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Analysis of risk factors of child anemia in Amhara region of Northern Ethiopia

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An abstract of a thesis is submitted to the Faculty of Rollins School of Public Health of Emory University in partial fulfillment of the requirements for the degree of

Master in Public Health
in Global Health
2017

Abstract

Analysis of risk factors of child anemia in Amhara region of Northern Ethiopia

By

Nina Negash Zeleke

Introduction: Anemia is an important risk factor for child health and development. Anemia can have a devastating impact on child cognitive development and impair healthy growth (Ngure et al., 2014; Stevens et al., 2013). There are intertwined factors that contribute to child anemia. These factors can be broadly categorized as biological, socioeconomic, and environmental. Environmental Enteropathy (EE) is a disorder caused by infection and inflammation in the small intestine. This condition affects the absorption of iron, which leads to iron-restricted red blood cell production, which in turn causes anemia (Ngure et al., 2014). There is limited evidence that connects environmental risk factors to childhood anemia via the EE route.

Objective: The overall objective of the study was to analyze the risk factors of anemia among children aged 6-36 months in three districts of the Amhara region of Ethiopia.

Method: The data analyzed for this study were generated from Nutrition at the Center Program's cross-sectional baseline survey, which was administered in February 2014. A total of 374 children, aged 6-36 months, and 395 mothers of childbearing years were included in the anemia testing. This study employed binary logistic regression analysis to examine the proposed relationship of the outcome variable and independent variables.

Results: About half of the children (48.7%) in the study area were anemic. The risk of EE negatively affects child's anemia status [Odds Ratio (OR)=0.839; 95% CI 0.687 to 1.026]. The likelihood of a child having anemia increases with the risk of EE, which means children living in a household with poor a) sanitation (i.e. poor toilet facility and child open defecation); b) water quality, and c) hygiene condition (i.e. poor maternal handwashing practices) are more likely to be anemic. Childhood anemia was significantly higher among children born from anemic mothers (70.3% versus 46.4%, $p<0.05$). That means mothers with anemia were over 4 times more likely to have an anemic child (OR=4.262; 95% CI 1.828 to 9.938). Children who received minimum dietary diversity (20%) were less likely to be anemic, compared to those who had a more homogeneous diet (OR=0.183; 95% CI 0.056 to 0.601).

Conclusion: The analytical results suggest that poor household WASH conditions lead to increased EE, which in turn contributes to childhood anemia. Access to improved household WASH conditions could potentially reduce a child's risk of (EE), which also reduces childhood anemia. WASH interventions should be integrated into efforts to reduce childhood anemia. Improving child dietary diversity, especially in area where bioavailability of iron is low, is an important component of childhood anemia reduction interventions. This also implies that multisector collaboration is vital to improving childhood anemia. Furthermore, interventions that focus on improving maternal anemia must be integrated into efforts that address childhood anemia, since maternal anemia is the strongest determinant of childhood anemia.

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Acknowledgment

I have received tremendous support and guidance from several people in the process of the thesis project development to complete the fulfillment of my academic program.

I would like to sincerely express my appreciation to the thesis project committee members, Dr. Khrist Roy, Dr. Noor Tirmizi, and Dr. Deborah McFarland, who have continuously supporting me starting from inception of the thesis project. They tirelessly provided technical guidance, reviewing, data analysis, and editing of process of the thesis project. It would have been hard to smoothly complete the thesis project without their paramount and valuable contributions.

Specifically, I would like to thank Dr. Deborah McFarland for her leadership of the thesis project committee as chairperson, continuous consultation and encouragement during my endeavor at Emory University

I would like to thank Yvette Higgins-Sparks who provided me program administrative support in the develop process of poster production and fellowship program.

I would like to thank CARE USA (CARE Ethiopia) for the opportunity of accessing me Ethiopia N@C program baseline data for the thesis project.

Finally, my gratitude goes to Foege fellowship program in supporting the funding to my program at Emory and Hiwote Solomon for editing the paper.

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Chapter I: Introduction

Context of Project:

Anemia is defined as hemoglobin concentration below the established cut off levels (for example, children 6-59 months of age the cut-off is 11g/dL) (WHO, 2004) in red blood cells or inadequate number of red blood cells or their low oxygen transferring ability to fulfill the normal functioning of human body (WHO, 2011). Anemia is an important risk factor for the health and development of children, and can impair healthy growth while having a devastating impact (Ngure et al., 2014; Stevens et al., 2013) . It can lead to infections, learning disabilities, increased risks of maternal and child morbidity and mortality, and, anemia affects social and economic development as a whole (WHO, 2004).

Globally, it is estimated that 2 billion people are anemic (WHO, 2016). Specifically, 40 percent of pregnant women and more than 40 percent of children (about 273 million children) under five in developing countries are anemic (WHO, 2016). Anemia is highest among children of under five years in sub – Saharan Africa (Stevens et al., 2013). In general, anemia is considered to be a widely distributed public health problem, with high levels of prevalence worldwide (WHO, 2004).

Starting from 1995, the global anemia among children of under-five has been reduced from 47 percent to 43 percent (Balarajan, Ramakrishnan, Ozaltin, Shankar, & Subramanian, 2011). It is estimated prevalence of anemia reduced from 0.2 to 0.3 percentage points annually between 1993 and 2013 (Branca, Mahy, & Mustafa, 2014). Because anemia shows slow rate of improvement the future trends of global anemia require additional interventions to accelerate reduction in prevalence of anemia.

Anemia is highly prevalent in Ethiopia, a country which is located in sub-Saharan Africa. According to Ethiopia Demographic and Health Survey (2011), 44% of Ethiopia children (under five) are anemic. The public health significance of child anemia in Ethiopia is severe according to WHO criteria (≥40%) (Bank, 2003; WHO, 2015). The prevalence of anemia in the country, specifically, among children age 6-59 months shows that 21% have mild anemia, 29% moderate anemia, and 3% severe anemia. The prevalence of anemia among women in reproductive age is about 17% (EDHS, 2011).

With the identification of childhood anemia as a major public health threat, CARE Ethiopia alongside government partners designed a five year (2013 to 2017) integrated nutrition program, Nutrition at the Center (N@C), to improve anemia in two districts of Amhara region of Ethiopia. The program's specific objectives include: improve infant, young child, maternal nutrition related behaviors, improve the use of maternal and child nutrition services, enhance household adoption of improved adoption water, sanitation and hygiene (WASH) practices, and strengthen access to nutritious food.

To set targets for the performance indicators of the nutrition at the center program, CARE Ethiopia carried out a baseline quantitative survey in the program's sites in February 2014. Two intervention districts and one control district, which are considered by the local government to be food insecure and have high rates of stunting and anemia, were selected for the survey. This study used the data generated by the survey to study and examine the determinant factors that affect child anemia in two districts in Amhara, Ethiopia.

There are intertwined factors that contribute to child anemia, which can be broadly categorized as biological, socioeconomic, and environmental. The cause of child anemia is deficiency of iron due to low iron absorption of intestine, low iron storage at birth (mother anemia),

repeated inflammation, blood loss, and inability of iron storing (Pasricha, Drakesmith, Black, Hipgrave, & Biggs, 2013). There are other basic determinants of child anemia such as socioeconomic status, which determine availability of foods or iron consumption (dietary diversity) and mothers' social status (Khan, Awan, & Misu, 2016). The environmental factors that determine child anemia include disease situations. For example, infectious and parasitic diseases contribute to 50% of anemia burden (Mason, Martorell, Saldanha, & Shrimpton, 2013). Other important contributing factors for high prevalence of anemia in some places are malaria, HIV/AIDS, hookworm infestation, schistosomiasis, and other infections such as tuberculosis (WHO, 2016).

There is some research and programmatic evidence that show the effects of socioeconomic status (such as income and maternal education) (Diouf et al., 2015) and a literature review highlights other factors such as WASH conditions that may affect early childhood development through anemia (Ngure et al., 2014). Environmental Enteropathy (EE), an intestinal disorder due to infections and inflammation, is another condition that may affect absorption of iron. It is theorized that EE imbalances iron by reducing iron absorption in the gut and directing iron from the circulation into storage places and it reduces plasma retinol, which is important to the production of red blood cells (erythropoiesis). Subsequently, this process leads to iron-restricted red blood cells production, that causes anemia (Ngure et al., 2014).

Problem Statement:

The global rate of improvement of anemia is very low despite many direct interventions to address child anemia. The slow improvement of anemia, indicates that current interventions are not addressing the determinants of anemia. The inter-connected factors of child anemia need to be

unpacked and explained to effectively design effective interventions to address the contributing risk factors of child anemia. Accordingly, the major determinants of child anemia such as household socioeconomic status, maternal education and anemia status, children's dietary diversity, household WASH and environmental enteropathy require more explanation.

In resource poor countries, there have been vertical interventions to address child anemia. However, due to the multi layered factors of child anemia, the determinant factors of child anemia suggest that integrating accelerated and holistic solutions are needed to reduce child anemia. The relative intensity of the risk factors of child anemia are not well explained. Knowing the relative strength of determinants of child anemia could help prioritize interventions in resource poor settings lead to identification of further research area that describes what determines child anemia.

Objectives:

The overall objective of this study is to analyze the determinants or risk factors of child anemia in two districts in Amhara, Ethiopia. The specific aims of the thesis project include: 1) to analyze the effects of number of pertinent social and biological variables pertinent to child anemia inclusive of and not limited to maternal literacy, maternal anemia and social capital; 2) to examine the effects of child dietary diversity and childhood diarrhea on anemia and; 3) to determine the effects of risk factors for environmental enteropathy on child anemia.

In order to enhance effectiveness in child anemia reduction, the respective interventions should consider the risk factors of child anemia. Implementing single-sector (vertical) interventions alone is insufficient to alleviate the problems of child anemia as it is affected by interconnected and several factors.

Child anemia will be the outcome variable to be considered and measured in this study. The determinants and risk factors will be maternal literacy, social capital, and anemia, child dietary diversity, water quality, and environmental enteropathy, each considered as an independent variable.

The study will use the data generated by the baseline survey of Nutrition at the Center Program of Ethiopia, which was collected in February 2014. The next chapter (chapter II) provides the literature review conducted and it includes the definition of terms such as child anemia, dietary diversity, and environmental enteropathy; it also identifies the hypotheses to test. Subsequently, chapter III entails descriptions of the sample, measures, models and methods of analysis employed in the study. Finally, chapter IV highlights the study results and chapter V includes the conclusion of the study, policy implications, limitations and future directions.

Chapter II: Literature Review

Anemia is the condition of low level of hemoglobin in blood which is diagnosed by low count of functioning red blood cells to deliver oxygen around the body. Children between 6-59 months of age are considered anemic when their hemoglobin concentration level is lower than 11.0 g/dL and non-anemic if the hemoglobin concertation is equal to or above 11.0g/dL (WHO, 2011). For the purposes of this study anemia is referred to and defined as "*iron deficiency*" anemia.

Worldwide, the most common method of determining the prevalence of anemia in a population is by measuring individuals' hemoglobin concentration levels using cyanmethemoglobin method in the laboratory and portable HemoCue systems. Measurement of hemoglobin concentration is a widely accepted indicator to classify severity of anemia (Table 2.1) (WHO, 2001).

Hemoglobin cut offs were first identified in 1968 and anemia defining criteria, which is mild, moderate and severe anemia, presented in table A, were first published in 1989. In the general population, for public health significance, *prevalence of anemia* has four categories. These are severe (40% or higher), moderate (20%-39.9%), mild (5%-19.9%), and normal (4.9% or lower) (WHO, 2011). Overall, if anemia is prevalent in more than 5% of the population, it will be considered as a significant public health problem, and if prevalence exceeds 40% of the population, it is considered a severe problem (WVI, 2012).

Table 2.1: Anemia cutoffs for women and children.

	Non pregnant women of reproductive age 15-49 years	Pregnant women	Children 6 months to 5 years
Non-anemic	≥12.0 g/dL	≥11.0 g/dL	≥11.0 g/dL
Mild anemia	10-11.9 g/dL	10-10.9 g/dL	10-10.9 g/dL
Moderate anemia	7-9.9 g/dL	7-9.9 g/dL	7-9.9 g/dL
Severe anemia	<7.0 g/dL	<7.0 g/dL	<7.0 g/dL

Source: *WHO/UNICEF/UNU. Iron deficiency anemia: assessment, prevention, and control. Geneva: World Health Organization; 2001. (WHO/NHD/01.3).*

In terms of the overall anemia global burden, an analysis of a pooled dataset from 996 surveys (161 countries) implies that the anemia problem is severe and significant affecting 27% of the world's population (1.93 billion people) in 2013 with 89% of the burden in developing countries. The prevalence of anemia in 1990 was 33.3% (1.83 billion people) (Kassebaum, 2016). Specifically, iron deficiency anemia affected 25% of the global population in 2011, which is about 1.6 billion people (Balarajan et al., 2011) with the greatest burden in low and middle income countries (UNCEF/WHO, 1999).

According to the Lancet (2013) Global Health update on trends in anemia reduction, the level of the global anemia problem is worsening while progress to alleviate the problem is slow. Some parts of Africa would take about 150 years to catch-up with the prevalence rate (15%) of high income regions (Mason et al., 2013).

A study on global (185 WHO member states) prevalence of anemia shows that the highest prevalence of anemia was in children (2011), 42.6% (95% CI: 37—47). In absolute number, there were 273.2 million anemic children in 2011, out of which 9.6 million had severe anemia. The study also indicates that severe anemia prevalence was highest in the Africa region[1] affecting 3.6% children (WHO, 2015). Recent analysis of childhood anemia also shows that the prevalence of anemia among children under five years of age is highest in sub-Saharan Africa (Siekmans, Receveur, & Haddad, 2014).

The prevalence of anemia is disproportionate between high and low income countries with estimated 9% and 43% prevalence respectively. Anemia has not only adverse health consequences but it also has negative effects on social and economic development. Every year, it is the cause for the loss of billions of dollars due to its economic effects on human capital (Balarajan et al., 2011; WHO, 2015).

Anemia Prevalence in Ethiopia

As of last year, 2016 more than half of the population of children between 6-59 months of age in Ethiopia are generally anemic (<11.0 g/dL). Anemia prevalence among children 6-59 months was 53.5% in 2005 and decreased to 44.2% in 2011 (EDHS, 2005, 2011). The recently

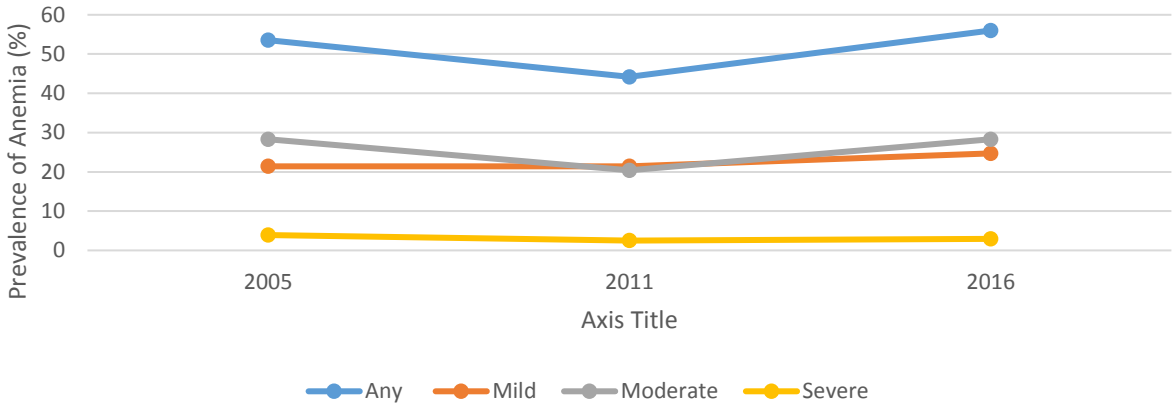
[1] Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe.

released EDHS 2016 report shows that the prevalence of anemia among children 6-59 months of age has actually increased to 56%. Overall, in the last decade, the prevalence of anemia in children between 6-59 months of age has not shown improvement, suggesting anemia is a significant public health problem in the country (WVI, 2012).

Further in Ethiopia, based on hemoglobin cut off categories, in 2005, mild (10-10.9 g/dL) anemia prevalence was 21.4% but has increased to 24.7% in 2016; moderate (7-7.9 g/dL) anemia prevalence hasn't shown any change, prevalence remaining at 28.3%, between 2005 and 2016 (EDHS, 2005, 2016). However, there has been a slight decline in severe anemia prevalence (less than 7.0 g/dL), which has decreased to 2.9% in 2016 from 3.9% in 2005 (EDHS, 2005, 2016). Trends of anemia prevalence in Ethiopia between 2005 and 2016 are shown in Figure 1.

