to know about my pregnancy (PW 2, JD)”.

This emphasizes the importance of home visits, and how seeing the FLW often is important for consistency of messages, but if the pregnant women who work miss the

FLW when she stops by the home, this affects the potential of knowledge gain that comes from messages delivered by FLW during home visits, and in turn, the pregnant women may not learn about the foods that are beneficial for the pregnancy periods.

*Opportunity: Diet Diversity*

The opportunity for consuming a diverse diet during pregnancy was influenced by the physical availability of food (at home or in the market if they have access), and/or the means to get the recommended foods. While the pregnant women may have learned about or are aware of the foods they should be consuming during pregnancy, unless the recommended foods are present in the house, or the pregnant women are going to get the food, they will not be able to have the dietary consumption recommended.

“She tells me about dietary habits, so whatever is available in the house, I eat that... We are daily wage labour and I have three children, so whatever is available at home I eat that only.”

Another woman similarly quoted:

“Yes, sometimes I face problem if the food items are not at home, then I prepare another thing which is available. But if I have to eat it then I give money and get it from outside.”

Depending on the nutritional value of the food at home, pregnant women may or may not be consuming foods that are nutritious for the pregnancy period.

Another limiting factor is that many of the households face financial strain, which restricts the family's ability to purchase some of the recommended foods.

“Yes, she does tell me to eat green vegetables and eat healthy food, but I eat what I can afford as I am laborer, not very financially strong. I have to send my kid to school as well, so I have to manage everything.”

If the pregnant woman has a family member who is able to provide the foods they are recommended, assuming that they are able to afford the food, that they are able to access the market, and that the market is carrying some of the recommended food items, they are more likely to consume it if it is present in the house. When describing some of the information provided by the FLW, this pregnant woman also mentions her husband's role in her food consumption:

“They call and give advice that what to eat and what not to eat...They tell that I should not eat such things which will damage my health and child's health too, so she tells about foods like green vegetables, which my husband brings regularly, and milk we get in the morning which I use for my household and that I have myself as well. While coming back from work daily in the evening, my husband brings fruits like mango or papaya and grapes, pineapple, whatever he likes, he used to bring that. My husband does not let there be shortage in food items.”

Whether husbands are responsible for bringing the food that is needed for the pregnant woman, or they are support to remind her to do some of the recommended behaviors, the likelihood for women to consume foods increases when a husband is supportive. There were various members present in some of the households, but if the pregnant woman had a husband who lived in their house, they were usually the person who would make the purchases at the market and bring it for the household. While family support can increase the likelihood that they will eat the recommended food items, for women who are not able to access the market on their own or do not have a husband who can get the foods, the dependence on another family members ends up being another barrier if no one in the family is able to provide the help she needs.

Some pregnant women, however, have strong in-law support that offset the dependence on the husband:

“RA: Since your husband stays outside so do you face problems in buying things?”

P: No, I don’t face any problem- I ask my brother-in-law to buy them for me.”

The combination of factors that pregnant women mentioned related to food access, i.e. difficulty accessing markets, lack of availability of the recommended food items, and financial limitations, which are key defining factors of what is considered food insecurity. For instance, there are various accessibility issues. The market that carries the specific fruits and vegetables are sometimes very far away, and without proper personal transportation, they are not able to visit frequently. Also, they may not have access to the market at all times:

“The market is not open every day here. Only Saturday and Wednesday the market is open. If vegetables are not available, then I prepare mixture of rice and pulses.”

Additionally, the families are usually struggling financially, but some of the fruit/vegetable recommendations are not in season or available nearby, so the price to buy them are quite high. One woman said:

“If you do not have money then there is problem in following the advice.”

Even if pregnant women receive the information from FLWs, they are restricted by aspects of food insecurity that prevent the physical access to food.

#### *Motivation: Diet Diversity*

Motivation for diet diversity stems from rationale provided in the diet diversity messages related to benefits for the mother and/or baby. Women who recalled the

reasoning behind recommended foods would see their nutritional intake as a responsibility as a mother:

“I feel like, If I will take care of my dietary, baby will keep healthy and I will also not get any problem, so I will not require medicine in future if I will take care of dietary.”

Another woman elaborated further, stating:

“RA: What did they explain to you regarding diet you should have?”

PW: They told me to have milk one glass a day and if milk is not available then have cottage cheese and have sweet prepared by milk....the message was that a pregnant woman should have lentils red lentils, green grams, yellow lentils, split chickpea and 3 meals a day. All these will help pregnant women and her baby to attain good health. By all doing all these things then only baby will develop properly.”

The shift from hearing advice to seeing it as a duty furthers the importance of the FLW’s messages and their role, as both accuracy and justification are equally important.

For women who do receive accurate or comprehensive messages, it may not guarantee that women have the recommended foods. If the pregnant women do not like the recommended foods or choose not to buy other foods for another reason, despite the messages they received, they are not receiving the nutritional benefit. One woman clearly stated: “I get all information, but I eat what I like to eat”. Ultimately, while receiving information is important to make it more favorable for pregnant women to consume the food items, it is not a determining factor.

## **II. ANC Checkups**

### *Capability: ANC Checkups*

Unlike the other indicators and their messages, women did not share explicit messages about ANC checkups. The interviews revealed that the FLW instructed the pregnant women to go to the checkup by a certain month during their pregnancy, to get blood pressure checked, and/or for specific tests (i.e. sonogram, blood test, urine test).

“When they call then I go wherever they ask me to come but when they don’t call then I don’t go.”

Additionally, the timing of the ANC visits depends on when they receive a reminder to do so from the FLW. Because of this dependence on the FLW, if the messages are inaccurate or their visits are infrequent, then they are likely to either not go often and/or are going at a later point in time than needed. While pregnant women should be attending ANC checkups at multiple time points beginning early at the pregnancy period, a pregnant woman shared that she was advised to attend in her 8<sup>th</sup> month of pregnancy, which is extremely late to go for an ultrasound and an ANC visit:

RA: Were you told how many times you have to go to hospital for checkup?

PW: Just one time more I have to go to the hospital.