Figure 1

Anemia Prevalence among Children Aged 6-59 Months, Ethiopia (2005 to 2016)



***Source**: EDHS 2005, EDHS 2011, and EDHS 2016*

Determinants of Child Anemia

Infants and younger children are at higher risk of anemia than older children (Habte et al., 2013; Kassebaum, 2016). Younger children with anemia usually are also at a higher risk of mortality, even milder anemia may lead to permanent cognitive damage, stunting and increased

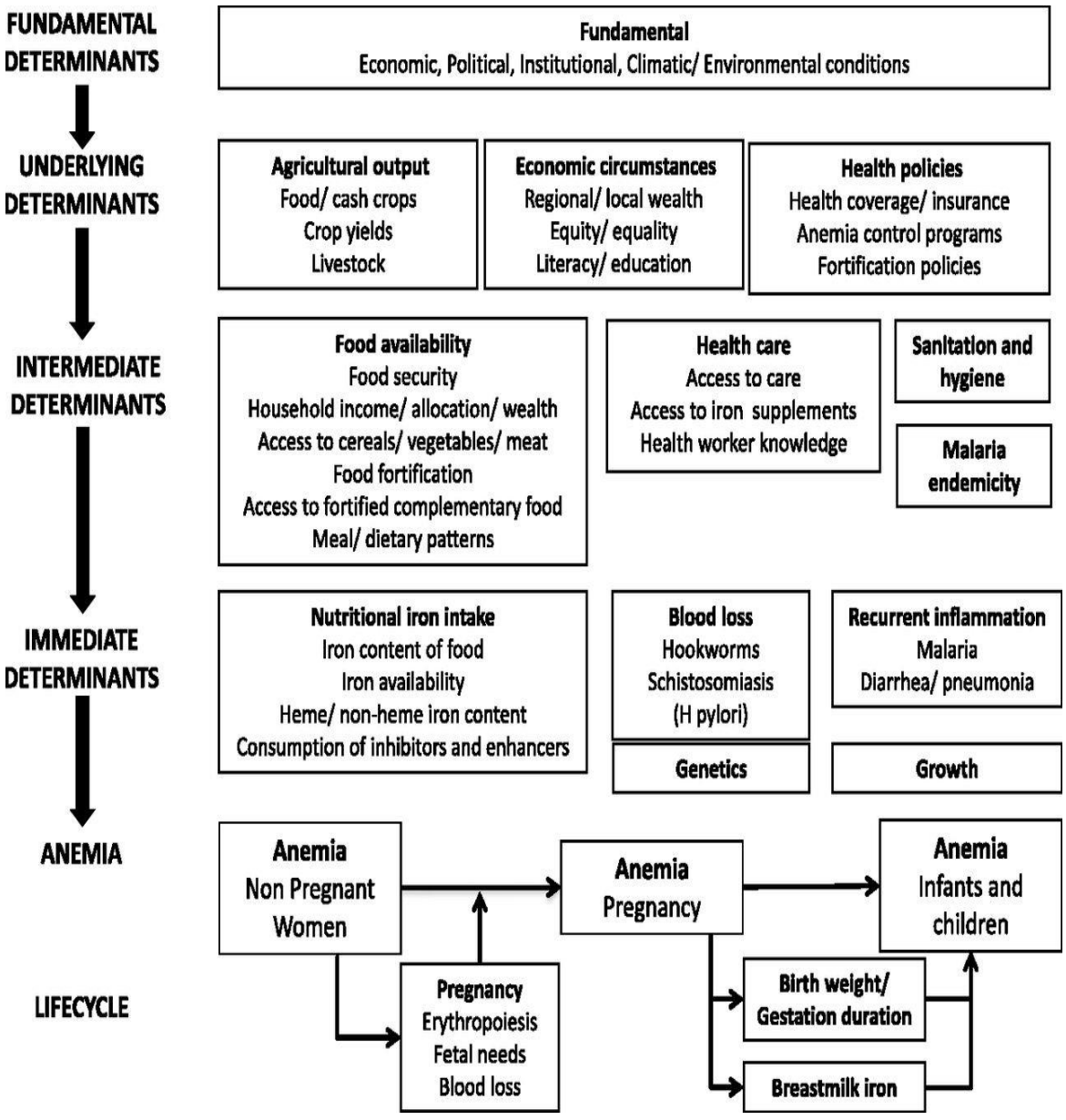
susceptibility to infectious disease (Brabin, Hakimi, & Pelletier, 2001). Iron deficiency anemia adversely affects cognitive and motor development and low productivity (WHO, 2015).

Though causes of anemia among young children may be multifactorial, iron deficiency is the *most common cause* in low and middle income countries which also contributes to over half of all anemia prevalence around the world (Kassebaum, 2016). Besides this, infectious diseases such as malaria, and deficiencies of micronutrients such as vitamin A, vitamin B12 are also contributing factors (Barugahara, 2013; Christofides, Schauer, & Zlotkin, 2005). Inherited or acquired disorders that affect hemoglobin synthesis, red blood cell production or red blood cells survival (e.g. hemoglobinopathies) could also potentially cause anemia (WHO, 2015).

Despite the primary cause of anemia - the deficiency of iron stores at birth and inadequate iron intake, there are also several other factors, that contribute to child anemia, such as socioeconomic and cultural aspects. Understanding and addressing these factors is important to help guide interventions and policies towards anemia reduction (Habte et al., 2013).

A conceptual framework proposed by Pasricha et al, 2013 (Figure 2) suggest that, the fundamental determinants of child anemia include economic, political, institutional, and environmental conditions. Underlying determinants include agricultural output, economic circumstances and health policies; intermediate determinants are identified as food availability which includes food security and meal patterns, health care and sanitation and hygiene; immediate determinants are nutrition iron intake, blood loss, and recurrent inflammation like malaria, diarrhea. These determinants interactively cause maternal and child anemia (Pasricha et al., 2013).

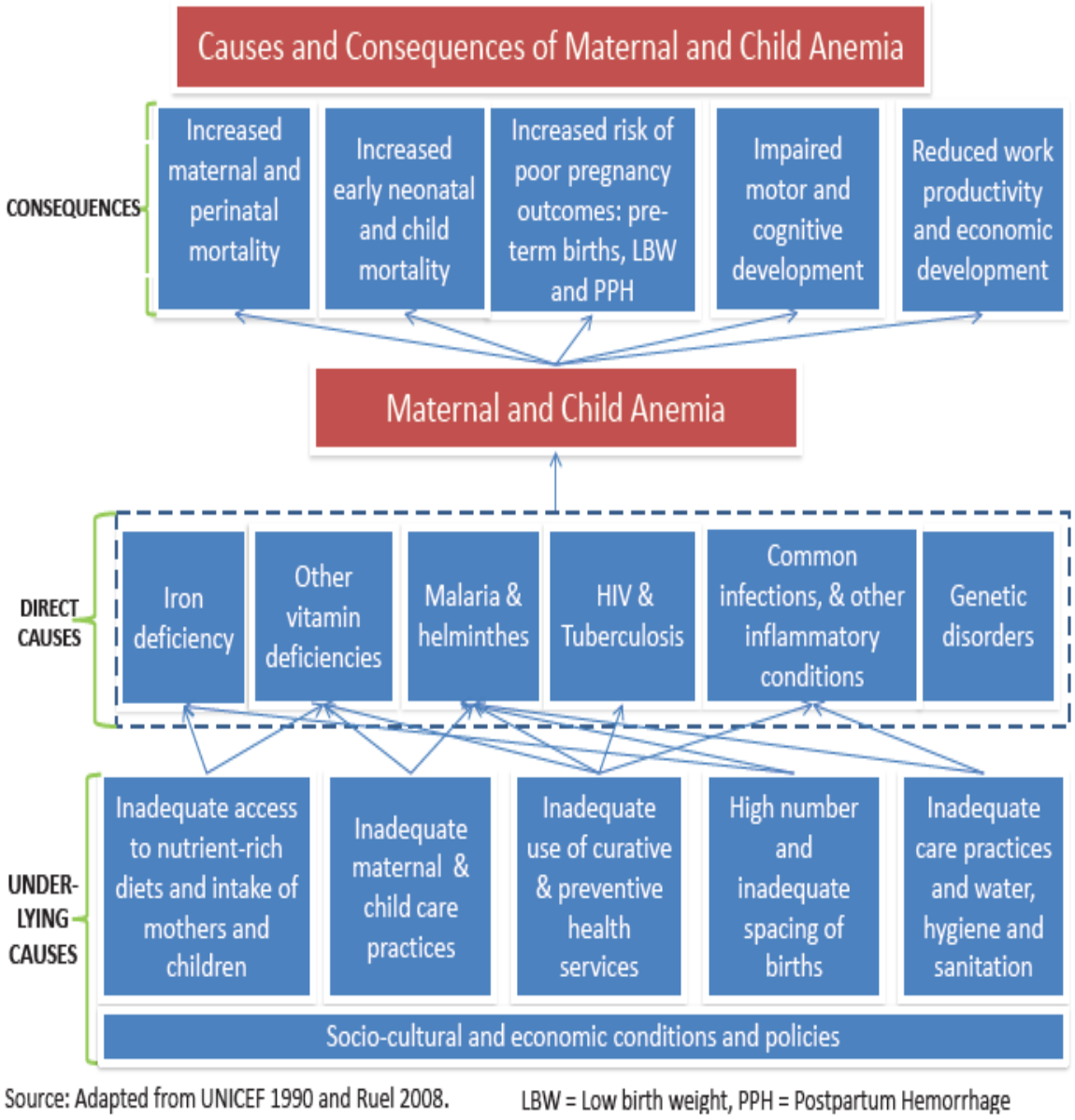
Figure 2: Conceptual Model of the Determinants of Maternal and Childhood Anemia



Adopted from (Pasricha et al., 2013)

The UNICEF 1990 and Ruel 2008 conceptual framework presented in Figure 3, provides a more focused maternal and childhood anemia causal pathway compared to Pasricha et al. 2103 shown in Figure 2. Nonetheless, both frameworks suggest somewhat similar causes and interaction among determinants of anemia.

Figure 3: Conceptual Framework of the Determinants of Maternal and Child Anemia



Immediate determinants of iron deficiency anemia also include iron absorption in the intestine and the ability to store iron. In addition, infectious disease such as worms and malaria cause chronic gastrointestinal blood loss that may lead to anemia (Pasricha et al., 2013). In young children, with the rapid expansion of red blood cells, children have very high dietary iron

requirement. The estimated requirement for iron for young children (6.9 mg) is *higher* than the need for an adult male (6.0 mg). Low dietary iron consumption and inhibition of iron absorption can lead to anemia in young children (Pasricha et al., 2013).

Poor sanitation and hygiene environment promote bacterial and parasitic infections thus increasing the risk of infectious diseases such as malaria. The resulting infection impairs iron absorption which furthers iron deficiency. In addition, maternal iron status directly affects iron stores in fetus and affects birth weight of children and the duration of gestation. Low birth weight infants are born with low iron stores and have higher iron requirement during growth (Pasricha et al., 2013). As a result, low birthweight infants are pre-disposed to the increased risk of iron deficiency anemia in the future (Pasricha et al., 2013).

Household Socioeconomic and Environmental Conditions and Child Anemia

A cross-sectional study in India among children aged 6-59 months (sample size 40885 in 2005 and 2006) showed that children from poor households with lower maternal education, whose mothers didn't intake iron supplements during pregnancy, and whose mothers were vegetarian were at increased risk of anemia.

A recent national study in Bangladesh that shows children aged 6-59 months from anemic mothers were at a higher risk of childhood and adult anemia was also significantly associated with household socio-economic status (Khan et al., 2016). Children from low income households were more anemic than children from high income households (Balarajan et al., 2011; Khan et al., 2016; Woldie, Kebede, & Tariku, 2015). The study also found significant difference in childhood anemia prevalence between children from households with improved water sources (51.1%) compared to children from households without improved sources of water (74.3%). However, the study also

implied that there was no significant difference in anemia between households with and without improved toilet facilities (Khan et al., 2016).

The prevalence of anemia was higher among children born from anemic and malnourished mothers (Balarajan et al., 2011; Khan et al., 2016) and maternal anemia was found to be strongly associated with child anemia (Balarajan et al., 2011). A study on anemia factors in northeast Ethiopia reveals that factors such as dietary diversity and introduction of complementary foods were also found to be associated with child anemia (Woldie et al., 2015).

A study among under five children in rural areas of Indonesia suggests that frequent episodes of diarrhea is a contributing factor. Further, those children who were considered as anemic are more likely from households with low maternal education (Ali & Zuberi, 2001; Howard, de Pee, Sari, Bloem, & Semba, 2007; Woldie et al., 2015). Most cited socioeconomic determinants of anemia in literature include household income, maternal education level, sanitation conditions, and diets (Goswmai & Das, 2015).

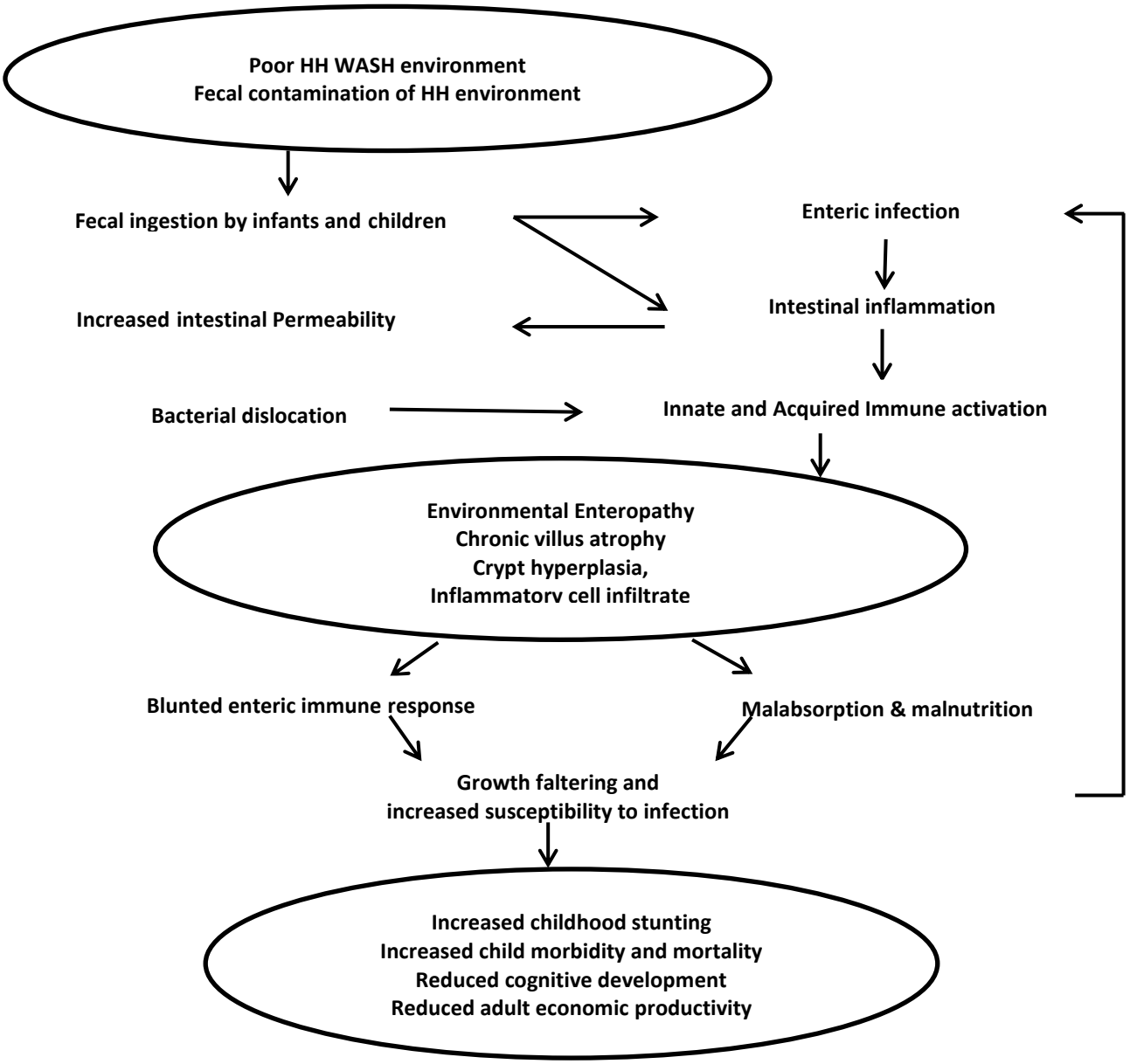
Environmental Enteropathy (EE) and Child Anemia

Household socioeconomic status and environmental conditions are the fundamental underlying causes of child anemia (Figure 4).

Environmental Enteropathy (EE), which is a sub-clinical condition that changes the morphology of the small intestine, thus affecting the absorption of nutrients including iron (Gabrilove, 2000; Ngure et al., 2014; Wayhs, 2004). The intestine helps maintain homeostasis of iron by controlling its absorption, any alteration of this intestinal function affects the absorption of iron (Gabrilove, 2000; Ngure et al., 2014; Wayhs, 2004). Consequently, EE limits the availability of iron for iron-restricted erythropoiesis, which is critical to regulating the maturation of red blood

cells. In addition, continued persistent inflammation caused by EE can reduce plasma retinol, which is essential to erythropoiesis (Figure 4) (Korpe & Petri, 2012).