RA: That checkup has to be done in 8<sup>th</sup> month?

PW: Yes

If some of the pregnant women are receiving inaccurate information, it can lead to overlooked health issues and cause problematic outcomes for her or the child during delivery. While FLWs may interact with pregnant women during home visits or in other settings, the ability to utilize the health center resources (i.e. lab results, sonogram, etc.) might lead to additional health-related findings.



*Opportunity: ANC Checkups*

Although ANC checkups was one of the indicators of focus, it is important for providing information related to all of the indicators, since this is a time where they are interacting with doctors and/or FLWs and another time period to receive all key messages. Accessibility was a major contributor to the attendance of ANC checkups.

Inability to access to the ANC checkup location was frequently reported as a reason that made it difficult for pregnant women to attend ANC checkups. Most of the health centers are far away from the pregnant women's residence, and since most families do not have a car or other modes of transportation, they would have to go on foot to an appointment. Even though it is recommended that women go at multiple time points throughout the pregnancy period, many women do not go for this reason. For instance, one pregnant woman cited that the hot weather while walking to the hospital makes going for checkups frequently challenging:

RA : Alright, what all difficulties do you face in getting these check-ups?

PW: I face difficulty in going from here to the hospital.

RA : Alright, there is problem in commuting to the hospital, what else?

PW: I face difficulties in commuting and it's very sunny, so I am not able to go.

However, a few interviews revealed that FLWs, specifically ASHAs, would provide a form of transportation (an ambulance usually referred to as a van) that took a few pregnant women from the village to the health center. This addresses the commute barrier mentioned above, and therefore increases the likelihood for the women to get ANC checkups, if the issue is related to accessibility.

Most of the pregnant women who shared that ASHAs remind them that it is time for an ANC visit, it almost always guarantees that women will go. Rather than specifying the month in the pregnancy period, the ASHA would tell them to go for the ANC checkup at the time of the home visit. This FLW follow-up with the pregnant women acts a reminder and prompts them to go for their checkup, demonstrating the importance of their visits and the timing of their visits during the pregnancy period.

P: One time I got ANC check-up and they told me to come in your 8 month.

RA: Why didn't you go for check-up before 6 months?

P: When ASHA took me there then only I will go there. ASHA takes 3 to 4 pregnant woman together, for check-up.

For some women, they turn to their family members to accompany them to their ANC checkup. One woman shared that she was aware of the need to visit the CHC for her ANC checkup, but despite her requests to go repeatedly, she was not able to go:

“I regularly ask my father in law and husband but both of them don't take me for check-up. Even in the morning I was asking. “

Because these women rely on the accuracy of the information provided, if this information is incorrect, or the FLW does not show up, it affects the consistency and frequency of their visits, as mentioned in the capability section when the FLW advised the pregnant women to attend an ANC checkup during her 8<sup>th</sup> month.

#### *Motivation: ANC Checkups*

The pregnant women shared instances were daily work burden, waiting time, and the quality of past visits decreased the likelihood for ANC checkup attendance.

Many of the pregnant women cited work schedule and child-related duties (if they have other children) as a factor that competes with them going to ANC check-up site:

RA: What problems you face when you go for a check-up? Why did you go for a check-up at 6 months?

P: Yes, I did not go there before 6 month of pregnancy because I have so much of work, but when ASHA called me, I went with her.

Because of work duties and time constraints, even if they are aware that there are certain points in pregnancy that they need to go for a checkup, many women reported not going.

Discomfort throughout the duration of the commute, as well as the wait time at the health center, can deter women from going for their checkups. In this interview, while wait time was wan issue, the accessibility aspect was mitigated due to the van that the ASHA has provided.

“Yes, we have to wait there. When I went for checkup to the block hospital it took at least 2 or 2.5 hours. The van came, took us there, husband of ASHA bahu had called the van and all the pregnant women went in that van together. It took 2 or 2 and a half hour, after that van dropped us back too.”

Additionally, crowding is an important factor in the ANC check-up attendance:

Yes, I have to wait if there is crowd otherwise I don't face any problem.

One pregnant women who had a negative experience when giving birth at her community health center with her previous child refused to return there for ANC visits and for her upcoming delivery.

“Once I went to the hospital, and the [doctors and medical staff] talked to me very rudely... From then on, I didn't go to the hospital... They are appointed by government to help others, to help poor, but if they only speak rudely then where will people go? This is the reason, even if I have a problem, then I do not choose to go to the hospital. Either I tell the [FLW] or I buy medicine from outside and take that. I have been pregnant for 7 months, and up till now I have not gone to [block] hospital and if anyone advises me to do so, then I refuse ... And anyone who comes to our home and says that your delivery has to happen there, I tell them clearly that when it is time for the delivery, it will be done at my home, I will not go to the hospital. If anyone goes to them, and they speak ill of you, where will one go? The government is giving them salary to help poor but what they will help? They are busy making money from the poor.”

Because of the quality of this visit, she is no longer willing to deliver in the hospital or attend any ANC checkups there, and this can be potentially harmful to herself and her baby. The issues highlight above demonstrate the implications they have on future decisions made related to her and her child's health.

### **III. Iron Folic Acid Supplement Intake**

#### *Capability: IFA*

Most pregnant women reported that the FLW had provided the folic acid supplements, and shared the directions they were provided to take IFA.

“I was given iron tablet that has to be eaten in evening with normal water or lemon water but not with milk or tea.”

In the case of IFA, the directions are provided with in a way that seems to consider the potential of side effects. While the advice to take lemon water is to increase the absorption of iron folic acid, it provided relief to this pregnant woman's problems after taking it:

“[FLW] also told how to take the iron tablets as I didn’t feel good once I ate iron tablet so she told me to have it with lemon water in the evening. Now I feel better when I take the tablet that way.”

Addressing this issues makes is more likely that she will continue to consume the pills, assuming she has access to them. Additionally, one pregnant woman shared the distinction between the intake of iron supplements and calcium supplements, which is important so that women are aware of the differences, since having both calcium and iron at the same time can reduce iron absorption:

“Yes, I get the iron and calcium tablets from there, and I was also told how to consume them, that the red tablets should be eat in night after the meals at the sleeping time, and the white one in the morning after the meal. So, one tablet in night and one in daytime.”

However, in reference to the food access mentioned in the diet diversity section, providing information in reducing the side effects (with lemon), but it is not available to the pregnant woman, she may not consume IFA supplement even if it is in her possession:

“RA: Do you ask [FLWs] any questions from your side?”

PW: Yes, recently I told [the FLW] that I don’t like IFA tablets as I get loose motion, so they told me to have it with lemon water.

RA: So have you have IFA tablets with lemon water?

PW: No, I will not lie- I had 4 to 6 tablets...

RA: So they told you to have IFA tablets with lemon water, but you did not have do that? Why?

PW: I was not able to get lemon- my mother in law was scolding me yesterday, she was saying to have tablets with milk.

RA: You don’t get lemon?

PW: No, my father-in-law is ill

RA: So you hardly get things from outside?

PW: Yes”

In other scenarios, having the family support makes it more likely that women will complete the behaviors, but in this case, they provided conflicting information to what the FLW told her, as taking milk with IFA supplement reduces absorption of iron. This emphasizes the importance of family’s exposure to accurate key messages so that family support is encouraging the correct behavior. Here, it is evident how dependent the pregnant women are on family members to get the components (lemon) stated in the directions in order to carry out the key behavior.

*Opportunity: IFA*

Opportunity for folic acid intake breaks down into having the opportunity to get the pills (access to the pills themselves) for consumption. While the messages may have been provided and retained, unless women are given the pills or have the ability to get them, they are not able to consume the pills.

Most pregnant women were provided the pills during their ANC checkup, so if they are not able to make the checkups, they may not get the pills. In this scenario, the FLW is going to the home and providing pills to the pregnant woman, so issues with access are offset:

“RA: When your tablets finish of iron and calcium do ASHA come to give it to you at your house?

PW: Yes, I go and tell her that medicines are finished she comes and give them to me.”

*Motivation: IFA*

While the indicator is referring to the intake of IFA, understanding what iron deficiency contributes to is important. Anemia was perceived to be an issue, and translated from Hindi to English as “not having enough blood”. A pregnant woman presented the information that went beyond the infancy period when it came to benefits from IFA consumption:

“RA: Okay, did [FLW] tell you anything about why it is important to take iron pills?

PW: Yes, baby will keep healthy and blood will increase in body. Brain development of baby will be good, baby will become bright, so will study well.”

One pregnant woman shared that she was explained the implications of taking IFA has on her and her baby’s health:

“The immunization used to be given, and weight of pregnant women also taken there, and iron folic acid and calcium tablets use to be given there. They also provide information regarding tablets, that blood of mother will increase and brain of baby will develops by consuming iron folic tablets. That is why I go there.”

This is a more technical version of the rationale that the pregnant woman recalled. It specifically references the improvement in outcomes as well as the development of the baby; similar information was only reported in one other interview, however, she was related to the FLW, so there was bias that when she received the detailed information. Additionally, even though this highlights a variety of aspects, providing the pills to this pregnant women was one of the motivators to get to her to go to the ANC visit, which emphasizes the link between all of these key messages.

Another message that included that iron folic acid is important to reduce symptoms as well as ensure on-time delivery:

“RA: Did she tell you about the importance of having iron tablet?”

PW: Yes she gave me. She told me that iron tablets help increasing the blood level and I won’t feel dizzy and weak also the baby will be healthy and fine. The date [of delivery] will also be on time. She told me about advantages so I take it.”

Another motivator that emerged was family support. One of the pregnant women whose husband was in the army revealed that even though her husband is not there, she was provided a reminder to take pills when speaking to him over the phone:

“RA: How does your husband take care of you during pregnancy?”

P: He takes care of me and tells me about food and medicines to take iron tablets on phone.”

Family support, even if not in the same household, can be used to provide reminders and general support for the pregnant women to take the pills. As mentioned above, this also demonstrates the importance of family members being aware of key messages, so they have the capacity to support the pregnant women in specific ways like this.

#### **IV. Calcium Supplement Intake**

##### *Capability: Calcium Supplement Intake*

Unlike what was shared when consuming IFA, there were not many directions specific to the consumption of calcium to avoid any complications. However, time of day was shared in some of the interviews:

“RA: Did she tell about calcium tablet?”

PW: Yes, she told to have calcium after eating morning meal.”



Additionally, some of the messages provided the important distinction between the timings of when to take IFA and calcium, as highlighted below:

“Yes, I get the iron and calcium tablets from there, and I was also told how to consume them, that the red [iron] tablets should be eat in night after the meals at the sleeping time, and the white [calcium] one in the morning after the meal. So, one tablet in night and one in daytime.”

One pregnant women shared a piece of information regarding diet specific to calcium. Even though the indicator is highlighting the supplement intake specifically, it is important to know that they can also receive calcium-specific diet information. While this is not enough supplementation, the awareness of the importance of calcium is emphasized in a slightly different context:

“In the morning any calcium rich source like milk should be taken and to eat at an interval of every 3 hours like 8 am in the morning, then 12 pm and at 7 pm a proper meal should be taken, and other than this something should be taken at every 3 hours so that baby gets proper nutrition.”

#### *Opportunity: Calcium Supplement Intake*

Since there were no strong side effects reported from taking calcium, it was more likely that women would take it. However, the opportunity to take calcium emerged as a key determinant of calcium intake due to issues with availability and provision of the pills:

“RA: Do you get calcium tablets?”

PW: I got calcium tablets initially but after that they told me calcium tablets are not available so take IFA tablets only.”

The inconsistency of pill availability is important, since this prevents the women from developing habits to take this pill, and it also reduces the likelihood for the pregnant women to experience the resulting benefits from continued calcium intake.

In the conversation below, multiple aspects were touched upon that contributed to her inability to have them:

“RA: The white medicine of calcium...

PW: That from one month I haven't had, because there is money problem.

RA: So from where did you get the medicines?

PW: That my husband brought from a private pharmacy, I couldn't get it from here.