Figure 4: Environmental Enteropathy Pathological Pathway Affecting Child Growth, Cognitive Development, and Adult Economic Productivity.



Adapted and modified from Poonum & William 2012; Peterson, et al, 2011

Source: (Korpe & Petri, 2012)

EE is another factor that causes decreased erythropoiesis resulting in anemia (Gabrilove, 2000; Ngure et al., 2014; Wayhs, 2004). In addition to absorbing nutrients, in a normal state, intestine acts as a line of defense against entry of pathogens, but epithelial damage caused by inflammation can lead to increased permeability of the surface area, *that* results in bacterial translocation that leads to bleeding (Syer & Wallace, 2014). Chronic bleeding may further lead to anemia by decreasing hemoglobin count.

With persistent inflammation of the gut from EE, the immune system becomes over-activated and produces high levels of pro-inflammatory cytokines, which increases the secretion of hepcidin hormone from hepatic system. Increased production of hormone hepcidin prevents absorption and utilization of iron leading to anemia (Syer & Wallace, 2014). Furthermore, cytokines may also affect bone marrow cells and negatively affect erythropoiesis (*a process critical to regulating the maturation of red blood cells*), which leads to anemia (Humphrey et al., 2015; Ngure et al., 2014).

Social Capital and Child Health

Social capital is defined as the norms of reciprocity, social networks, and values that facilitate co-operative action within community groups. Research shows that for mothers individual social networks of support have a positive effect on child nutritional status (De Silva & Harpham, 2007). Social network and co-operative actions may help mothers to gain more knowledge, think and do things differently. Therefore, maternal social capital may have positive effect on mother and child health.

Findings also suggest that households of lower socio-economic status tend to have higher levels of *bonding social capital*. These households are less likely to have higher *bridging or*

community group social capital, compared to mothers of higher socio-economic status who are more involved in the group activities. This finding has also been observed in other countries. Many hypotheses have been proposed to explain this difference, but a likely reason may be that the pressure to balance the need to meet ends and participate in community activities adds to the burden of productive and reproductive roles (De Silva & Harpham, 2007).

Key Study Hypotheses

The primary proposition of this study is that children living in households with poor environmental conditions including, lack of improved drinking water sources, poor handwashing practice of under-five mothers/caregivers, lack of improved toilet access (utilization), maternal anemia, literacy, maternal social support networks, age at marriage, child dietary intake, and diarrhea, are considered as fundamental factors that predispose a child to a higher anemia risk.

WASH parameters will affect childhood anemia through *direct and indirect* mechanisms. The direct effect of poor household WASH conditions expose children to enteric infections of bacteria and parasites, which might potentially impair iron absorption and lead to anemia. The indirect effect of poor household WASH conditions exposes children to environmental enteropathy (EE), which increases the risk of anemia, implying that environmental enteropathy also has *direct effect* on increasing the risk of childhood anemia.

Based on the literature reviewed, this study also suggests that children born from anemic mothers likely have low iron stores, and children with low dietary diversity, especially lacking animal source foods, are also at a higher risk of anemia. The study will specifically test the following hypotheses:

H_1: Poor household WASH environment leads to child anemia.

H_2: Higher environmental enteropathy risk increases the risk of child anemia.

H_3: Lack of child dietary diversity and maternal anemia increase the risk of affects child anemia.

H_4: Low bonding social capital & low maternal education increase the risk of affect child anemia.

Chapter III: Survey Methodology, Variables, Measurements, and Model

This thesis study uses the baseline survey data generated by nutrition at the center (N@C) program of Ethiopia in February 2014. Thus, the thesis project will employ the N@C program's baseline survey design elements such as survey methodology, sample size determination, and sampling techniques, and variable measures to test the proposed hypotheses for the purposes of this study.

N@C Program Overview:

Nutrition at the Center (N@C) is a five-year multi-sectoral project of CARE Ethiopia designed to improve the nutritional status of women (15-49) and children (less than 3 years of age) in *Ebenat* and *Simada* districts of Amhara Regional State of Federal Democratic Republic of Ethiopia. N@C was designed to improve the nutrition status of women and children by focusing on two health outcomes, namely, reduction of anemia and stunting among children under 3 years of age and reduction of anemia among women (15-49) years of age. N@C further aimed to improve nutrition related behaviors and utilization of maternal and child health and nutrition services, to increase household adaptation of appropriate hygienic and sanitation practices and to increase availability and equitability of access to nutrient-dense food to achieve the health outcomes.

N@C program conducted the baseline survey in February 2014 to examine the nutritional status of the impact groups (target populations), identify immediate and distal factors affecting

nutrition, and set up specific aims for the program outcomes and impact indicators. N@C applied a quasi-experimental evaluation design. with one control district (*Tach Gaynt*), from the same region (Amhara region) which has similar socioeconomic characteristics with the intervention districts, in the baseline survey.

Survey Sites

The baseline survey was conducted in three districts: two intervention (*Ebenat* and *Simada*) districts and one comparison (*Tach Gaynt*) district. All three districts are in South Gondar Zone, Amhara Regional State of Ethiopia (Figure 3.1). They are in the northern highland part of Ethiopia and are known to be chronically food insecure areas, which were targeted by the government social transfer from Productive Safety Net Program (PSNP) since 2005.

Intervention Districts Livelihood Characteristics

***Simada* District**: The district covers 2,281.72 square kilometer area. There are 40 *Kebeles* (a *Kebele* is the lowest government administrative unit in Ethiopia) in the district (39 rural and 1 urban). The total projected population of the district in 2014 is 258,963 among which 127,975 are male and 130,988 are female (CSA, 2013).

Figure 5 - N@C Program Intervention and Control Districts

Source: N@C Baseline Report (2014)

In the district, crop production, livestock and petty trade are the main sources of income and livelihood. Rural communities in the district mostly face food shortages for more than 6 months every year. The main stable food for household consumption is cereals followed by legumes. CARE qualitative survey implies that animal source foods are rarely consumed in the district (CARE, 2013).

Other development partners working in the district include: Organization for Rehabilitation and Development of Amhara (ORDA-a local NGO), and Food for the Hungry (FH) operating in areas of community health and nutrition.

***Ebenat* District**: The district covers 2,498.38 square kilometer area. The district has 36 *Kebeles* (35 rural and 1 urban). Total projected population of the district in 2014 is 250,452 among which 126,888 are male and 123,564 are female (CSA, 2013).

The major sources of livelihood in the district include crop production, livestock, and petty trade to generate livelihood income. The most staple food is cereals. Most communities in the district experience chronic food shortages.

Other development partners working in the district include: Concern, Organization for Rehabilitation and Development in Amhara (local NGO), Integrated Family Health Program (IFHP), and CHILD Health, operating in areas of community health, nutrition, and WASH.

***Tach Gayint* (*Control*) District:** The district covers 1, 025.39 square kilometer area. The district has 21 *Kebeles* (18 rural and 3 urban). The district's total population (projected) in 2014 is 116,876 (male 58,273 and female 58,603) (CSA, 2013).

The major sources of livelihood in the district include crop production, livestock, and petty trade to generate livelihood income. The most staple food is cereals. Most communities in the district experience chronic food shortage.

Other development partners working in the district include: Food for hungry (FH), International Medical Corps (IMC), Food and Agricultural Organization (FAO), UNICEF, Organization for Rehabilitation and Development in Amhara (local NGO).

Study Population

The study population is children aged 6-35 months and women of reproductive age (15-49) years in *Ebenat*, *Simada*, and *Tach Gayint* districts of Amhara region of Ethiopia. The measurement of the outcome of interest (i.e. hemoglobin concentration) was conducted for the sampled children meeting the age criteria. Furthermore, the measurement of hemoglobin concentration was conducted for each child biological mother.

Study Design

The study followed a plausibility quasi-experimental design. A quasi-experimental design requires counterfactuals but lacks random assignment of interventions to research participants. It also requires measurement of parameters (indicators) at baseline and endline to compare intervention and comparison groups at the end of the program.

Survey Methodology

The baseline survey used a cross-sectional study method. Primary data collection was conducted by administering a household questionnaire to each sampled household and by

measuring hemoglobin concentration of the selected child and his/her mother who met the inclusion criteria for the survey.

The survey study used the following eligibility criteria to include a mother and her child in the survey:

- A woman in the reproductive age group of (15-49) years;
- Has permanently lived in the study site for at least six months.
- Has a biological baby that lives with her and is between 6-36 months of age.

Sampling

The sampling strategy and sample size were determined by the CARE team. A two stage cluster sampling design was used. The primary sampling units (PSU) were *Kebeles* and the secondary sampling units (SSU) were the households within the selected *Kebeles* with eligible women and children.

Sampling Frame

The lists of Kebeles with population size were provided by the respective district officials. The lists were used as sampling frames. N@C program considered 44 *Kebeles* for intervention (22 from *Simada* and 22 from *Ebenat* districts) and 10 Kebeles from *Tach Gayint* district for comparison, which were determined by the district officials. There were 22 *Kebeles* from intervention districts (11 *Kebeles* from *Simada* district and 11 *Kebeles* from *Ebenat* district) and 10 *Kebeles* from comparison district (*Tach Gayint*) included in the baseline survey. *Kebeles* were

randomly selected using lottery method. After the selection of the PSU, a probability proportional to size (PPS) procedure was used in the selection of the SSU.

Sample Size Determination

Needed sample size of the secondary sampling units (households/individuals), was calculated for the outcome indicators using the following statistical formula,

$$n = \frac{D * (Z_{1-a} + Z_{1-b})^2 * [p_1 (1 - p_1) + p_2 (1 - p_2)]}{(p_2 - p_1)^2}$$

Where

n = required sample size

D = design effect (*de* = 1.2);

p_1 = estimated baseline prevalence rate of a condition

p_2 = planned target prevalence rate of a condition

Z_{1-a} = the z-score corresponding to the desired confidence level (typically, we set a = .05, thus

$Z_{0.95}$ = 1.645); and

Z_{1-b} = the z-score corresponding to the desired power level (typically, we set b = 0.80

In order to calculate the sample size for the determination of iron deficiency anemia, estimates of the prevalence of anemia in children and mothers were used as key indicators.

N@C program aimed to improve anemia in children from estimated baseline prevalence of 44% to the end line prevalence of 31% (13 percentage point reduction) among participating children (6-23) months of age. Thus, for sample size estimation with P_1 = 44%, P_2 = 31%,

significance level = 5%, power = 80% and the difference between baseline and end line = 13 percentage points and considering a design effect of 1.2, 206 children were required in each district to test the assumption. Thus, the total number of young children required for assessing anemia in the study area was 412. Likewise, nearly 314 women of reproductive age (15-49) years were sampled from both intervention and comparison districts to detect prevalence of anemia.

Table 3.1 - Sample Size Distribution for Anemia Testing by Intervention and Comparison Districts

Target	**Intervention (*Simada* and *Ebenat*)**	**Comparison (*Tach Gayint*)**	**Total**
Children	206	206	412
Mothers (non-pregnant)	157	157	314

Selection of Participants

The survey team used the method "*spin the bottle*" at the center of the Kebele to determine the starting point for the two enumeration teams. From the random starting point, two enumeration teams moved in opposite directions (one in the direction pointed by the *bottle head* and the other to the opposite of it). Each team started the survey from the first house in their respective direction. If there were no eligible participants in a selected house, the enumeration team moved on to the next house in the same direction. If there were more than one eligible child in a selected household, one eligible child was selected at random for anemia testing and related variables measurement.

Survey Instrument

The survey questionnaire was adapted from WHO recommended standard indicators for measuring infant and young child feeding indicators. The survey questionnaire was initially developed by the CARE team and refined after two rounds of field pretesting. The final survey questionnaire was jointly translated into the local language by CARE team and consulting firm (DADIMOS). The survey instrument on average took 1 hour and 30 minutes to complete (Annex A).

The baseline survey used hemocue[2] machines to measure hemoglobin level for both mothers and children. The measurement consistency and accuracy were checked in the field by the trained staff.

In total the baseline survey instrument included 19 modules listed in the table (Table 3.2) below. The anemia modules included a separate consent form in addition to the general survey consent form.

[2] A hemocue machine is small and portable electronic device used to measure hemoglobin concentration with small blood drop from finger prick recommended by WHO.

Table 3.2 - N@C Baseline Survey Modules

Module	Description
Module A	Household identification and summary on consents
Module B and C	Mother and child information (characteristics)
Module D	Household characteristics
Module E, F, G, I	Agriculture production, access to food, food preservation, extension, hunger scale
Module J, K, M, Q, S	Women's dietary diversity score, maternal health/pregnancy, responsive feeding, women empowerment, mother's anthropometry, mother anemia(hemoglobin)
Module L, N, Z	Infant and Young Child Feeding Practices (IYCF), childhood illness, child anthropometry, child anemia (hemoglobin)
Module O, P	Drinking water, handwashing, sanitation and disposal of child's feces
Module R	Community group and Government safety net participation

Survey Interviewers

The survey interviewers and field supervisors were recruited (selected) from the survey sites and closest towns. They were selected based on a pre-set of criteria including knowledge of the local language; prior experience in enumeration; and diploma level education at the minimum. There were 70 enumerators and 7 supervisors who participated in the survey data collection. Furthermore, 7 nurses were recruited to specifically conduct the anemia testing.

CARE in consultation with the local consulting firm developed training manuals for the survey. These survey manuals were used to train the survey team members. The training took place

in early February 2014. It took 10 days for enumerators and 4 days for anemia testers. The training included understanding sampling methods, interviewing techniques, how to request consent, mock interviewing (role play), maintaining confidentiality, pretesting the questionnaire, taking blood sample for anemia testing, how to use hemocue machine to measure hemoglobin concentration, and other logistical issues.

Data Collection

The consulting firm (DADIMOS) in consultation with CARE developed the data collection protocol and field manual used as guiding tools in the data collection process. Each data collection team was composed of 12 members (10 enumerators, 1 supervisor, and 1 nurse). The survey enumerators assigned a special code to eligible households of respondents (mothers) who *consented* for anemia testing and completed the survey. Following the completion of the survey, the *nurse* in each team completed anemia testing for the eligible child and her/his mother. To ensure confidentiality no identifying household information was collected and respondents were further verbally informed that their responses would remain anonymous. Once the completed questionnaires were received from supervisors, they were stored in a safe place (CARE's field office) before data entry.

Data Cleaning and Entry

The survey consulting firm (DADIMOS) in consultation with CARE developed a data entry template using CSPro5.1. Guided by the data entry protocol, the survey followed double data entry. Before the start of data entry, questionnaires were reviewed for completeness and errors and clarifications were sought from the field supervisors. Twelve data entry clerks were recruited and trained to conduct the double data entry. Data entry was conducted at CARE Ethiopia field office

(at *Debre Tabor*) close to the survey sites. Preliminary analysis further helped to check for sample size completeness at the *Kebele* level and helped correct any un-expected values.

Data Analysis

The local consulting firm completed the basic analysis and report using IBM SPSS Statistics Version 20 and WHO Anthro version 3.2.2. For the purposes of this study additional univariate, bivariate, and multi-variate statistical analyses were completed using statistical analysis software, IBM SPSS Version 20 and WHO Anthro version 3.2.2, which was used to compute anthropometric measures.

Statistical Model

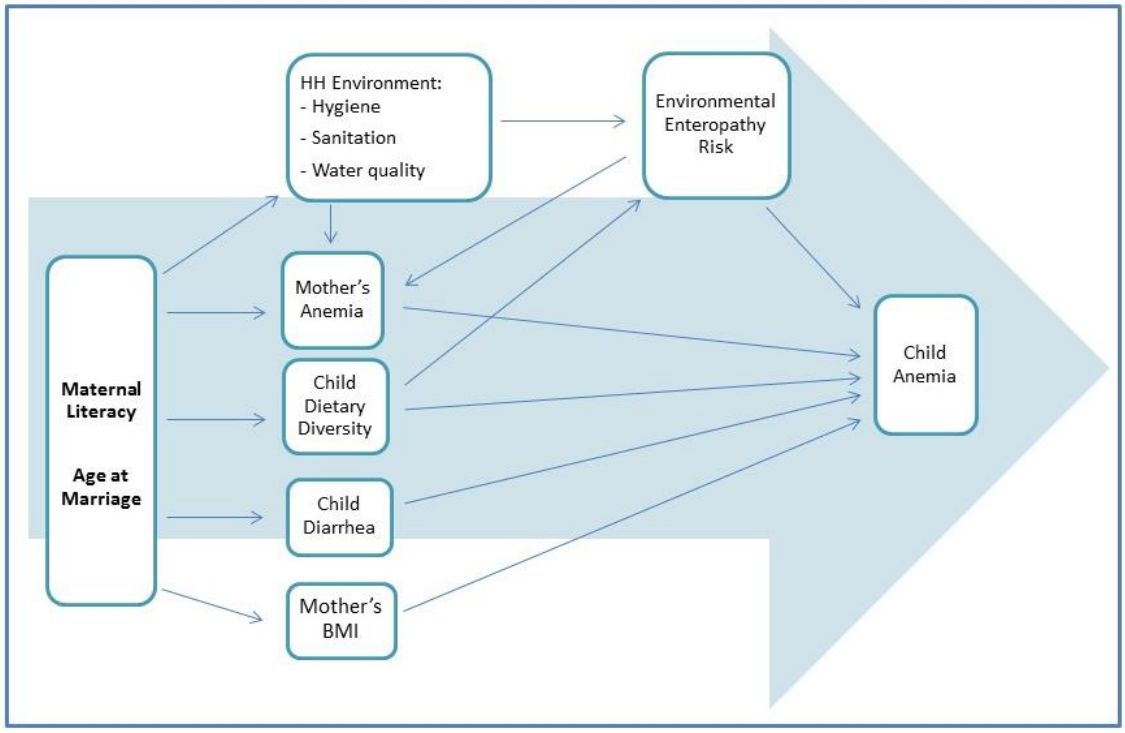
The statistical model framework for this study is shown in Figure 3.2 below. The statistical model was developed after conducting a thorough literature review and assessing the available baseline survey data. The statistical model framework theorizes relationships between the risk factors identified for the purposes of this study and the outcome childhood anemia.