RA: So, first time you got calcium pills from here and next time you didn't get that, what they told you?

PW: No, I didn't get that white medicine of calcium, I only got red [iron] medicine.

RA: Okay, so you only got red medicine from there and white medicine you brought from private pharmacy only.

PW: Yes, I didn't get.

RA: But did they tell you about calcium tablet?

PW: Yes, they told that we don't have here you can take it from market.”

The pregnant woman was told that there are no pills available for her at the time of her appointment, but if it is not distributed during the ANC checkup, this introduces another set of barriers: access, financial strain, and family member dependence. She

shares that she is not able to afford the medication, but otherwise her husband would have to get it on her behalf. This demonstrates the importance of distribution of pills at the time of the ANC checkup.

For women/ family members who put in the effort to try and get the pills, they were faced with the issue of getting the pills, which can dissuade them from taking pills at a later point:

“RA: But you could not get calcium tablets

PW: Yes, I could not get calcium tablets.

RA: Not even in the block?

PW: It is not available anywhere. There is no distribution anywhere.”

#### *Motivation: Calcium Supplement Intake*

Similar to IFA consumption, providing the importance of why taking the pills can lead to improved outcomes makes it more likely that they will take the pills:

P: Yes, she told about it. She used to ask, for what it is important? Then I told that, the tablet which you use to give that red one [iron], that increases the blood and it is important for me and my baby. And the white one [calcium], that makes bone strong. It also makes baby’s bone strong and I feel relief by having it.

This quote emphasized the importance of motivation, as she shares that the “relief” from knowing that these pills have the potential to address the issues specified provided comfort towards things that have been identified by pregnant women as stressors.

Although most women mention the instructions and rationale provided when told about the pills, one pregnant women mentioned that she was taking pills without receiving these details:

“PW: Red (Iron) tablet use to be given by the ANM didi and Calcium tablets we have purchase from the medical store.

RA: Ok, so did ANM didi tell you something about how to take that iron tablets?

PW: Yes, she told that take that tablet in the evening. This will help to increase mother’ blood level and also helpful for the growth of baby ‘brain.

RA: Ok, and what about calcium tablets?

PW: She did not tell about calcium tablet yet. Although, she told me that, “she will explain about calcium tablet when she will come here”.

RA: Ok, so are you taking calcium tablet?

PW: Yes, I am taking that tablet daily. I have to purchase as it has been finished.”

Although she still has to go and get the pills from somewhere other than the FLW, she mentions that she has not been told explicitly about calcium pills, other than the fact that it has to be bought from a pharmacy. This leads to the potential for the pregnant woman to take the pill incorrectly, since taking the pill incorrectly does not yield the health outcome needed. However, this quote reveals that in some cases, rationale may not be needed to motivate the women to take the pills.

## V. Weight Gain and Weight Gain Monitoring

Although weight gain is not specified as a separate indicator, it emerged as an important factor when considering the relationship amongst the key messages. Weight gain, which differs from weight monitoring, specifically refers to change in weight over the pregnancy period, while weight monitoring is in reference to the recording of weight change over the pregnancy period. However, the potential to gain weight is linked to the consumption of foods, and therefore linked to the type of foods consumed. While a diverse diet (i.e. high quality of food) is not necessary for weight gain, the ability to access certain foods, and the ability to consume quantities necessary to gain weight are important considerations. Weight monitoring is linked to ANC checkup attendance. Weight monitoring is done at ANC checkup. If women are able to go for their checkup throughout the pregnancy period, they become aware of how much weight they are gaining, and whether they are at a healthy weight at each point in the pregnancy period, depending on the what the FLW shares at the time.

### *Capability: Weight Gain Monitoring*

Overall, when the pregnant women were asked about messages related to weight gain, some of women shared awareness of the need to gain weight, with more specific messages including numeric information, such as:

“[FLW] told me that before the birth of my baby my weight should increase up to 12 Kg.”

While this quote demonstrates that a noticeable weight gain should occur throughout the pregnancy period, there is no recall of an explanation as to why that is

important or means to accomplish that. However, when the information is presented in context of diet, like the message below, it implies that they are paying attention to their weight of the food they are eating:

“ Yes, when they measure my weight, then [FLW] gave information regarding proper diet and said if I eat properly that I will gain weight.”

Another pregnant woman reported something similar, but instead she referenced diet and quantity of foods, which is contributor to weight gain:

“RA: She told you to have proper diet. What information did she give you regarding diet?

PW: [FLW] told me to have everything in proper quantity like oranges, milk, meat, fish, pluses, green vegetable.”

It is unclear what the specific quantities were, but the word “proper” suggests that she was given related information and that diet information was provided. However, unless the weight gain message is supplemented with the explicit statement of how to gain weight, the pregnant women may not eat as much as they should. One pregnant woman recalled a message that suggested that gaining weight would be negative for her and the baby:

“PW: [FLW] told me if I eat breakfast then I should eat less food because it can affect the baby. Overeating should not be done.

RA: How will the baby get affected if you do overeat?

PW: There is problem in sitting and standing... if I eat too much baby is not able to move in stomach and a pressure is created.

RA: A pressure is created. Who told you about this?

PW: [FLW] told me.”

This pregnant woman did relate diet and weight gain messages, but unfortunately, the message is implying that consuming less food is more beneficial than eating food that could increase her weight. weight gain capability is mentioned above, the ability to gain

weight is dependent on how much the pregnant woman is eating and whether or not she is aware of the need to gain weight during pregnancy. Incorrect message recall and the inability to buy certain quantities of food contribute to weight gain not occurring in increments necessary for her and her baby's health. Awareness of the need to gain weight may also be important so that she knows she needs to focus on doing so:

“Yes, I don't know how much my weight is. ASHA only knows about my weight, I don't know, I only standup on the weighing scale.”

*Opportunity: Weight Gain Monitoring*

Opportunity in this section again is linked to the diet diversity aspect, as food access and food consumption contribute to the pregnant woman's ability to gain weight. However, the ANC checkup site is primarily where the weight would be measured, so unless the pregnant woman is going to ANC checkups at least more than once and at different time points during the pregnancy period, she does not have the opportunity to have her weight measured. However, even if women are going for ANC checkups, it is not always guaranteed that their weight will be measured:

“RA: Why don't [the FLWs] measure weight?”