As noted in chapter II, the primary proposition of this study is that children living in households with poor environmental conditions including, lack of improved drinking water sources, poor handwashing practices of mothers/caregivers, and lack of improved toilet facilities have higher risk of childhood anemia. Furthermore, maternal anemia, maternal nutrition status measured by body mass index (BMI), maternal literacy, maternal social support, maternal age at marriage, child dietary intake, and child diarrhea are considered as fundamental risk factors for the purpose of this study that pre-dispose a child to a higher anemia risk.

Specifically, poor environmental conditions will affect childhood anemia through *indirect* mechanism of environmental enteropathy. The direct effect of poor household WASH conditions

expose children to environmental enteropathy (EE), which increases the risk of anemia, implying that environmental enteropathy has a *direct effect* on increasing the risk of childhood anemia.

Figure 6 - Statistical Model: Proposed Theoretical Framework



This study employs binary logistic regression analysis to examine the proposed relationship of the outcome variable (dependent variable) and independent variables in the model. This will help to identify the effect strength and importance of the associated risk factors of childhood anemia. Binary logistic regression is used to assess the likely effect of the risk factors considered for this study on the dichotomous outcome variable (child anemia). Logistic regression uses maximum likelihood estimation (MLE) method to calculate the factor coefficients.

Study Variables and Measures

The baseline survey participants were biological mothers or primary care givers of the sampled children. In our study sample, almost all the respondents were the biological mothers.

Thus, mothers' practices in terms of hygiene, sanitation, child feeding, and age at marriage affects child health and development outcomes. The N@C program baseline survey 2014 provides data for the above theorized risk factors and the outcome.

Table 3.3: Maternal Education

3.3.1 Can you read this sentence to me? (*Enumerator: Show respondent card with sentence on it. "I like to go to the market." Circle response describing their reading ability)*
1= Cannot read at all
2= Able to read only parts of sentence
3= Able to read whole sentence
4= Not available in language (specify) _____
5= Blind/visually impaired

Survey respondents were categorized either illiterate or literate based on their response to their educational status (Table 3.3). Respondents who were able to read the whole sentence or parts of sentence (response 2 or 3) were considered as literate.

Table 3.4: Maternal Social Capital

Maternal Social Capital
3.4.1 You can rely on people in your community to help you if you have difficulty breastfeeding your baby
3.4.2 You can rely on people in your community to help you if you can't provide your child with enough healthy food
3.4.3 You can rely on people in your community to help take care of your children/household if you need to go to health facility/institution
3.4.4 You can rely on people in your community to help deal with a violent or difficult family member
3.4.5 You can rely on people in your community to help take care of your children/household if you need to go outside the home to work
Response Scale: 1= Strongly disagree, 2= Disagree, 3= Neither agree or disagree, 4= Agree, 5= Strongly agree

Mothers were asked to respond to a set of items reflecting certain conditions on a scale of 1-5 regarding the social support they can have from their community (Table 3.4). Responses (1-2) were combined and defined as those with no social capital; response 3 is defined as some social capital; and responses (4-5) were combined and defined as those with moderate to high social capital. A mean index with a range of (0-2) was then developed. Using the mean index score range, respondents with a score range of (0.0 - 0.5) were defined as with low social capital, respondents with a score range of (0.6 – 1.5) were defined as with some social capital and respondents with a score range of (1.6 – 2.0) are defined as with moderate to high social capital.

Table 3.5: Sanitation – Household Toilet Facility

3.5.1 What kind of toilet facility do members of your household usually use?
01= Flush/pour flush to piped sewer system
02= Flush/pour flush to septic tank
03= Flush/pour flush to pit latrine
04= Flush/pour flush to elsewhere
05= Flush/pour flush unknown place/not sure DK where
06= Ventilated improved pit latrine (VIP)
07= Pit latrine with slab
08= Pit latrine without slab/open pit
09= Composting toilet
10= Bucket
11= Hanging toilet/hanging latrine
12= No facilities/bush/field
13= Other (specify)_____

Respondents were asked to report the kind of toilet facility their household members usually use (Table 3.5). Categories (1-3, 6-7, and 9) are considered as improved toilet facilities. Categories (4-5, 8 and 10-13) are defined as not improved toilet facilities (WHO/UNICEF, 2015)

.

Table 3.6: Sanitation – Child Defecation

3.6.1 The last time (child name) passed stool, where did he/she defecate?
1= Used potty
2= Used washable diaper
3= Used disposable diaper
4= Went in his/her clothes
5= Went in the house
6= Went outside of house/yard
7= Used latrine
8= Don't know

Respondents were asked the last time the child passed stool and where the child defecated (Table 3.6). Categories (1-3 and 7) are considered as "does not openly defecate" whereas categories (4-6 and 8) are considered as "openly defecates."

For the purposes of study, respondents' hygiene was measured by handwashing practice at three critical times (after toilet use, before feeding a child, and after changing baby diaper/washing bottom). The respondents' hygiene practices influence exposure of children to pathogens, since respondents are assumed to be the primary caregivers of the children. Response category "*always*" is considered as the best practice and categories "*never*" or "*sometimes*" are considered as lack of hygiene. For the purposes of this study a dichotomous version was developed by combining the response "*never*" or "*sometimes*" for handwashing at three critical times (Table 3.7).

Table 3.7: Hygiene – Handwashing Practices and Presence of Soap and Water for Handwashing

Handwashing Practice
3.7.1 When do you usually wash your hands? (*Do not read responses. Allow respondent to answer first, and then ask how often by probing, with never, always or sometimes)*
a. before feeding the child
b. after toilet use
c. after changing the baby diaper/clean bottom
Response Scale: 1= Never; 2 = Always; 3 = Sometimes
Observation – Presence of Soap & Water for Handwashing
3.7.2 Is water present at the specific place for hand washing?
1= Yes (Water is available)
2= No (Water is not available)
3.7.3 Is soap or detergent present at the specific place for hand washing?
1 = Bar soap
2 = Detergent (powder/liquid/paste)
3 = Liquid soap (including shampoo)
4 = None

The measurement of respondents' handwashing practice was supported by direct observation of handwashing facility at a designated place with the presence of soap and water within 10 paces of toilet facility.

Questionnaires were completed through direct observation in the HHs regarding presence of water "yes" or "no" and soap (1-4) at a specific place to facilitate handwashing by mothers/primary caregivers (Table 3.7)

Table 3.8: Household Drinking Water Quality

3.8.1 What do you usually do to the water to make it safer to drink? (*Do not read, but circle all that apply*)
a. Boil water
b. Add bleach/chlorine
c. Strain it through a cloth
d. Use water filter (ceramic/sand/composite/etc),
e. Solar disinfection
f. Let it stand and settle
g. Use purifying tablets
h. Other (Specify) _____
i. Don't know

Respondents were asked to respond regarding their practice of treating drinking water for the household before consumption (Table 3.8). The drinking water quality is defined by the indicator "*if water is treated to make safe for drinking*". Using any method defined through categories (a-h) is considered as making water safe for household consumption (Table 3.8).

Table 3.9: Child Diarrhea

3.9.1 In the last two weeks, has the (Child Name) experienced three or more loose stools in a single day (within 24 hrs)
0 = No
1 = Yes

Child diarrhea is measured by whether the mother responded “Yes” to the question if the child has experienced more than three loose stools in a single day (Table 3.9)

Table 3.10: Child Dietary Diversity

3.10.1 Please tell me everything your child ate during the last 24 hours [*If respondent mentions mixed dishes (e.g. porridge, sauce or stew) Probe: What ingredients were in that mixed dish*?]
Food Group One
Grains (example: bread, rice, biscuits, or other foods made from millet, sorghum, maize, rice, wheat or grain, teff)
Roots and tubers (example: white potatoes, cassava or foods made from roots)
Food Group Two
Legumes and nuts/seeds (example: beans, peas, lentils, nuts, seeds or foods made from these)
Food Group Three
Dairy products (example: milk (animal milk, tinned or powdered milk), cheese, yogurt or skimmed milk or other milk products)
Food Group Four
Flesh foods (example: beef, pork, lamb (mutton), goat, wild game, chicken, or other birds, fresh or dried fish or shellfish, liver, kidney, heart or other organ meats)
Food Group Five
Eggs
Food Group Six
Vitamin-A rich fruits and vegetables [example: , fruits rich in vitamin A (e.g. ripe mangoes, papaya), pumpkin, carrots, sweet potatoes, squash and other locally available vitamin-A rich vegetables that are yellow or orange inside]
Food Group Seven
Other fruits and vegetables [example: other fruits including guava, pineapple, watermelon, melon, orange, apple, grape, banana, jackfruit or other local fruits, other vegetables (e.g. tomatoes, cabbage, kale)]

Response Scale: 0 = No; 1 = Yes; ; 08 = Don't Know

Note: "Consumption of any amount of food from each food group is sufficient to "count", i.e., there is no minimum quantity." (WHO, 2007)

Respondents were asked to recall everything they fed during the last 24 hours to the selected child (Table 3.10). Responses were recorded for each food group consumed. A summative index of dichotomized responses (0 or 1) to the seven food groups was then created. Children who reported to have consumed 4 or more food groups in any amount were considered to have met the minimum dietary diversity criteria. Food categories listed above were adapted from WHO guideline of indicators for assessing infant and young child feeding practices (WHO, 2007).

Table 3.11: Child Hemoglobin Concentration

3.11.1 Will you allow the child (child name) to participate in the anemia test?
1= Granted
2= Refused
3.11.2 Child's hemoglobin (finger prick sample)
Record reading: |__|__|.|__| g/dL
98.8= Don't Know/Machine Error

After mothers' consent to allow their children to participate in the anemia test (Table 3.11) the nurse pricked the finger to draw a blood drop to measure hemoglobin concentration using the hemocue machine and recorded the reading (Table 3.11). The children were then categorized as severely anemic if hemoglobin reading is < 7.0 g/dL, moderately anemic if hemoglobin reading is 7.0 - 9.9 g/dL, mildly anemic if the hemoglobin reading is 10.0 - 10.9 g/dL, and non-anemic if

hemoglobin reading is ≥11.0 g/dL (WHO, 2011). Based on these hemoglobin readings, a dichotomous version of child anemia measure (anemic and non-anemic) was used in the study.

Table 3.12: Mother's Anthropometry and Hemoglobin Concentration

Body Mass Index (BMI)
3.12.1 Mother's Height in Centimeters
Record reading: |__|__|__|.|__| cm
3.12.2 Mother's Weight in kilograms
Record reading: |__|__|__|.|__| kg
3.12.3 Do you agree to participate in the anemia test?
1= Granted
2= Refused
3.12.4 Mother's hemoglobin (finger prick sample)
Record reading: |__|__|.|__| g/dL
98.8= Don't Know/Machine Error

A mother is considered as underweight (an indicator of malnutrition) if the body mass index reading is less than 18.5 and considered of normal weight if it 18.5 or more (Table 3.12).

Mothers were also asked for their consent to participate in the anemia test (Table 3.12). After their consent, the nurse pricked the finger to draw a blood drop to measure hemoglobin concentration using the hemocue machine and recorded the readings (Table 3.12). According to WHO/UNICE cuts off for categorizing anemia status, mothers (non-pregnant) were categorized as severely anemic if hemoglobin is < 8.0 g/dL, moderately anemic if hemoglobin reading is 8.0 -

10.9 g/dL, mildly anemic if hemoglobin reading is 11-11.9 g/dL, and non-anemic if hemoglobin is ≥12.0 g/dL (WHO, 2011). Based on these hemoglobin readings, dichotomous version of maternal anemia (anemic and non-anemic) was used in the study.

Table 3.13: Mother's Age at Marriage

3.13.1 How old were you at the time of your first marriage?
Write age in years |__|__|
98 = Don't Know

Mothers were asked, how old she was at the time of her first marriage (Table 3.13). Age distribution was then categorized as 11-17 years old and 18 or more years for the purposes of this study.

Summary of Dichotomous Variables

For this study, based on the definitions in the tables above, the selected variables were further categorized into dichotomous variables for the analyses. The dichotomous variables will simplify the analysis of the proposed association of risk factors of childhood anemia and/or their relationship. The proposed theorized relationship of risk factors of childhood anemia will be examined using binary logistic regression. The summary of the dichotomous variables is shown in Table 3.14.

Table 3.14 Summary of Dichotomous Variables

Maternal education
0 = Literate
1 = Illiterate
Age at marriage (mother)
0 = 11-17
1 = 18 or >
Maternal social capital
0 = None/low
1 = Moderate/somehow/high
Child diarrhea
0 = No
1 = Yes
Child dietary diversity
0 = Lack minimum dietary diversity
1 = Have minimum dietary diversity
Body mass index (mother)
0 = Normal
1 = Underweight
Maternal anemia
0 = Non-anemic
1 = Anemic
Child anemia (*dependent variable*)
0 = Non-anemic
1 = Anemic

Source: N@C Ethiopia Baseline Survey, 2014

Children who are living in HHs with poor environmental conditions are at higher risk to develop EE. For the purposes of this study EE is defined as a sub-clinical disorder of the small intestine that pre-disposes a child to anemia risk.

Children living within an immediate contaminated environment are at a higher risk of exposure to parasites and fecal pathogens affecting their growth and increasing their anemia risk. This thesis suggests that children affected by EE are likely to be anemic.

Hygiene, sanitation, and water quality are elements of the immediate HH environment that the child experiences on a daily basis. For the purpose of this study, HH sanitation (measured by toilet type), HH hygiene (measured by handwashing at critical times, presence of soap and water at a designated place) and water quality (measured by use of any method to make the water safe for drinking) are considered as key components of EE risk (Table 3.15). For each measure, risk is defined by dichotomous category 1 (see Table 3.15). For the purposes of this study a summative index of the above noted measures is developed for use in the reported analyses.

Table 3.15: Measures of EE

Household toilet facility
0 = Improved toilet facility
1 = Unimproved toilet facility
Child defecation
0 = Child does not openly defecate
1 = Child openly defecate
Maternal handwashing practice
0 = Handwashing at 3 critical times
1 = No handwashing at 3 critical times
Household drinking water quality
0 = Treated to make water safe
1 = Did not treat to make water safe
Presence of soap for handwashing
0 = Yes
1 = No
Presence of water for handwashing
0 = Yes
1 = No

Chapter IV: Results

Descriptive statistics (frequencies) and cross tabulations were conducted to explore relative proportions of dependent and independent variables (Table 4.1). Binary logistic regression was used to assess the effect of the independent variables reflected in the model.

Descriptive Statistics:

Table 4.1: Basic Frequencies of Selected Independent and Dependent Model Variables of N@C Baseline Survey, February 2014.

Variable	N	Percent (%)
Child Anemia (*dependent variable*)		
Not Anemic	192	51.3
Anemic	182	48.7
Child's Dietary Diversity		
Lack Min Dietary Diversity	882	95.1
Have Min Dietary Diversity	45	4.9
Mother's Anemia		
Not Anemic	347	90.1
Anemic	38	9.9
Bass Mass Index (Mother)		
Underweight	264	29.1
Normal	644	70.9
Mother Literacy		
Illiterate	600	64.7
Literate	327	35.3
Make Water Safe		
Don't Use any method	701	75.6
Use more than 1 method	226	24.4
Diarrhea		
No	648	69.9
Yes	279	30.1

Variable	N	Percent (%)
Age At Marriage		
11-17	675	75.9
18 or >	214	24.1
Social Capital Index		
None/Low	206	22.2
Somewhat/Moderate/High	721	77.8

Sources: N@C Baseline Survey, 2014

The basic frequencies presented in Table 4.1 show that about half of the children (48.7%) in the study area are anemic. The prevalence of anemia among biological mothers of the children is about 10.0%. The body mass index (BMI) measure suggest that 29.1% of mothers in the survey site are underweight. In terms of educational status majority of the mothers, about 65% are illiterate.

Among the surveyed households, only 24.4% of the households use one or more methods of treatment to make the water safe for consumption and the rest 75.6% of the households do not use any method to make household drinking water safe.

Mothers' community social capital suggests that around 78% of mothers in the study area rely on their community support especially for their child care needs. Majority of mothers in the study area (76%) were married before the age of 18.

The prevalence of child dietary diversity is low in the study area. Only 5% of the children received minimum dietary diversity recommended by World Health Organization (WHO). In addition, about 30% of the children experienced diarrheal disease within the two weeks prior to the survey.

Bivariate Analysis:

Bivariate analysis between independent variables against the dependent variable results are presented below (Table 4.2).

Table 4.2: Bivariate Analysis Results of Selected Independent Variables Versus Dependent Variable of N@C Baseline Survey, February 2014

Variable	Measure	Child Anemia		Significance
		No	**Yes**	
Child's Dietary Diversity	Lack Min Dietary Diversity	176(49.7)	178(50.3)	
	Have Min Dietary Diversity	16(80.0)	4(20.0)	0.008*
Mother's Anemia	Not Anemic	178(53.6)	154(46.4)	
	Anemic	11(29.7)	26(70.3)	0.006*
Body Mass Index (Mother)	Underweight	56(54.4)	47(45.6)	
	Normal	135(51.1)	129(48.9)	0.578
Mother's Literacy	Illiterate	122(51.7)	114(48.3)	
	Literate	70(50.7)	68(49.3)	0.856
Diarrhea	No	129(50.2)	128(49.8)	
	Yes	63(53.8)	54(46.2)	0.512
Age At Marriage	11-17	133(51.2)	127(48.8)	
	18 or >	44(49.4)	45(50.6)	0.780
Social Capital Index	None/Low	45(56.3)	35(43.8)	
	Somewhat/Moderate/High	147(50.0)	147(50.0)	0.321

* significant at $p < 0.05$

The bivariate analysis results (Table 4.2) imply that child anemia is significantly higher among children born from anemic mothers ($p<0.05$). Children who received minimum dietary diversity (20%) are less likely to be anemic, compared to those who did not.

Multivariate Analysis:

Multivariate analysis indicates child's dietary diversity, mother's anemia, environmental enteropathy risk, and maternal social capital, likely may affect child anemia status.

Children are less likely to be anemic if they meet minimum dietary diversity requirement compared to those who lack dietary diversity (OR=0.183; 95% CI 0.056 to 0.601) (Table 4.3). Dietary diversity is an indicator of both dietary quality and micronutrient adequacy of the diet. In the study area, 95.1% of children do not meet the minimum dietary diversity, contributing to high prevalence (48.7%) of childhood anemia.

Mothers with anemia are more likely to have an anemic child (OR=4.262; 95% CI 1.828 to 9.938). If women go through the pregnancy without the required iron intake, it may adversely affect the child's health, especially when iron deficiency occurs during the first semester of pregnancy. Mother's anemia leads to lowered transfer of iron stores in child and these low stores may persist for more than one year; consequently, resulting in iron deficiency anemia (de Sa et al., 2015).

EE risk (OR=0.839; 95% CI 0.687 to 1.026) negatively affects child's anemia status (Table 4.3). The likelihood of a child having anemia increases as the EE risk increases, which means children living in a household with poor sanitation (poor toilet facility and child open defecation), water quality, and hygiene condition (poor maternal handwashing practices) are more likely to be anemic. Younger children exposed to infectious disease are more likely to be anemic (Khan et al., 2016).

EE is a subclinical condition that alters the small intestinal morphology and function caused by *constant contamination of small intestine villi among inhabitants* in poor sanitation conditions (Korpe & Petri, 2012). Small intestine is the key organ responsible for the homeostasis of iron by controlling its absorption in response to the iron changes in the body. The altered intestinal morphology affects iron absorption, resulting in child developing iron deficiency anemia.

Table 4.3: Multivariate Analysis – Logistic Regression Results on Effects of Dichotomous Independent Variables on Dependent Variable (Child Anemia), N@C Baseline Survey, February 2014

Variable	p-value	Exp (β)	95% CI
Child Dietary Diversity 0 = Lack Min Dietary Diversity 1= Have Min Dietary Diversity	0.005	0.183*	[0.056 0.601]
Mother's Anemia 0 = Not Anemic 1 = Anemic	0.001	4.262*	[1.828 9.938]
BMI (Mother) 0 = Normal 1 = Underweight	0.483	0.836	[0.508 1.377]
Mother's Literacy 0 = Illiterate 1 = Literate	0.642	0.893	[0.553 1.441]
Diarrhea 0 = No 1 = Yes	0.372	0.800	[0.491 1.304]
EE Risk	0.088	0.839**	[0.687 1.026]
Age At Marriage 0 = 11-17 1 = 18 or >	0.355	1.286	[0.755 2.192]
Social Capital 0 = None/Low			

Variable	p-value	Exp (β)	95% CI
1 = Somewhat/Moderate/High	0.056	1.740**	[0.986 3.070]

* significant at p < 0.05; ** significant at p < 0.1

In the study area, about 78% of the survey respondents (mothers) indicated they have sufficient social capital (bonding social capital) that if needed they can rely on their communities to get support for child care. This suggests that most children will probably be looked after by more than one caregiver, within their neighborhood. Majority of our target population is of lower or lower middle socioeconomic status, that in turn defines the quality of their social capital; which mostly reside with the people of same socio-economic status within the community.

Social capital despite its benefits can have negative consequences. Leaving children with neighbors may result in un-intentional negligence (*a negative social capital effect*) due to many children with multiple needs present at one place at the same time. In the absence of the primary care giver (mother of the child), needs such as meal portions, mealtime, meal frequency, hygiene, and sanitation needs may not be fulfilled adequately affecting child health due to inadequate micronutrient intake. Thus, higher social capital because of its un-intentional *negative effect* may affect child's health that may in turn affect child's anemia status (OR=1.740; 95% CI 0.986 3.070).

Chapter V: Discussion and Conclusion

This chapter presents analyses that support the theorized proposed pathways (Figure 3, page 19) of selected risk factors that pre-dispose a child to iron deficiency anemia. Maternal anemia affects child's anemia status analysis. There is a strong association between maternal and child anemia status. The risk of childhood anemia is significantly higher among children born to anemic mothers (OR=4.262 95% CI 1.828 to 9.938). A study by Pasricha et al (2013) also shows that mothers' iron status would determine the amount of iron stores among children. Children born to anemic mothers are at increased risk of iron deficiency anemia.

Both, the bivariate and multivariate analyses show that children who have not received minimum dietary diversity are at higher risk of childhood anemia. Furthermore, multivariate analyses support the theoretical proposition that inadequate access to nutrient-rich diets and intake is an underlying cause of childhood anemia (Woldie et al., 2015). The results show that children who have received minimum dietary diversity are relatively at reduced risk of childhood anemia (OR=0.183; 95% CI 0.056 to 0.601). Young children have very high dietary iron requirements due to rapid expansion of red blood cells. Only 5% of the children in the study sites received minimum dietary diversity recommended by WHO and thus are likely to have deficiency of iron. Low dietary diversity suggests that a large number of children likely have micronutrient deficiency - which is one of the main reasons of childhood anemia.

More than three quarters of the respondents reflected that they rely on their communities and neighborhoods if they need help. Although social support has benefits, the quality and type of social capital affect the expected benefits that may accrue as a result. Social capital literature also suggests that it can have negative effects as well (De Silva & Harpham, 2007). Majority of the respondents in our study area rely on neighbors especially for childcare needs. Social capital that

helps lend support that meet childcare needs also leads to negligence that affects a child's health as is suggested by the analyses (De Silva & Harpham, 2007). It seems that children of mothers who are more likely to rely on community for childcare needs are at increased risk of childhood anemia (OR=1.740; 95% CI 0.986 to 3.070). One possible explanation may be that children in the absence of primary care givers (mothers) may not get sufficient attention in terms of feeding and sanitation needs. Un-met feeding and sanitation needs may increase their risk of developing childhood anemia.

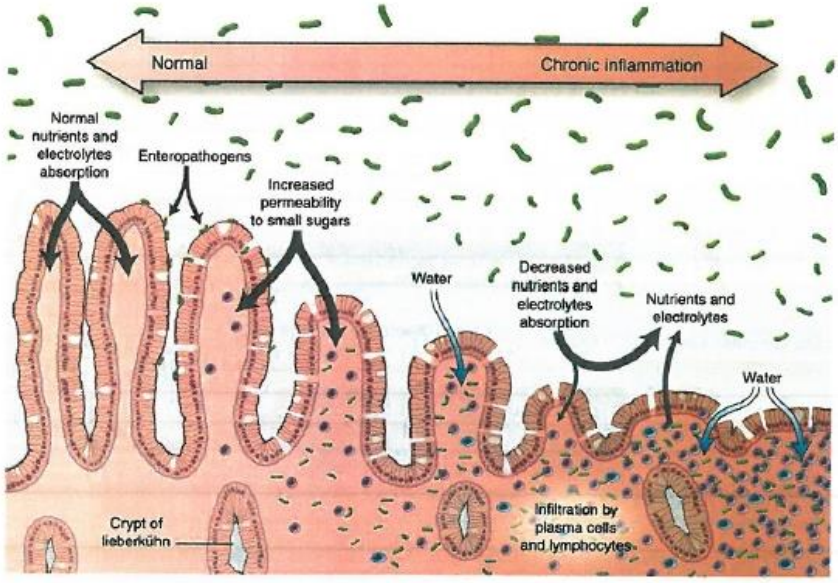
The prevalence of illiteracy in the study sites is about 65%. Bivariate and multivariate analyses results indicate that maternal literacy does not affect childhood anemia in the study population. However, other studies have shown that children from households of low maternal education are more likely to be anemic (Ali & Zuberi, 2001; Howard et al., 2007; Woldie et al., 2015). Similarly, age at marriage does not show any effect on childhood anemia. The high prevalence of illiteracy in the study sites and weak measurement of literacy, which was based on mothers' ability to ready a sentence, may not necessarily indicate significant difference in terms of education among the sampled mothers.

Mothers' nutritional status, measured by Body Mass Index (BMI), does show significant contribution to childhood anemia. The proportions of anemic children born to underweight and normal mothers are 46% and 49%, respectively. This finding is not aligned with some other research findings that imply that the prevalence of anemia is higher among children born to malnourished mothers (Balarajan et al., 2011; Khan et al., 2016). The finding from this study is not supported by the analyses presented here; likely because 71% of surveyed mothers are of normal weight in terms of BMI.

In the survey areas, the prevalence of diarrhea is 30%. The bivariate and multivariate analyses show that child diarrhea has no significant effect on childhood anemia. A study in rural areas of Indonesia did show that frequent episodes of diarrhea is a contributing factor for anemia (Howard et al., 2007). This study is cross sectional and the frequency of diarrheal episodes was not assessed, thus it may be difficult to compare with such finding.

EE is a consequence of poor household WASH environment that exposes children to enteric infections that impairs iron absorption. Analysis supports the hypothesis that poor household WASH conditions contribute to child anemia through EE. Results show that children at a lower risk of EE condition, are less likely to be anemic (OR=0.839; 95% CI 0.687 to 1.026). The finding is in line with the proposed theoretical pathway that poor household WASH conditions besides their direct effect also have a mediating effect on childhood anemia through EE, a sub-clinical condition that limits the availability of iron for absorption (see Fgure 7).

Figure 7. Difference Between Healthy (left) and EE Infected Intestine (right)



Source: (UNCEF, 2017)

Policy Implications/Recommendations:

The greatest burden of iron deficiency anemia lies in developing countries. Children aged 6-59 months is the most vulnerable population for anemia (WHO, 2015). There is a general agreement that there is a need to increase access to improved water and sanitation in rural tropical regions of Africa with poor sanitation facilities. The prevalence of anemia in low income countries remains high and needs attention (WHO, 2015).Ethiopia is one of low income countries with high prevalence of anemia, 56% (EDHS, 2016), that needs to address the high prevalence of anemia.

Analyses lend support to the fact that childhood anemia has multiple risk factors that need concerted efforts. The survey results also support that independent and vertical interventions may not necessarily address the problem of childhood anemia. Interventions designed to address child anemia, focus on improving child dietary diversity, may need to be integrated with horizontal interventions such as agricultural interventions that strive to increase access, quality and dietary diversity in general.

Evidence suggest that national level progress has been made in anemia reduction at a fast pace in some countries (Thailand and Vietnam) (Mason et al., 2013). This reduction is attributed more to the improved diet and reduction in infectious disease and direct iron supplementation (Mason et al., 2013). However, this approach has some challenges which include insufficient dose of iron supplementation, behaviors related to consistent use of supplements (WHO, 2015). On the contrary in case of Ethiopia despite efforts such as iron supplementation to children, there has been an increase in childhood anemia prevalence from 44.2% in 2011 (EDHS, 2005, 2011) to 56% in 2016 (EDHS 2016).

Fortification of staple foods and condiments ideally provide improved access to foods with iron. Since there are other factors that contribute to anemia, other than iron deficiency, there is a need for integrated approaches to address anemia prevalence (Mason et al., 2013; WHO, 2015).

The findings of this study show that maternal anemia is a significant contributor to childhood anemia. Hence, interventions that focus on improving maternal anemia must be integrated in the efforts that address childhood anemia, since maternal anemia is the highest factor in determining childhood anemia.

In general, the findings of this study support the notion that any intervention designed to reduce anemia should account for local conditions, especially etiology and prevalence of anemia and that these interventions should be integrated within the existing primary health care system and programs (Kassebaum, 2016).

Limitations:

- Some WASH related behaviors (e.g. handwashing practice) were measured based on respondents' self-report. Such reporting bias may mask the effect of risk of child's exposure to bacteria or parasitic infections.
- The measurement of social support was based on general questions and may not provide detail insights on quality and type of social support that respondents may have in their communities.

There is limited literature or research on the risk of EE on childhood anemia, which is one of the nutritional outcome and determinants of childhood growth. The findings of this study help us pose the following questions for further research:

a) What is the relative contribution of WASH components responsible for exposing children to EE risk?
b) Is there a differential in the effect of interventions aimed at anemia reduction where EE risks vary?

Findings of study may be interpreted with caution by taking into account the above limitations.

Conclusion:

Given the study limitations, the findings of this study support the key theoretical assertion that EE, mothers' anemia, child diet diversity are greater risk factors contributing to childhood anemia. Measurement of EE was based on households' WASH environment with the theoretical assumption that children, who are exposed to poor household environment, are at a greater EE risks. Study also suggests that there is a need for further research into assessing EE in a non or minimally invasive manner rather to rely on indirect measures such as poor HH WASH environment.

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Annex A: CARE Ethiopia N@C Baseline Household Survey Instrument

A. Household identification and summary

Household Identification

	AREA	CODE	RESPONSE
A1	Country	01=Benin 03=Bangladesh 02=Ethiopia 04=Zambia	|__|__|
A2	Region name: _____		CODE:|__|__|
A3	District name: _____		CODE:|__|__|
A4	Sub district name: _____		CODE:|__|__|
A5	Municipality name: _____		CODE:|__|__|
A6	Village name: _____		CODE:|__|__|
A7	Household number (1-XX)		|__|__|

Interview Information

A8	Date of interview	|__|__| dd	|__|__| mm	20|__|__| yy

		INITIALS	STAFF CODE OR DATE
A9	Name of interviewer (3 Initials & code)		|__|__|
A10	Field supervisor review (3 initials & code)		|__|__|
A11	Survey Completed	01 = Yes 02 = No	

FOR DATA ENTRY USE ONLY	INITIALS	CLERK CODE	DATE OF ENTRY/CHECK
First Data Entry Write data clerk 3 initials and date)			
Second Data Entry Write data clerk 3 initials and date)			
Supervisor Check Write supervisor check and date)			

SCREENING QUESTION AND CONSENT

CONSENT	Hello. My name is ___ and I work with LOCAL FIRM and a non-government organization. What is your name? Nice to meet you. Our team is in your village today and we would like to ask you questions from our survey. The information we collect will be used for planning, implementation and evaluation of a program. We are interviewing the mothers who have children less than 3 years of age. Do you have any children 3 years of age or less?	
	Child 1	☐ 0 to <6 ☐ 6 to <12 ☐ 12 to <18 ☐ 18 to <24 ☐ 24 to <36
	Child 2	☐ 0 to <6 ☐ 6 to <12 ☐ 12 to <18 ☐ 18 to <24 ☐ 24 to <36
	Child 3	☐ 0 to <6 ☐ 6 to <12 ☐ 12 to <18 ☐ 18 to <24 ☐ 24 to <36
	SELECTED CHILD AGE	☐ **0 to <6** ☐ **6 to <12** ☐ **12 to <18** ☐ **18 to <24** ☐ **24 to <36**

Record <u>time</u> the interview started in 24 hour format	HOUR	|__|__|
	MINUTES	|__|__|

CONSENT	You have been selected at random to participate in this survey. We will be working with the National Ministry of Health to improve your health and well-being of as well as the health and well-being of your child and household. To do so, we would like to ask you questions about your household, agricultural practices, the types of food you have, food diversity, gender and group participation. We would like to take height, weight and upper arm measurements from you; and length and weight measurement of any child less than -+three years of age. [IF ANEMIA TESTING: We will also test you and children less than three years of age for anemia, or low iron in the blood by taking a small sample of blood (prick from finger or heel) and will conduct the test immediately in front of you and share the results. I will describe this more in-depth later.] We will not record any personal information which will be able to identify you with your responses, and your answers will be kept confidential. Please know, your participation is completely voluntary and you may choose not to participate at any time and to stop the survey at any time. Do you have any questions for me?		
A16	Do you agree to participate in the survey? Enumerator: Is the respondent a mother of a child between the age of 0 and 36 months of age, AND does the respondent agree to participate in the survey?	01 = Yes 02 = No	If 02→ thank them for their time and END survey

B. Child Information

The information below is collected for the living child of the women being interviewed. This child should be less than three years of age: between 0 and 36 months of age.