PW: I don't know, I visited twice but they did not measure my weight. Yesterday, they were telling that in the [ANC site] that there is no weighing machine and that is why they are not measuring weight.”

While the few women who had their weight measured reported that it happened at the ANC site, one pregnant woman shared that she had her weight checked by a FLW at home:

P: [FLW] used to visit my home; I went to the [ANC site] for immunizations and met her there, and once she came to my home for weighing my weight- she used to come often.

Although this was not mentioned by other pregnant women who were interviewed, FLWs measuring weight conducting a home visit allows for a critical indicator to be met if they have the means to bring along a functioning weighing scale.

*Motivation: Weight Gain Monitoring*

Again, rationale is an important contributor to perceiving weight gain and maintaining a healthy weight as a goal during the pregnancy period. An example showcases the message that does not include a weight goal, but it is reflecting a general importance as to why weight gain is important:

“Yes, [FLW] says that, weight should not decrease, otherwise you and your baby both will have problem. And if you are having good diet, this indicates that your baby is in good health and you are also having good health.”

Even though this message does not mention the number of kilograms, it is arguable that including a number may not do much considering women do not have a weighing scale, and the FLW is the one who would be tracking the weight trajectory, as discussed below. As mentioned above for diet diversity, rationale contributes to motivation since it can place emphasis on the importance of practicing these behaviors.



## VI. Summary of Results

Table 1. Facilitators and Barriers

<b>Facilitators (indicator associated)</b>	<b>Barriers (indicator associated)</b>
Home visits (all indicators)	Transportation (all indicators) *addressed with ambulance service
Recalling messages that include anticipated barriers (diet diversity and IFA supplement)	Daily work schedule preventing (ANC checkup) *potentially addressed through home visit
Recalling rationale or benefits for why it is important follow recorded behaviors (all indicators)	Discomfort getting to ANC site (ANC checkup)
Having family support -encouragement and ability for them to bring outside items (diet diversity, IFA and calcium supplement intake)	Crowding and waiting time (ANC checkup)
Ambulance service to ANC site (ANC checkup)	Timing of reminders (ANC checkup)
Understanding of both quality and quantity of foods (diet diversity, weight gain/ weight gain monitoring)	Supplements not provided consistently and/or at the time of ANC checkup (IFA and calcium supplement intake)
	Side effects (IFA supplement intake)
	Explanation on how to gain weight (weight gain/ weight gain monitoring)
	Perception that attending ANC checkup is only to present a health issue (ANC checkup)
	Misconception that gaining weight is harmful (weight gain/ weight monitoring)
	Food insecurity (diet diversity)

\*indicates a facilitator that addresses barrier

## **Discussion**

This qualitative study explored the facilitators and barriers that contribute to the capability, opportunity, and motivation to perform key maternal nutrition behaviors, including: diet diversity, ANC checkups, weight gain and weight gain monitoring, iron folic acid supplement intake, and calcium supplement intake.

Results from the interviews illustrated that while certain aspects make it more favorable for pregnant women to following the advice surrounding the key behaviors, such as the ambulance service to counter transportation issues; home visits that allow for women to continue with daily responsibilities and receive information; and family members providing encouragement and logistical support. However, there are a number of inhibitors that stem from structural issues, such as food availability in markets, high cost of foods, and supplement shortages that slow the behavior change process.

Results demonstrate the importance of FLWs through this process, as they are essential to the pregnant women's capability, opportunity, and motivation of each key behavior. This is the first area where message quality and accuracy are integral to the success of the next step. Assessing the maternal nutrition group education given by midwives in an antenatal clinic in Uganda found that the messages delivered was comprehensive in topics covered, but lacking details when it came to explaining the specifics of nutritional consumption for pregnant women, weight gain, risky behaviors, and other essential points (Nankumbi et al., 2018). In addition, it was apparent that other components that support the delivery of these messages, such as the setting, cross-checking information with established guidelines, and access to resources that supplement the education, are necessary to improve the quality of education given to the

pregnant women (Nankumbi et al., 2018). However, if this step is successful and the pregnant women and family members received and remember the key pieces of information, but structural issues are present like lack of food access and/or availability, calcium supply shortage, limited access or transportation to ANC, etc. then this impacts the likelihood of the outcomes.

An ethnographic study conducted interviews and focus groups with individuals in the East Usambara Mountains, Tanzania to understand their thoughts around consuming a diverse diet (Powell et al., 2017). Unlike the findings above, the participants shared that despite financial background, everyone could consume a diverse diet (Powell et al., 2017). However, their findings similarly highlighted seasons when foods are available as an influence to whether or not people can consume certain foods (Powell et al., 2017). Additionally, they noted other factors such as household size, gender, agricultural components such as “agrobiodiversity” and “livelihood diversity” that were not considered in this study (Powell et al., 2017). One conclusion drawn from Powell’s study was that education promotion activity will be “easily integrated” due to the local individuals’ favorability towards diet diversity (Powell et al., 2017). However, this study’s findings are emphasizing that components that limit the key messages from being practiced are why there is a need to enhance these messages.

Another study, which was quantitative and involved 508 women in Southwestern Bangladesh looked at sociodemographic influences on the diet diversity (Shamim et al., 2016). Using diet recall within the last 24 hours, the researchers identified a few key determinants: household size, higher education, and having a husband who worked as a business man were all factors that were present for the women who were consuming a

diverse diet (Shamim et al., 2016). The study also found that the participants were less informed about eggs, dairy food items, and leafy vegetables, which contributed to them incorporating it into their diet less (Shamim et al., 2016). Lastly, the results revealed that eggs and dairy products were lower in those who were part of a lower socioeconomic status. The researchers concluded that even though the women reported having knowledge on the need to eat certain foods during pregnancy, it did not translate to their actual food consumption behavior (Shamim et al., 2016). The findings of the present study did not explore the pregnant women's consumption of each type of food, however, financial strain also emerged as a barrier to consuming the recommended foods.