NO.	QUESTIONS AND FILTERS	RESPONSE CODE		SKIP TO
	What is the name of your child? *Enumerator instruction: Identify the target child and write name*			
B1	Is (child's name) male or female?	01=Male 02=Female		
B2	Does (child's name) have a health passport/child card/immunization card? (& other language)	01= Yes 02=No		
B3	When is the child's birthdate (actual age of child)	Write birthdate 98 98 98 = don't know	|__|__| |__|__| 20|__|__| DD MM YY	
B4	How old is (child's name)? *NOTE: Write actual age of child (Refer to month conversion/seasonal or event calendar)*	Write age in <u>completed</u> months 00= Less than 30 days 98= Don't know	|__|__|	
B5	*Enumerator: VERIFY DO NOT READ* *How was (child's name) age verified?*	01=Yes, Health passport (or health card, other document) 02= Yes, Mother's recall 03 = Other document 04= N/A, Not verified, not applicable		
B7	What was (child's name) weight at birth	Write in kilograms 98.8 = Don't know	|__|__|.|__|	
B8	*Enumerator: VERIFY DO NOT READ* *Was (child's name) weight verified:*	01= Yes, Health passport 02= Yes, Mother's recall 03= N/A, Not verified, not applicable		

C.Mother's Information

INSTRUCTIONS: Ensure that this is administered to the mother of the target child identified (less than 36 months of age). If this mother was not the respondent to a previous module, re-introduce the survey and obtain verbal consent.

Read: I would like to start by asking you a couple questions about you and your children.

NO.	QUESTIONS AND FILTERS	RESPONSE CODE		SKIP TO
C0	What is your date of birth? *Respondent is not eligible if birthdate is before current date 1964 or after 1998*	Write birthdate 98 98 98 = don't know	|__|__| |__|__| 19|__|__| dd mm yy	If age <15 or >49 END SURVEY
C1	How old are you? *ENUMERATOR: Verify the age at last birthday. Verify with C0*	Write age in years	|__|__|	
C2	What is your current marital status?	01 = Married (monogamous) 02= Married (polygamous) 03= Divorced or separated 04= Widowed 05= Single (Never married) 06= Cohabitating with partner (monogamous) 07= Cohabitating with partner (polygamous)		If 05, 06 or 07 → C4
C3	How old were you at the time of your first marriage?	Write age in years	|__|__|	
C4	Who is the head of your household?	01 = Male-headed household 02 = Female-headed household 03 = Joint (male and female) headed household		
C5	What is your relationship to the head of the household?	01 = Self (Female headed) 02 = Spouse of HHH 03 = Sibling of HHH 04 = Child of HHH 05 = Parent of HHH 06 = Grandchild of HHH 07 = Grandparent of HHH 08 = Other		
C6	Have you ever received formal education (attend school)?	01= Yes 02= No		If 02→ C8
C7	What is the highest level of education that you have completed?	01= Some primary 02= Completed primary 03= Some secondary 04= Completed secondary 05 = Some higher education 06= Completed higher education 07 = Adult education 08= Vocational school 98 = Don't know		

NO.	QUESTIONS AND FILTERS	RESPONSE CODE		SKIP TO
C8	Can you read this sentence to me? *Enumerator: Show respondent card with sentence on it. "I like to go to the market."* *Circle response describing their reading ability*	01= Cannot read at all 02= Able to read only parts of sentence 03= Able to read whole sentence 04= Not available in language (specify) _____ 05= Blind/visually impaired		
C9	How many times have you been pregnant?	Write in response 98= Don't know	|__|__|	
C10	Are you currently pregnant?	01= Yes 02= No 08 = Don't know		
C11	How many living children do you have?	Write in response 98= Don't know	|__|__|	

D. Basic information of household characteristics

Read: Now I would like to ask you a few questions about your household and the type of things your household owns.

NO.	QUESTIONS AND FILTERS	RESPONSE CODE		SKIP TO
D1	How many people stay in this household? *How many people (all ages) share food from the same pot?*	Write number	|__|__|	
D2	Does your household own any agricultural land?	01 = Yes 02 = No		
D3	Do you own your house?	01 = Yes 02 = No		
D4	I'm going to ask you about farm animals. How many… does your household own? a. Cattle/cow b. Goat c. Sheep d. Chickens e. Pigs f. Horse g. Donkey h. Mule i. Other	Write number of animals 00= None 95= 95+ 98= Don't know	a. |__|__| b. |__|__| c. |__|__| d. |__|__| e. |__|__| f. |__|__| **g. |__|__|** **h. |__|__|** **i. |__|__|**	If all '00' →D6a
D5	At night, are there any farm animals kept inside the house where you sleep?	01= Yes 02= No		If 02→D6a
D6	Are any farm animals are kept inside the house at night when you sleep?	a. Cattle/cow b. Goat c. Sheep d. Chickens e. Pigs f. Horse g. Donkey h. Mule i. Other		
D6a	Do you keep any other animals inside the house at night where you sleep (including pets)?	01= Yes 02=No		

Instructions: If you are not inside the household; ask the mother to visit the house (and see the interior and exterior).

D7	Main material of the floor. *Enumerator: Observe and record one response*	01= Earth/Sand 02= Bamboo 03= Stone/Brick 04= Cement 05= Tile 06= Vinyl strip 07= Other (specify)_____	
D8	Main materialof the roof. *Enumerator: Observe and record one response*	01= Grass roof 02= Metal roof 03= Stone or tile roof 04= Plastic alone 05= Plastic plus grass 06= Asbestos 07= Other (specify)_____	
D9	Main material of the exterior walls. *Enumerator: Observe and record one response*	01= Earth/Sand/Mud/Clay 02= Bamboo, corn stalks 03= Stone/ Fired Brick 04= Cement 05= Tile 06= Vinyl strip 07= Mud brick or wattle 08= Other (specify)_____	
D11	Does your household have any mosquito nets that can be used while sleeping?	01= Yes 02=No	If 02→D15
D12	How many insecticide treated mosquito nets (ITN) does your household have?	Write number of ITN |__|__| 00 = None in household	
D13	Did you sleep under the mosquito net last night?	01=Yes 02= No	
D14	Did your [CHILD'S NAME]sleep under the mosquito net last night?	01=Yes 02= No	
D15	Where is cooking usually done?	01= In a room used for living or sleeping 02 = In a separate room in the same building used as a kitchen 03= In a separate building used as kitchen 04 = Outdoors 05= Other (specify): _____	
D16	Do you have electricity, solar power or generator in your home?	01 = Yes 02 = No	

D17	Does your household own any of the following: *Read all responses, circle all that apply*	a. Bicycle b. Radio c. Bed d. Mobile/other Telephone e. Television f. Refrigerator g. Cart pulled by animal h. Watch/Clock i. Sewing Machine j. Motorcycle k. Car/Truck l. Tractor m. small generator (for irrigation) n . Other (specify)_____	

E. Agriculture production, access to food

Read: This section asks about the household's production of food, access to land, and where you get the food you eat.

NO.	QUESTIONS AND FILTERS	RESPONSE CODES	SKIP TO
E1	What are the main sources of household food that you consume? Read all responses, circle all that apply	a. Produce food b. Purchase food c. Food for work d. Government food aid e. NGO food aid f. Trade/Borrowfood g. Charity h. Other (specify):_____	If "a" is<u>not</u>circled→ E3
E2	Who usually grows the food you produce for consumption? Read all answers, circle all that apply	a. Self (respondent) b. Husband c. Other female family members/clan d. Other male family members/clan e. Neighbors f. Farm collective g. Don't know h. Other (specify):_____	

READ: Now I am going to ask you a series of questions about the land your household lives on, uses for productive purposes -- that is leases or sharecrops, owns or rents out. I would like you consider not only the land your household uses now, but also the land your household may have used over the last six months. By piece of land, I mean one continuous piece, which is used predominantly for the same purposes and managed by the same person or group of people. I will first ask about the homestead, followed by any home/kitchen garden production.

E3	Do you have any plot (or plots) of land that you use to grow food for family or personal consumption?	01 = Yes 02 = No	If 02 → E13
E4	Who owns the plot of land?	01= You (Respondent) 02= Your husband 03= Both you and your husband 04= Other Male relative 05= Other Female relative 06= Land owner 07= Neighbor 08= Company 09= Other (specify):_____ 98= Don't know	If 01 or 03 → E6
E5	How did you get access to grow on the plot of land that you use to grow food for personal or family consumption? *Read all answers, circle ONE*	01= Rented in (cash) 02= Sharecropped in 03= Borrowed (no payment) 04= Other (specify)_____ 08= Don't know	
E6	Do/Did you have to obtain resources from someone (i.e., money, seeds, tools, animals) to grow food for personal or family consumption?	01= Yes 02= No	If 02 → E8
E7	Who provides you with the resources (i.e., money, seeds, tools, animals) to grow food for personal or family consumption? *Read all answers, circle all that apply*	a. You (Respondent) b. Your Husband c. Other Male relative d. Other Female relative e. Land owner f. Neighbor g. Private company h. Government program i. Non-government organization j. Religious organization k. Other (specify):_____	
E8	What types of food do you PRODUCE on this plot(s) of land *Read all answers, circle all that apply*	a. Grains: wheat, corn, oats, rice, sorghum millet b. Roots or tubers: White potatoes, manioc, cassava, sweet potato c. Pulses/legumes/nuts e.g. chicken peas, peas, beans, groundnuts etc d. Meat, poultry, fish e. Eggs f. Milk and milk products g. Vitamin A-rich plant foods (Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside, mangoes,	

		papayas, or other locally grown food that is rich in Vitamin A) h. Dark green, leafy vegetables i. Other fruits or vegetables j. Coffee, tea, k. Other (specify) _____	
E9	What are the main uses of foods you PRODUCE on this plot of land? *Read all answers, circle all that apply*	a. Personal/Family Consumption b. Sale c. Barter trade d. Other (specify): _____	
E10	Who usually decides which foods you PRODUCE on this plot of land?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other Family 07= Other (specify)_____	
E11	Which foods do you SELL from your plot of land? Read all answers, circle all that apply	a. Grains: wheat, corn, oats, rice, sorghum millet b. Roots or tubers: White potatoes, manioc, cassava, sweet potato c. Pulses/legumes/nuts e.g. chicken peas, peas, beans, groundnuts etc d. Meat, poultry, fish e. Eggs f. Milk and milk products g. Vitamin A-rich plant foods (Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside, mangoes, papayas, or other locally grown food that is rich in Vitamin A) h. Dark green, leafy vegetables i. Other fruits or vegetables j. Coffee, tea, k. None l. Other (specify): _____	If "k"→ E13
E12	Who usually decides which foods you SELL on this plot of land?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other Family 07= Other (specify) _____	

E13	Do you have a home/kitchen garden that you use to grow food for family or personal consumption?	01 = Yes 02 = No	If 02→E23
E14	Who owns the home/kitchen garden?	01= You (Respondent) 02= Husband 03= Both you and your husband 04= Other Male relative 05= Other Female relative 06= Land owner 07= Neighbor 08= Company 09= Other (specify): _____ 98 = Don't know	If 01 or 02 → E16
E15	How did you get access to the home/kitchen garden that you use to grow food for personal or family consumption? *Read all answers, circle ONE*	01= Rented in (cash) 02= Sharecropped in 03= Borrowed (no payment) 04= Other (specify)_____ 05= Don't know	
E16	Do/Did you have to obtain resources from someone (i.e., money, seeds, tools, animals) to grow food on your home/kitchen garden for personal or family consumption?	01= Yes 02= No	If 02 → E18
E17	Who provides you with the resources (i.e., money, seeds, tools, animals) to grow food on your home/kitchen garden for personal or family consumption? *Read all answers, circle all that apply*	a. You (Respondent) b. Husband c. Male relative d. Female relative e. Land owner f. Neighbor g. Private company h. Government program i. Non-government organization j. Religious organization k. Other (specify): _____	
E18	What types of food do you PRODUCE on this home/kitchen garden? *Read all answers, circle all that apply*	a. Grains: wheat, corn, oats, rice, sorghum millet b. Roots or tubers: White potatoes, manioc, cassava, sweet potato c. Pulses/legumes/nuts e.g. chicken peas, peas, beans, groundnuts etc d. Meat, poultry, fish e. Eggs f. Milk and milk products g. Vitamin A-rich plant foods (Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside, mangoes, papayas,	

		or other locally grown food that is rich in Vitamin A) h. Dark green, leafy vegetables i. Other fruits or vegetables j. Coffee, tea k. Other (specify) _____	
E19	What are the main uses of foods you PRODUCE on your <u>home/kitchen garden</u>? *Read all answers, circle all that apply*	a. Personal/Family Consumption b. Sale c. Barter trade d. Other (specify): _____	
E20	Who usually decides which foods you PRODUCE on this <u>home/kitchen garden</u>?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other Family 07= Other (specify) _____	
E21	Which foods do you SELL from your <u>home/kitchen garden</u>? *Read all answers, circle all that apply*	a. Grains: wheat, corn, oats, rice, sorghum millet b. Roots or tubers: White potatoes, manioc, cassava, sweet potato c. Pulses/legumes/nuts e.g. chicken peas, peas, beans, groundnuts etc d. Meat, poultry, fish e. Eggs f. Milk and milk products g. Vitamin A-rich plant foods (Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside, mangoes, papayas, or other locally grown food that is rich in Vitamin A) h. Dark green, leafy vegetables i. Other fruits or vegetables j. Coffee, tea, k. None l. Other (specify): _____	If circle "k"→ E23
E22	Who usually decides which foods you SELL from this <u>home/kitchen garden</u>?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other Family 07= Other (specify) _____	

E23	What types of food do you have to buy Read all answers, circle all that apply	a. Grains: wheat, corn, oats, rice, sorghum millet b. Roots or tubers: White potatoes, white yams, manioc, cassava, sweet potato c. Pulses/legumes/nuts e.g. chicken peas, peas, beans, groundnuts etc d. Meat, poultry, fish e. Eggs f. Milk and milk products g. Vitamin A-rich plant foods (Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside, mangoes, papayas, or other locally grown food that is rich in Vitamin A) h. Dark green, leafy vegetables i. Other fruits or vegetables j. Coffee, tea k. Cooking related items (sugar, oil, salt, flour) l. Snacks (sugar, junk foods) m. Other (specify): _____	

F. Food preservation and storage

NO.	QUESTIONS AND FILTERS	RESPONSE CODES	SKIP TO
F1	In the last 12 months, did the household preserve any fruits and vegetables for use later in the year?	01= Yes 02= No	If 02→ F5
F2	If yes, what methods of food preservation did you use Read all answers, circle all that apply	a. Solar drying b. Other drying c. Canning d. Salting e. Pickling f. Other (specify): _____	
F3	What varieties of fruits and vegetables did you preserve? Read all answers, circle all that apply	a. Pumpkin b. Citron c. Banana d. Kale e. Cabbage f. Lettuce g. Carrot h. Tomato i. Citrus j. Red pepper k. Sun flower l. Onion (red and white) m. Mango n. Papaya o. Lemon p. Orange **q.** Other (specify)----------	
F4	What amount (kilos) did you preserve of these varieties	Write response in kilograms 95.0 = 95 kilos or more 98.8 = Don't know |__|__|.|__|	
F5	During the last post-harvest period, did you store any crops that you grew?	01= Yes 02= No	If 02→Module G
F6	What variety of crops did you store? Read all answers, circle all that apply	a. Chicken pea b. Pea c. Teff d. Sorghum e. Flaxseed f. Maize g. Millet h. Wheat i. Barely j. Bean k. Haricot bean	

NO.	QUESTIONS AND FILTERS	RESPONSE CODES	SKIP TO
		l. Oats m. Lentil n. Grass pea o. Red pea p. Other (specify)----------	
F7	What was the main method(s) of storage that the household used for this crop over the last 12 months? Read all answers, circle all that apply	a. Improved locally made structure/granary b. Modern storage structure like cribs or silos c. Sealed/tight containers d. Improved cereal banks e. Improved community storing facilities f. Traditional storage g. Other (specify): _____	
F8	What is the purpose of the crop(s) being stored? Read all answers, circle all that apply	a. Food for household consumption b. To sell for higher price c. Seed for planting d. Other (specify): _____	

G. Agriculture Extension

NO.	QUESTIONS AND FILTERS	RESPONSE CODES	SKIP TO
G1	In the past 12 months, have you ever met, or been visited by an agricultural extension worker	01= Yes 02= No	
G2	In the past 12 months, have ever met, or been visited by a livestock/fisheries extension worker	01= Yes 02= No	

H. Coping Strategy Index [Omitted for Ethiopian Baseline]

I. Household Hunger Scale

NO.	QUESTION	RESPONSE CODES	SKIP TO
I1	In the past 4 weeks/30 days was there ever **no food** to eat of any kind in your house because of lack of resources to get food?	01 =Yes 02= No	If 02→I3
I2	How often did this happen in the past [4 weeks/30 days]?	01= Rarely (1-2 times) 02= Sometimes (3-10 times) 03= Often (more than 10 times)	
I3	In the past [4 weeks/30 days]did you or any household member (including children) go to sleep at night hungry because there **was not enough food**?	01 =Yes 02= No	If 02→I5
I4	How often did this happen in the past [4 weeks/30 days]?	01= Rarely (1-2 times) 02= Sometimes (3-10 times) 03= Often (more than 10 times)	
I5	In the past [4 weeks/30 days] did you or any household member (including children) go a whole day without eating anything at all because there **was not enough food**?	01 =Yes 02= No	If 02→Module J
I6	How often did this happen in the past [4 weeks/30 days]?	01= Rarely (1-2 times) 02= Sometimes (3-10 times) 03= Often (more than 10 times)	

J. Women's Diet Diversity Score

READ: Now I would like to know about the kind of food you consume during a normal/typical day.