For ANC checkup indicator, the present study found that daily tasks, transportation, and limited understanding of importance of going to ANC checkup without a health issue were notable barriers. In a qualitative study conducted in Pakistan to understand facilitators and barriers to accessing ANC checkup attendance, the analysis revealed that factors that influenced ANC checkup attendance included daily workload, accessibility issues, and the lack of significant health issues, which was similarly concluded in this study (Nisar et al., 2014). However, other barriers included their perception of the health care providers and the services given at the ANC site and hesitation from attending given no prior experience (Nisar et al., 2014). This was not concluded from our study, possibly due to the influence of social desirability to answer everything positively and correctly. Women also shared that they did not know about the number of ANC checkups that are recommended within the pregnancy period, which is congruent to the findings of this study (Nisar et al., 2014).

When looking at calcium supplement intake in Western Kenya, Martin et al.

considered the perspectives from pregnant women and ANC providers to see experiences related to calcium supplement dissemination intake (Martin et al., 2018). This approach is similar to the objective of the larger qualitative study that this data contributes to. Their findings revealed that the ANC providers cited a high workload as negative factor, but they were satisfied quality of training and supplemental materials used to educate them to counsel (Martin et al., 2018). From the pregnant women perspective, the ANC providers made them knowledgeable on the benefits of taking supplements and how to mitigate side effects, while also being the source for the supplements (Martin et al., 2018). The ANC providers shared the belief that is consistent with the findings of this study, which was that educating the women on the benefits of the supplement for themselves and their baby made it more likely that they would consume the pills (Martin et al., 2018). However, while calcium provision was limited in the present study's context, in this Kenya study, the knowledge that calcium was available made them more likely to go for their ANC visits, (Martin et al., 2018). This suggests that the link between each of the key behaviors can influence the occurrence of the other behaviors, as was demonstrated in the Kenya study. The pregnant women shared that their motivation also stemmed from the physical improvement in their wellbeing (like increased energy) as well as feeling satisfied that they took steps to improve their baby's health (Martin et al., 2018). The pregnant women shared their experiences with side effects, but many of them continued to take the pills, which is inconsistent with the data in this study, since side effects was a deterrent to supplement intake and mentioned in the context of IFA supplement intake (Martin et al., 2018).

A study conducted in Ethiopia also focused on health provider and pregnant

women's experiences related to IFA supplement consumption (Birhanu et al., 2018). This study confirmed that both the women and the health providers viewed home visits as a positive, however, the health providers cited high workload as their primary issues with the frequency of home visits (Birhanu et al., 2018). The women shared that they were not explicitly educated on the IFA side effects, but were provided advice on how to avoid them (Birhanu et al., 2018). Only half of the respondents were told that IFA supplement intake was beneficial for her and the child, but they wanted to understand more (Birhanu et al., 2018). Some women expressed concern and uncertainty surrounding the consumption of both IFA and calcium supplements at the same time, demonstrating that in the context of this study, there is a need for FLWs to be explicit about advice provided for each pill and to clarify any confusion that may exist (Birhanu et al., 2018). Family support was cited as a facilitator to taking pills, and the health providers encouraged women to involve their husband and family by asking them to keep them on track with consistent supplement consumption (Birhanu et al., 2018). This present study emphasizes the importance of motivational factors like family encouragement and providing comprehensive knowledge on benefits and side effects of taking IFA, but the Ethiopia study reveals the influence that IFA supplement advice can have on their views towards calcium supplement intake, and vice versa.

Overall, the findings of this study were in agreement with some of the literature that exists surrounding key maternal nutrition behaviors, but more analysis should be done to develop behavior change strategies that account for facilitators and barriers that exist around maternal nutrition practice.

### **Future Research**

This analysis showed that there are numerous barriers shared among households in the villages across the different blocks such as financial issues, food security components, inability to access the ANC checkups, and calcium supply. Further research is needed to understand the setting and contextual factors that are present and distinct within blocks.

In order to get a clearer picture of all factors that influence and underlie the adoption of behaviors, it is essential to combine insights from the pregnant woman, husband, mother-in-law, and/or other key actors who play a role in the process. Although knowledge is important to improve or correct maternal nutrition behaviors, it may not be sufficient unless underlying assumptions are addressed. Efforts should be made to consider the intricacies that exist within family roles (i.e. where they feel they contribute and how that is perceived by the pregnant woman) in order to inform how these family members can become more involved in the maternal nutrition outcomes. When looking at the household level to understand eating habits and the family dynamic in Nepal (Morrison et al., 2018), which shares many cultural norms India, it was evident that the mother-in-law had both a direct and indirect influence on the daughter-in-law's food consumption, such as food quantity, the types of foods they consumed, and the frequency in which they consumed food. In addition, consideration of individual factors such as the type of information the pregnant women receives, how she feels about the information presented to her, and her perceived and actual ability to act on the instructions given to her (Bianchi et al., 2016). Similar to Martin et al., looking at the FLW and pregnant woman perspective side by side can reveal inconsistencies that can clarify some of the barriers reported among the pregnant women (Martin et al., 2018). Considering a holistic

analysis has the potential to demonstrate the significance and the weight of the facilitators and barriers that emerged during the interviews with the pregnant women, and may inform how household unit focus on key behaviors affects the pregnant women's adherence.

In this study, some of the pregnant women responded that other family members, like the sister-in-law, provided an important support that was unique from the husband and mother-in-law, since she was often of the same age, and in some households, was also pregnant. Involving more family members can enhance the process for the pregnant women, and also shift the way in which support is provided within the household. Since husbands and mother-in-law are socially viewed as authoritative figures, having a peer equivalent can be effective in a different way.

Application of theory can also provide important insights when looking at the behavior change process (Aboud & Singla, 2012). Using a behavior change theory during programmatic development and analysis can allow for an in-depth understanding of the reasons behind decision-making, and the role of socio-contextual components during the behavior adoption period (Zongrone et al., 2018). Since this is exploring the program impact, it may be helpful to stay within the implementation science context. This study only applied a portion of the framework developed by Michie et al., but next steps could include understanding all the factors that are included in the behavior wheel such as policy level influence and the intervention functions (Michie et al., 2011).

### **Strengths and Limitations**

The larger qualitative study that this was a part of allowed for exploration on each program level, which is essential to understanding the program context at the district,



block, and household level. For this study, the application of the COM-B framework was helpful to note the subtleties of the contextual factors that surround each of these behaviors. The interviews also covered a variety of topics, which provided a bulk of information that paint a picture of what is happening at the household level. However, this also restricted the ability to ask multiple questions about one or two indicators in order to avoid participant fatigue. The nature of the questions regarding key messages from FLWs was dependent on the level of recall by each pregnant woman. In turn, the information provided may not be an accurate representation of the information provided during the visits and appointments. Additionally, when researchers asked questions about their interactions with the FLWs, and whether or not they were told or instructed to help them with the performance of key behaviors, many women were concerned about getting the FLWs in trouble, which may have limited the details they shared when responding to the questions about their interactions with them. Since the interviews were conducted in the pregnant women's household, the presence of family member within the household at the same time, particularly in-laws, also was a concern when talking about the role of their family members. Due to the number of interviews, the extent of generalizability is somewhat limited, but that does not undermine the importance of the research in contexts similar to this study.

### **Conclusion**

This qualitative study aimed to identify the facilitators and barriers that affect the practice of key maternal nutrition behaviors: diet diversity, ANC checkup attendance, weight gain monitoring, and IFA and calcium supplement intake. Facilitators that contribute to pregnant women performing the recommended behaviors included family

support, home visits, understanding of benefits and importance of these behaviors, and ambulance transportation to the ANC checkup. However, numerous barriers exist including performance of behaviors late in the pregnancy period, receiving or recalling incorrect information, inability to afford the recommended foods and medications, issues accessing food, unavailability of recommended foods, lack of dissemination of calcium, and lack of transportation to get to the ANC site.

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## **CHAPTER FIVE: Public Health Implications**

This qualitative study aimed to understand the facilitators and barriers that pregnant women face that affect their practice of diet diversity, ANC checkup attendance, weight gain and weight gain monitoring, and IFA and calcium supplement intake within the maternal nutrition program. Identifying these factors can influence the development and rollout of future maternal nutrition efforts to increase the likelihood of these behaviors being adopted throughout the pregnancy period, in order to improve health outcomes for the mother and the baby.

While the focus of the study is understanding the pregnant women's experience with the key behaviors, the findings emphasized the role of FLWs to provide the description and advice related to each behavior. If the pregnant women are first hearing the information from FLWs, it is important that the FLWs are able to tailor information with consideration of the barriers that women and family members face. For example, tailored advice may include specific foods to eat that are available in the village, at the market, or in the house will help encourage nutritious intake.

Each behavior contributes to the improvement of outcomes, but consistency of practice throughout the pregnancy period is necessary for an impact on health outcomes. For instance, attending one ANC checkup does not ensure that the mother and baby will remain healthy during pregnancy. Similarly, eating healthy and consuming supplements intermittently may only temporarily be beneficial to the pregnant women's health, but it is not enough to have lasting effects. Unless this is mentioned in tangent to the key messages, the behavior change impact is minimized. Key elements to behavior change include that pregnant women 1) have received complete and accurate information

surrounding the behavior and the impact on her and her baby's health (building her capability and motivation), and 2) that there are opportunities and means in place for the women to do so. For issues such as provision of supplements, food insecurity, and food and medication prices, the system is unable to support the need for consistency, but it is still important for them to understand this concept in relation to the aspects of behaviors they are able to accomplish. This strengthens the importance that messages reflect back to the benefits of doing these behaviors, i.e. rationale, so that FLWs are not sharing information related to the behaviors as separate pieces of information. Each behavior has an impact both individually and in combination with all the behaviors to optimize the health benefits. The time point during pregnancy at which women are receiving information, as well as the importance of doing certain behaviors throughout the pregnancy period, should also be included during discussions. Programs should ensure that these aspects are included with the behavioral messages at the time when FLW training is conducted.

Another factor that contributes to the behavioral outcomes is family support. In households where family members were invested in the pregnant woman's health, some barriers that were present in some households are addressed. Having at least one family member who provides encouragement to eat well and take medicines, and buys recommended food items and medications, can drive behavior change and contribute to a favorable environment for her to execute them. The community mobilization events that exist are very important for family members to get information on maternal nutrition behaviors, but also educating FLWs on how to adjust messages during home visits, where



the other family members may be present (since only some pregnant women shared that their family members go to the ANC checkup with them).

Ultimately, these findings contribute understanding the issues that can prevent any efforts to scale up these interventions to other parts of India. Rural parts of India, where there is an increased need for maternal nutrition impact to improve health outcomes, also introduce barriers like transportation, distance from the ANC site, and availability of food in the market, etc. and require that programs work to directly address those barriers. Understanding why there are limitations to the recall of the key messages is integral for the success of maternal nutrition programs. Since each state in India varies in context, it is important to implement a similar study in each region of India to see whether the same facilitators and barriers exist for pregnant women in different areas.

Efforts should be made to 1). Ensure accuracy of messages being provided to the FLWs, 2). Test the effectiveness of the way messages are delivered to the pregnant women, and accordingly improve FLW training and training materials, 3). Provide means for the pregnant women to have consistent reminders of the specifics related to key behaviors, 4). Ensure at least one family member present during ANC checkup or home visits so they can hear the messages in the context of pregnant woman's health, 5). Address transportation issues by making the ambulance van a component in villages where the health center is at a distance, and 6). Find ways of encouraging support systems to exist among pregnant women so that if they do not have family support, they have another group to turn to.