NO.	QUESTIONS AND FILTERS	RESPONSE CODES		SKIP
J1	Was yesterday a special day of celebration or fasting? *Clarification special day includes: celebration, or feast day where you ate special foods or more food than normal. It also includes fasting day where you ate less than usual*	01 = Yes 02 = No		If 02→J3
J2	How many days ago was a "normal" day where special kinds of foods were not eaten, or no one in the household ate more or less than usual or did not eat because of fasting?	Write number of days	|__|__|	

READ:Please describe the foods (meals and snacks) and drinks that you took yesterday (or last "normal" day), both during the day and night, whether at home or outside the home. Let's begin with the first thing you took in the morning.

Enumerator instructions: When composite dishes (soup, stew) are mentioned, asked for the list of ingredients. When the respondent has finished, probe for meals and snacks not mentioned.

NO.	FOOD GROUP	EXAMPLES	RESPONSE CODES Yes	No
J3	a. CEREALS	Corn/maize, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, noodles, porridge or other grain products…) (Injera (flat bread), wet (liquid food prepared from flour of chicken pea, pea and bean), Kolo (roasted cereals), bread,	1	2
	b. VITAMIN A RICH VEGETABLES AND TUBERS	Pumpkin, carrot, squash or sweet potatoes that are orange inside. (e.g. kale, cabbage, sweet pepper)	1	2
	c. WHITE ROOTS AND TUBERS	White potatoes, white cassava, other foods made from roots (e.g. other options)	1	2
	d. DARK GREEN LEAFY VEGETABLES	Dark green/leafy vegetables including wild ones + locally available vitamin A rich leaves such as cassava leaves, local cabbage, kale, spinach	1	2
	e. OTHER VEGETABLES	Other vegetables (e.g. tomato, onion), including wild vegetables	1	2
	f. VITAMIN A RICH FRUITS	Ripe mangoes, apricots (fresh or dried), ripe papaya, dried peaches, other locally available vitamin A rich fruits	1	2
	g. OTHER FRUITS	Other fruits, including wild fruits	1	2
	h. ORGAN MEAT	Liver, kidney, heart or other organ meats or blood-based foods	1	2
	i. FLESH MEATS	Beef, pork, lamb, goat, wild game, chicken, or other birds	1	2
	j. EGGS	Chicken, duck, guinea fowl or any other egg	1	2
	k. FISH	Fresh, dried fish, shellfish or small, dried fish	1	2
	l. LEGUMES, NUTS AND SEEDS	Beans, peas, chicken peas, lentils, nuts, seeds or foods made from these	1	2
	m. MILK AND MILK PRODUCTS	Milk, cheese, yogurt, skimmed milk or other milk products	1	2
	n. OILS AND FATS	Oil, fats or butter added to food or used for cooking	1	2

NO.	FOOD GROUP	EXAMPLES	RESPONSE CODES Yes	No
	o. OTHEROILS	Foods made from palm oil	1	2
	p. OTHER	Specially fortified foods (e.g. Corn soya blend (CSB) foods fortified with micronutrient powder, plumpy'nut, other Ready-to-Use Therapeutic Foods or lipid-based nutrient supplement?	1	2
	~~q. OTHER~~	[Edible insects omitted for Ethiopia]	1	2
	r. OTHER SPICES, CONDIMENTS	Spices (black pepper, salt), condiments (soy sauce, hot sauce), fish powder	1	2
	s. OTHER SWEETS	Sugar, honey, sweetened soda, sweetened juice or sugary foods such as chocolates, candies, cookies, pastries and cakes (including biscuits)	1	2
	t. OTHER SALTY READY-MADE SNACKS	High fat, salty, pre-packaged foods, typically eaten between meals as convenience	1	2
	u. OTHER BEVERAGES	Coffee, tea, alcohol beverages, areke (local alcohol), local beer (Tela or Korefe)or any other local examples	1	2
	v. OTHER (Write in)		1	2

K. Maternal health/pregnancy

Read: Now, I have several questions about your last (most recent) pregnancy.

NO.	QUESTIONS AND FILTERS	RESPONSE CODES	SKIP TO
K1	During your last pregnancy, did you attend antenatal care (ANC) or pre-baby care?	01= Yes 02= No	If 02→K5
K2	How many times did you attend ANC?	01= One time 02= Two times 03= Three times 04= Four times (or more) 08= Don't know, don't remember	
K3	Whom did you see for ANC service?	01= Health personnel doctor 02= Nurse/midwife 03= Auxiliary midwife 04= Other person traditional birth attendant 05= Community/Village health Worker 06= Other (specify)_____	
K4	Where did you receive ANC?	01= Your home 02= Other home 03= At government hospital 04= At government health center 05= At government health post 06= Other government sectors (specify) 07= At private hospital/clinic 08= Other private medical sector (specify) -- 09= Other (specify)_____	

NO.	QUESTIONS AND FILTERS	RESPONSE CODES	SKIP TO
K5	During your last pregnancy, did you take any intermittent preventive treatment (IPT) or any medicine to prevent malaria? (list the local brand name, show example)	01= Yes 02= No 08 = Don't know/remember	
K6	During your last pregnancy, did you take any iron tablets?(list the local brand name, show example of iron tablet)	01= Yes 02= No 08= Don't Know	If 02→K8
K7	During your last pregnancy, how long did you take iron tablets?(describe local name, show example of iron tablet)	01= Less than 30 Days 02= 30 to 59 Days 03= 60 to 89 04= 90 Days or more 08= Don't know	
K8	During your last pregnancy, where did you deliver your child?	01= At home 02= At government hospital 03= At government health center 04= At government health post 05= At private hospital/clinic 06= At parent's home 07= Other (specify) _____	
K9	During your last pregnancy, who assisted you in the delivery of your child?	01= Traditional Birth Attendant 02= Skilled Birth Attendant 03= Traditional Doctor 04= Traditional Healer 05= Midwife 06= Medical Nurse 07= Medical Doctor 08=Family Member 09= Other (specify) _____	
K10	After your last delivery, did you attend post-natal care (PNC)(after baby care)?	01= Yes 02= No	If 02→ Module L
K11	How many days after your last delivery did you attend PNC care?	Write number of days |__|__| 98= Don't know	
K12	Where do/did you attend PNC care?	01= At home 02= At government hospital 03= At government health center 04= At government health post 05= At private hospital/clinic 06= Traditional Birth Attendant 07= Local Doctor 08= Other (specify) _____	

L. Infant and Young Child Feeding Practices (IYCF)

Instructions and verification: Copy the child's name. Verify the date of birth from Module B.		
NO.	**QUESTIONS AND FILTERS**	**RESPONSE CODES**
	Copy the name of child from Module B	
L2	Age of child in months (copy from B4)	|__|__|

Read: I would like to ask you some questions about how you have been feeding CHILD'S NAME from birth until now.

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE		SKIP TO
L3	Did you ever breastfeed CHILD'S NAME?	01= Yes 02= No			If 02→L5
L4	How soon after birth did you first put (CHILD'S NAME) to your breast?	01= Immediately 02= In less than one hour 03= One hour to less than 24 hours 04= One day (24 hours or more) 08= Don't know			
L5	After CHILD'S NAME was born, what did you do with your first milk (colostrum)?	01= Gave it to your child 02= Threw it away 08= Don't know			
L6	In the first 3 days after birth, did you give (CHILD'S NAME) anything in addition to breast milk?	01= Yes 02= No			If 02→L8
L7	What else did you give CHILD'S NAME in the first 3 days after birth? DO NOT read all answers, circle all that apply		One time	More than one time	
		a. Animal milk	1	2	
		b. Plain water	1	2	
		c. Sugar or glucose water	1	2	
		d. Gripe water	1	2	
		e. Sugar-salt-water solution (ORS)	1	2	
		f. Fruit juice	1	2	
		g. Infant formula	1	2	
		h. Tea/infusions	1	2	
		i. Coffee	1	2	
		j. Honey	1	2	
		k. Herbal infusion	1	2	
		l. butter	1	2	
		m. local beer (tela)	1	2	
		n. Other (specify):_____	1	2	
L8	Are you currently breastfeeding CHILD'S NAME?	01= Yes 02= No 08= Don't Know			If 02→L10

L9	Yesterday, did you breastfeed CHILD'S NAME during the day and night?	01= Yes 02= No 08= Don't Know	

L10. Read: I would like to ask you about liquids that CHILD'S NAME may have had yesterday during the day and at night.

NO.	QUESTION	CODING CATEGORY	RESPONSE	SKIP TO
L10	During the last 24 hours (day or at night), did (CHILD'S NAME) receive any of the following? *Ask about every liquid. If the mother responds 'yes' circle circle '1'. If the child did not take the item, circle '2'.For questions b, c or g; if the mother says 'yes' write number of times the infant was given the liquid in the last 24 hours*	Yes No	If 01=Yes, write number of times 98= Don't know	
	a. Plain water	1 2		
	b. Infant formula (NIDO, S26, NAN (WRITE LOCAL BRAND NAME)*(if yes, write number of times)*	1 2	|__|__|	
	c. Cow's/goat's/sheep's milk, tinned, or powdered milk , fresh milk, ultra high temperature (UHT)(WRITE LOCAL BRAND NAME – like mama, family)	1 2	|__|__|	
	d. Fruit juice or juice drinks	1 2		
	e. Broth (chicken soup, vegetable soup bean soup etc)	1 2		
	f. Other water-based liquids (e.g. Soft drinks like Pepsi, Coca Cola, Sprite, Fanta)	1 2		
	g. Sour milk or yogurt or skimmed milk, curd	1 2	|__|__|	
	h. Thin porridge (cannot pick with hands)	1 2		
	i. Tea or coffee	1 2		
	j. Vitamin syrup, cough syrup, other medicines	1 2		
	k. Oral Rehydration Salt	1 2		
	l. Any other liquid (write liquid below)	1 2		

L11: Read: Now I would like to ask you about any **foods**CHILD'S NAME had yesterday (24 hours). I am interested in whether your child had the item even if it was combined with other foods, any snacks whether at home or outside the home. Please begin when (CHILD NAME) first woke up yesterday. Did (CHILD NAME) eat anything at that time?

Interviewer instructions: This is free recall from the first food item. Please underline the food name that has been consumed, and tally after the mother has finished listing the food. If there are columns with no underlines check question L12

a. Think about when (CHILD NAME) first woke up yesterday. Did (CHILD NAME) eat anything at that time?
   - If yes: Please tell me everything (CHILD NAME) ate at that time. Underline each food group*Probe:* anything else? Until respondent says nothing else
   - If no: continue to Question b).

b. What did (CHILD NAME)do after that? Did (CHILD NAME) eat anything at that time?

- If yes: Please tell me everything (CHILD NAME) ate at that time. Probe: Anything else? Until respondent says nothing else.
- Repeat Question b) above until respondent says the child went to sleep until the next day
- If respondent mentions mixed dishes (e.g. porridge, sauce or stew) Probe: What ingredients were in that (Mixed dish)? Probe: anything else? until respondent says nothing else.

As the respondent recalls foods, underline the corresponding food and write "1" in the column next to the food group. If the food is not listed in any of the food groups below, write the food in the box labeled 'other foods'. If foods are used in small amounts for seasoning or as a condiment, include them under the condiments food group.

When the mother has completed recalling what the child ate yesterday, review the food groups listed below. If there is a food group with no food underlined, say to the mother: 'I know you have told me everything that [NAME] ate yesterday, but just to be certain we haven't missed anything, I'd like to read you a list of foods. Please tell me if [NAME] had any of the foods I'll mention …'.

L11	Food Group	Example	Yes	No	DK
	a. CEREALS (GRAINS)	bread, rice, biscuits, or other foods made from millet, sorghum, maize, wheat or grain (Injera (flat bread), wet (liquid food prepared from flour of chicken pea, pea and bean), *Kolo* (roasted cereals),	1	2	8
.	b. VITAMIN A RICH VEG &TUBERS	pumpkin, carrots, sweet potatoes, squash and other locally available vitamin-A rich vegetables that are yellow or orange inside	1	2	8
	c. WHITE TUBERS & ROOTS	White potatoes, cassava or foods made from roots	1	2	8
	d. DARK GREEN LEAFYVEG	dark green/leafy vegetables locally available vitamin-A rich leaves, for example pumpkin leaves	1	2	8
	e. OTHER VEGETABLES	other vegetables (e.g. tomatoes, cabbage, kale)	1	2	8
	f. VITAMIN A RICH FRUITS	fruits rich in vitamin A (e.g. ripe mangoes, papaya)	1	2	8
	g. OTHER FRUITS	other fruits including guava, pineapple, watermelon, melon, orange, apple, grape, banana, jackfruit or other local fruits	1	2	8
	h. ORGAN MEAT (IRON-RICH)	liver, kidney, heart or other organ meats	1	2	8
	i. FLESH MEATS	Beef, pork, lamb (mutton), goat, wild game, chicken, or other birds	1	2	8
	j. EGGS	Egg	1	2	8
	k. FISH	fresh or dried fish or shellfish	1	2	8
	l. LEGUMES, NUTS AND SEEDS	beans, peas, lentils, nuts, seeds or foods made from these	1	2	8
	m. MILK AND MILK PRODUCTS	Milk (animal milk, tinned or powdered milk), cheese, yogurt or skimmed milk or other milk products	1	2	8
	n. OILS AND FATS	Oil, fats or butter or foods made with any of these	1	2	8
	o. OTHEROILS	Foods made from palm oil	1	2	8
	p. OTHER FORTIFIED FOODS	Specially fortified foods (e.g. Corn soya blend (CSB) foods fortified with micronutrient powder, plumpy'nut, other Ready-to-Use Therapeutic Foods or lipid-based nutrient supplement?	1	2	8
	q. OTHER (INSECTS)	Dried fish	1	2	8
	r. OTHER SPICES, CONDIMENTS,	Spices (black pepper, salt), condiments (soy sauce, hot sauce) fish powderor any other local examples	1	2	8

	s. OTHER SUGARY FOODS	Cookies (cake, biscuit,), sweets, chocolates, candies, pastries	1 2 8
	t. OTHER SALTY READY-MADE SNACKS	High fat, salty, pre-packaged foods, typically eaten between meals as convenience	1 2 8
	u. OTHER (Write in)		1 2 8
	Check categories a-u		IF ALL'NO' → L12 IF AT LEAST ONE 'YES' or ALL 'DK' →L13

NO.	QUESTION	CODING CATEGORY	RESPONSE	SKIP TO
L12	**CHECKER FOR L11, if MOTHER SAID ALL '02' = NO** Did CHILD'S NAME eat any solid, semi-solid, or soft foods yesterday during the day or night? By that I mean were any of these foods thick enough that you could have picked them up with your fingers and fed them by hand?	01= Yes *If yes repeat L11 and underline food groups in L11. Continue to L13.* 02= No 08 = Don't know		If02 or 08→ L14
L13	How many times did CHILD'S NAME eat solid, semi-solid or soft foods other than liquids yesterday during the day or night? How many times did this happen?	Write number of times 98 = Don't know	__|__|	
L14	Did CHILD'S NAME drink anything from a bottle or nipple yesterday during the day or night?	01= Yes 02= No 08= Don't know		
L15	Yesterday, during the day or night, did CHILD'S NAMEeat any iron fortified formula? *(example: locally available fortified formula)*	01= Yes 02= No 08= Don't know		
L16	Yesterday, during the day or night, did CHILD'S NAMEeat any iron fortified food baby foods *(example local baby foods)*	01= Yes 02= No 08= Don't know		
L16a	At what age did you first introduce solid/semi-solid food to CHILD'S NAME?	Write age in months 98= Don't know	__|__|	

	QUESTION	CODING CATEGORY	RESPONSE	SKIP TO
L17	Have you ever seen (CHILD'S NAME) eat soil?	01= Yes 02= No		If 02→L21
L18	At what age was this behavior first observed?	Write age in months 98 = Don't Know	__|__|	
L19	Have you ever observed this behavior in the past 30 days?	01= Yes		If 02→L21

		02= No	
L20	How often have you ever observed this behavior in the past 30 days?	01= Everyday 02= Once per week 03= Couple times	
L21	Have you ever seen (CHILD'S NAME) eat chicken poop?	01= Yes 02= No	If 02→ Module M
L22	At what age was this behavior first observed?	Write age in months 98 = Don't Know |__|__|	
L23	Have you ever observed this behavior in the past 30 days?	01= Yes 02= No	If 02→ Module M
L24	How often have you observed this behavior in the past 30 days?	01= Everyday 02= Once per week 03= Couple times	

M. Responsive Feeding

NO.	QUESTION	CODING CATEGORIES	RESPONSE	SKIP TO
M0	ENUMERATOR: VERIFY L2 Is (CHILD NAME) 6 months or older?	01= Yes 02= No		If 02→ Module N
M1	Who is the primary person responsible for feeding? (CHILD NAME) the main meal?	01= Mother 02= Father 03= Grandmother 04= Aunt (Mother sister-in-law) 05= CHILD NAME'S sister/brother 06= Other (specify): _____ 08= Don't know		If 08→ Module N
M2	Most of the time do they/you do anything to encourage (CHILD NAME) to eat?	01= Yes 02= No 08= Don't know		If 02or 08→Module N
M3	What did they/you do? What did they/you say? *Probe:Did they/you say anything else?* Do not read all answers, circle all that apply	a. Offered another food or drink b. Talked/Encouraged verbally c. Praised child for eating d. Played /laughed e. Modeled eating f. Refocused the child's attention (Show cartoon, animal) g. Ordered strongly/forced child to eat h. Threatened i. Another person helps child j. Had child sitting close to me k. Let the child feed him/herself l. Let child touch the plate m. Singing, dancing, music n. Told story o. Other(specify)_____ p. Don't know		

N. Childhood illness

Read: Think back over the last two weeks. Has (CHILD NAME)experienced any of the following symptoms?