List of Abbreviations:

ANC: antenatal care

ASHA: Accredited social health activist

FLW: frontline worker

IFPRI: International Food Policy Research Institute

IFA: Iron folic acid

PW: Pregnant woman

CHC: Community health center

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## **Appendix A: Oral Consent Form**

### Introduction and Study Overview

Namaste. My name is [Name of Interviewer] and I am working with Emory University and IFPRI to understand the implementation of the maternal nutrition program in your community. We would like to speak with you about your experiences and understand the factors related to the delivery of maternal nutrition services in this area. We are also interested in how monitoring data is used in decision-making for the maternal nutrition program. The information provided by you is very important for us, as it will help to understand how maternal health and nutrition program is implemented in this area and can be improved. Our discussion will last approximately 45 minutes.

Your participation in this interview is completely voluntary, and you may refuse to answer any questions or decide to end the interview at any point. This will neither impact your ability to access the services nor influence the quality services you are utilizing. There are no consequences of any kind if you decide that you do not want to participate.

This study is not intended to benefit you directly, but we hope this research will benefit people in your community in the future. There are no costs for you to participate in the study and you will not receive any compensation for your participation.

Any information provided by you will remain entirely confidential and will only be shared with members of the research team. We will take care to ensure that your information is kept securely, and your name and identity will not be linked with your responses.

During the interview, I will be taking notes. I would also like to record this interview to make sure I do not miss any information you provide. The recording will be safely stored and no one outside the research team will have access to it. There will be no way to identify you through either the recording or interview.

Please keep in mind that there is no right or wrong answer in this discussion. We would simply like to understand your experiences and views and encourage you to speak without hesitation.

Do I have your permission to record this interview?

Do I have your consent to proceed to the interview questions?

### **Contact Information**

If you have questions about this study, your part in it, your right as a research participant, or if you have questions, concerns or complains about the research you may contact the following:

Melissa Young, PhD at +1-404-727-1529

Emory Institutional Review Board at 404-712-0720 or toll-free at 877-503-9797 or by email at [irb@emory.edu](mailto:irb@emory.edu).

Consent

Do you have any questions about anything I just said? Were there any parts that seemed unclear?

Do I have your consent to proceed to the interview questions?

Participant agrees to participate:            Yes            No

If Yes:

\_\_\_\_\_  
Signature of Person Conducting Informed Consent Discussion

\_\_\_\_\_ . \_\_\_\_\_  
Date            Time

\_\_\_\_\_  
Name of Person Conducting Informed Consent Discussion

## Appendix B: Pregnant Women In-depth Interview Guide

Age:	Did you register your current pregnancy?
Married (years):	How many children you have:
How far along in pregnancy?	Expected due date:

### Opening questions:

- How long have you been married?
- How far along in pregnancy are you?
- Who is in the household with you?
- What is your routine like every day?
- Are you planning on going to your mother's place for delivery?

### Pregnancy:

1. If you registered your pregnancy, when did that take place? Who did you register your pregnancy with?
2. How have your feelings about your health changed from the beginning of your pregnancy until now?
  - a. What do you think contributed to these changes?

### Antenatal Care (ANC) and FLW Interactions:

3. In your community, what are the ANC services available to you?
4. After you became pregnant, have you approached anyone to look at both your health and the health of your baby?
  - a. If so, who have you been going to for seeking care?
  - b. Where have you visited?
    - i. Gram Swasth Poshan Diwas (VHND), subcentre, PHC, CHC, district hospital, private hospital, private clinic, other?
  - c. What were you prescribed during your visit?
5. Can you describe your experience accessing ANC services?
  - a. How far along in your pregnancy were you when you first visited?
  - b. Who, if anyone, came with you to your first appointment?
  - c. What services and advice did you receive?
  - d. How often have you received ANC services?





14. What health advice did you receive from family and friends during your pregnancy?
  - a. Is their advice different from what you heard during ANC visits? In what ways is the advice different?

Reflection:

15. How have your dietary practices changed from before you were pregnant until now?
16. Can you tell me how your husband is involved with your care during your pregnancy?
17. How has your mother-in-law been involved with your care during pregnancy?
18. What role did friends and community members have on your nutritional practices?
19. What affects if and how often you follow the advice provided to you during your pregnancy?
  - a. What are some difficulties you have when trying to follow the nutritional advice you were given during your pregnancy?

Closing:

20. Is there anything that you are worried about with you or your child's health? What else would you like to know about your health and your child's health that was not discussed during your checkups?
21. Would you like to tell me anything else about your pregnancy, or any concerns you have overall?

We really appreciate you taking time to speak to us today!

## Appendix C: COM-B by Indicator

### Diet Diversity:

<b>Capability</b>	<b>Opportunity</b>	<b>Motivation</b>
Recall of comprehensive diet messages	Food availability in the house and in market	Family support
Recall of messages that account food availability and accessibility issues	Accessibility of food items (through family member)	Benefits mother and baby
Home visits (opportunity for information)	Affordability of food items	
	Market inaccessible (closed or far away)	

### ANC Checkup:

<b>Capability</b>	<b>Opportunity</b>	<b>Motivation</b>
PW rely on FLWs to let them know when to attend ANC checkup	Inability to access ANC site	Only checkup when they are experiencing health issue
FLW home visit indicates timing of visit during pregnancy period	Ambulance/ Van transportation provided by FLW	Commute discomfort (experience dizziness, nausea)
		Waiting time and crowding at ANC site
		Daily work schedule

### IFA Supplement Intake:

<b>Capability</b>	<b>Opportunity</b>	<b>Motivation</b>
Most PW were given IFA supplements and provided instructions	Access to pills	Some understanding of anemia and related issues
Recall of how to take pills, when to take it, ways to avoid side effects		Family support
		Benefits of IFA supplements for mother (during delivery) and baby
		Experiencing side effects

### Calcium Supplement Intake:



<b>Capability</b>	<b>Opportunity</b>	<b>Motivation</b>
Recall of directions of how to take pills and when to take it	Purchase from pharmacy/ medical store	Beneficial for baby's bone development
Few reported difference between calcium and IFA directions		Family support

Weight gain and Weight Monitoring:

<b>Capability</b>	<b>Opportunity</b>	<b>Motivation</b>
Awareness of need to gain weight, but no counseling provided	ANC checkup site	Myths/ misconception that weight gain is harmful
Some PW knew Kg weight gain needed during pregnancy		No indication that there is widespread understanding of importance to gain weight