No.	QUESTIONS AND FILTERS	RESPONSE CODES Yes	No	SKIP
N1	Has (CHILD NAME)experienced runny nose and cough in the past two weeks?	1	2	
N2	Has (CHILD NAME) experienced rapid or difficulty in breathing in the past two weeks?	1	2	
N3	Has(CHILD NAME)experienced a fever in the past two weeks?	1	2	If 2→ N5
N4	Has(CHILD NAME)been diagnosed with malaria from a health care provider in the past two weeks?	1	2	
N5	In the last two weeks, has (CHILD NAME) experiencedthreeor more loose stoolsin a single day (within 24 hours)	1	2	
N6	Has(CHILD NAME)experienced at least one stool with blood in the past two weeks?	1	2	
N6	Has(CHILD NAME)been diagnosed with intestinal worms in the past two weeks?	1	2	

O. Drinking water

NO.	QUESTIONS AND FILTERS	CODE	RESPONSE	SKIP
O1	What is the primary source of drinking water for members of your household?	01= Piped water into dwelling 02= Piped water into yard/plot 03= Public tap/standpipe 04= Tubewell/borehole 05= Protected dug well 06= Unprotected dug well 07= Protected spring 08= Unprotected spring 09= Rainwater collection 10= Bottled water 11= Cart with small tank/drum 12= Tanker truck 13= Surface water (river, dam, lake, pond, stream, canal, irrigation channels) 14= Other (specify)_____		If 01 or 02→O3
O2	How long does it take to go there, get water and come back? *Enumerator instructions: Only include time to get to water source and back. Do not include socializing or other errands*	Write number of minutes 480= 480 minutes or more (8+ hours) 988= Don't know	|__|__|__|	
O3	What is the secondary source of drinking water for members of your household?	01= Piped water into dwelling 02= Piped water into yard/plot 03= Public tap/standpipe 04= Tubewell/borehole 05= Protected dug well		If 14→O5

		06= Unprotected dug well 07= Protected spring 08= Unprotected spring 09= Rainwater collection 10=Bottled water 11= Cart with small tank/drum 12= Tanker truck 13= Surface water (river, dam, lake, pond, stream, canal, irrigation channels) 14= No secondary source 15= Other (specify)_____	
O4	Over the past 12 months, approximately how many months do you use your secondary water source?	01= Rarely (Less than 2 months) 02= Sometimes (2+ to 3 months of the year) 03= Often (3+ to 4 months of the year) 04= Frequently (4+ to 6 months of the year)	
O5	Who usually goes to the water source to fetch the water for your household?	01= Adult woman 02= Adult male 03= Female child (less than 15 years of age) 04= Male child (less than 15 years of age) 08 = Don't know	
O6	Do you treat your water in any way to make it safer to drink?	01= Yes 02= No 08= Don't know	If 02 or 08 → skip to O8
O7	What do you <u>usually</u> do to the water to make it safer to drink? Do not read, but circle all that apply	a. Boil water b. Add bleach/chlorine c. Strain it through a cloth d. Use water filter (ceramic/sand/composite/etc) e. Solar disinfection f. Let it stand and settle g. Use purifying tablets h. Other (Specify) _____ i. Don't know	
O8	Do you store water for drinking in the household?	01= Yes 02= No 08 = Don't know	If 02 or 08→Module P
O9	If Yes, what kind of containers are they? *(Narrow mouthed: opening is 3 cm or less)*	01= Narrow mouthed 02= Wide mouthed 03= Both types	
O11	Who takes water from these containers? Read all answers, circle all that apply	a. Adult woman b. Adult male c. Female child (between ages 5 and 15) d. Male child (between age 5 and 15) e. Female child (less than 5 years of age) f. Male child (less than 5 years of age)	

O12	How do you remove water from the drinking water container?	01= Pouring 02= Dipping 03= Both Pouring and Dipping 04= Container has a spigot or tap 05= Other (Specify)_____ 08= Don't Know	If 01 or 04, skip to O14
O13	What do you use to remove water?	01= Same receptacle/cup used to drink from 02= Receptacle reserved for retrieving water	
O14	When were the containers cleaned last?	01= Today or Yesterday 02= Less than one week ago 03= Several Weeks ago 04= Never 05= Other (Specify)_____ 08= Don't Know/Remember	

Read: Great, thank you. I have a couple questions about your household water sources and sanitation.

P. Hand washing, sanitation and disposal of child's feces

NO.	QUESTIONS AND FILTERS	CODE	RESPONSE	SKIP
P1	What is the primary source of water used by your household for other purposes, such as cooking and hand washing?	01= Piped water into dwelling 02= Piped water into yard/plot 03= Public tap/standpipe 04= Tubewell/borehole 05= Protected dug well 06= Unprotected dug well 07= Protected spring 08= Unprotected spring 09= Rainwater collection 10=Cart with small tank/drum 11= Tanker truck 12= Surface water (river, dam, lake, pond, stream, canal, irrigation channels) 13= Other (specify)_____		If 01 or 02 →P3
P2	How long does it take to go there, get water and come back?	Write number of minutes 480= 480 minutes or more (8+ hours) 988= Don't know	|__|__|__|	
P3	What is the secondary source of water used by your household for other purposes, such as cooking and hand washing?	01= Piped water into dwelling 02= Piped water into yard/plot 03= Public tap/standpipe 04= Tubewell/borehole 05= Protected dug well 06= Unprotected dug well 07= Protected spring 08= Unprotected spring 09= Rainwater collection		If 13→P5

		10=Cart with small tank/drum 11= Tanker truck 12= Surface water (river, dam, lake, pond, stream, canal, irrigation channels) 13= No secondary source 14= Other (specify)_____	
P4	Over the past 12 months, approximately how many months do you use your secondary water source for cooking and hand washing?	01= Rarely (Less than 2 months) 02= Sometimes (2+ to 3 months of the year) 03= Often (3+ to 4 months of the year) 04= Frequently (4+ to 6 months of the year)	

NO.	QUESTIONS AND FILTERS	CODE RESPONSE	SKIP
P5	When do you usually wash your hands? *(Do not read responses. Allow respondent to answer first, and then ask how often by probing, with never, always or sometimes. If respondent does not mention an activity, such as "before eating", circle 01 for Never.)*		
	a. before eating	01= Never 02= Always 03= Sometimes	
	b. before preparing food	01= Never 02= Always 03= Sometimes	
	c. Before feeding the child	01= Never 02= Always 03= Sometimes	
	d. after toilet use	01= Never 02= Always 03= Sometimes	
	e. after changing a baby	01= Never 02= Always 03= Sometimes	
	f. Other	01= Never 02= Always 03= Sometimes	

Observation section:

Read: I'd like you to please show me where you store your drinking water, and also where you most often wash your hands.

NO.	QUESTIONS AND FILTERS	CODE/RESPONSE	SKIP TO
P6	Can you please show me where you store your drinking water? *Observe: Are the containers covered?*	01= All are covered 02= Some are covered 03= None are covered 04= No permission to see	
P7	Thanks, can you show me where you most often wash your hands? *(Ask to see and observe. Record only one hand washing place. This is the hand washing place that is used most often by the respondent or household.)*	01 =Inside/within 10 paces of the toilet facility 02= Inside/within 10 paces of the kitchen/cooking place 03= Elsewhere in home or yard 04= Outside yard 05= No specific place 06= No permission to see	If 6→ P12
P8	***OBSERVE:*** *Is water present at the specific place for hand washing?* *Enumerator: If there is a tap or pump present at the specific place for hand washing, open the tap or operate the pump to see if water is coming out. If there is a bucket, basin, or other type of water container, examine it to see whether water is present in the container. Record observation.*	01= Yes (Water is available) 02= No (Water is not available)	
P9	***OBSERVE:*** *Is soap or detergent present at the specific place for hand washing?* *Enumerator: record observation. Circle all that apply.*	a. Bar soap b. Detergent (powder/liquid/paste) c. Liquid soap (including shampoo) d. None	If 'a, b, c' for P9 <u>and</u> 'a, b, c' P10 → P12
P10	***OBSERVE:*** *Is locally sourced cleansing agent present at the specific place for hand washing?* *Enumerator: Record observation. Circle all that apply.*	a. Ash b. Mud/sand c. None d. Other (specify)_____	
P11	Do you have soap/local sourced cleansing agent in your house?	01= Yes 02= No 08= Don't know; N/A	
P11a	Can please see your soap/locally sourced cleansing agent? *Circle all that apply.*	a. Soap present b. Ash present c. None available	

P12	What kind of toilet facility do members of your household <u>usually</u> use?	01 = Flush/pour flush to piped sewer system 02= Flush/pour flush to septic tank 03= Flush/pour flush to pit latrine	If 12 →P15

		04= Flush/pour flush to elsewhere 05= Flush/pour flush unknown place/not sure DK where 06= Ventilated improved pit latrine (VIP) 07= Pit latrine with slab 08= Pit latrine without slab/open pit 09= Composting toilet 10= Bucket 11= Hanging toilet/hanging latrine 12= No facilities/bush/field 13= Other (specify) _____	
P13	Do you share this facility with other households?	01= Yes 02= No	if 2=No → P15
P14	How many households use this facility?	Write number of households 98 = Don't know |__|__|	
P15	The last time (child name) passed stool, where did he/she defecate?	01= Used potty 02= Used washable diaper 03= Used disposable diaper 04= Went in his/her clothes 05= Went in house/yard 06= Went outside of house/yard 07= Used latrine 08 =Don't know	If 07= →Module Q
P16	The last time (child name) passed stool, what was done to dispose of the stools?	01= Dropped into toilet facility/latrine 02= Buried 03= Put into container for trash 04= In yard 05= In sink or tub 06= Thrown into waterway 07= Washed or rinsed away 08= Don't know	If 1-6, →P18
P17	If "washed or rinsed away", probe where the waste water was disposed?	01= Dropped into toilet facility 02= Put into container for trash 03= In yard 04= Outside of yard 05= Into sink or tub 06= Thrown into waterway 08= Don't know	
P18	Which of the following items do you <u>usually</u> use when you are menstruating? <u>Do not</u> read answers	01 = Nothing (not menstruating) 02 = Old cloth 03 = Reusable pads 04 = Disposable pads 05= Tampons 06= Other (specify) _____ 08= Don't know	

Q. Women's Empowerment

Mobility

Read: Now I would like to ask you about going places. Please tell me whether you can to go to the following places on your own, only if someone accompanies you, or not at all?

NO.	QUESTIONS AND FILTERS	RESPONSE CODES	SKIP TO
Q1	Can you go to the market to buy or sell things, on your own, only if someone accompanies you, or not at all?	01= Not at all 02= If someone accompanies me 03= On my own	
Q2	Can you go fetch water?	01= Not at all 02= If someone accompanies me 03= On my own	
Q3	Can you go to training courses, including adult literacy classes?	01= Not at all 02= If someone accompanies me 03= On my own	
Q4	Can you go to the health facility (when you are sick)?	01= Not at all 02= If someone accompanies me 03= On my own	
Q5	Can you go to a community meeting?	01= Not at all 02= If someone accompanies me 03= On my own	
Q6	Can you go to homes of close-by friends on your own, only if someone accompanies you, or not at all?	01= Not at all 02= If someone accompanies me 03= On my own	
Q7	Can you go to outside the village?	01= Not at all 02= If someone accompanies me 03= On my own	
Q8	Can you go to church or mosque?	01= Not at all 02= If someone accompanies me 03= On my own	

Community Social Capital

Read: I would now like to ask you some questions about your community. For each of the following statements do you: STRONGLY DISAGREE, DISAGREE, ARE UNDECIDED, AGREE, OR STRONGLY AGREE?

NO.	QUESTIONS AND FILTERS	RESPONSE CODES	SKIP TO
Q9	You can rely on people in your community to help you if you have difficulty breastfeeding your baby.	01= Strongly disagree 02= Disagree 03= Neither agree or disagree 04= Agree 05= Strongly agree	
Q10	You can rely on people in your community to help you if you can't provide your child with enough healthy food.	01= Strongly disagree 02= Disagree 03= Neither agree or disagree 04= Agree 05= Strongly agree	
Q11	You can rely on people in your community to help take care of your children/household if you need to go to the doctor or hospital.	01= Strongly disagree 02= Disagree 03= Neither agree or disagree 04= Agree 05= Strongly agree	
Q12	You can rely on people in your community to help deal with a violent or difficult family member.	01= Strongly disagree 02= Disagree 03= Neither agree or disagree 04= Agree 05= Strongly agree	
Q13	You can rely on people in your community to help take care of your children/household if you need to go outside the home to work.	01= Strongly disagree 02= Disagree 03= Neither agree or disagree 04= Agree 05= Strongly agree	

Household Decision-making

Read: Now, I would now like to ask you about who usually makes decisions in your household.

NO.	QUESTIONS AND FILTERS	RESPONSE CODES	SKIP TO
Q14	In your household who usually makes decisions about own health care?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q15	In your household who usually makes decisions about your child's health?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q16	In your household who usually makes decisions about large household purchases? *Probe: (give local examples of large purchases)*	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q17	In your household who usually makes decisions about household purchases for daily needs?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q18	In your household who usually decides when you visit family/relatives or friends?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	

Q19	In your household who usually decides <u>when your whole household will visit family/relatives/friends</u>	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q20	In your household who usually decides <u>how to use money that *you*</u>bring into the household?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q21	In your household who usually decides how to use the <u>money *your husband*</u>brings into the household?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q22	In your household who usually decides when your family will sell a <u>large asset</u> (like a cow)?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q23	In your household who usually decides when your family will sell a <u>small asset</u> (like a chicken)?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	

Q24	In your household, who usually decides <u>whether you can work to earn money?</u>	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	

Read: The next two questions ask about the relationship with your husband/spouse.

Q25	In your household, who usually decides <u>when you and your husband have sex?</u>	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____ 07= No husband/spouse	If 7→Skip to Q27
Q26	In your household, who usually decides <u>whether you and your husband use family planning?</u>	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	

Q27	In your household, who usually decides whether to give the baby something other than breast milk during the first 3 days after birth?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q28	In your household, who usually decides when to first introduce soft or solid food to your child?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	
Q29	If there is not enough food in the household, who decides how food is shared among family members?	01= You (respondent) 02= Your husband 03= Both you and your husband 04= Mother/Father In-law 05= Mother/Father 06= Other (specify)_____	

Gender Attitude and Belief: Tolerance of Intimate Partner Violence

Read: Sometimes a husband is angry with his wife. In your opinion, is a husband justified in hitting his wife in the following situations

No.	QUESTIONS AND FILTERS	RESPONSE CODES Yes	No	SKIP
Q30	Is he justified in hitting his wife, if she goes out without telling him?	1	2	
Q31	Is he justified in hitting his wife, if she neglects their children?	1	2	
Q32	Is he justified in hitting his wife, if she argues with him?	1	2	
Q33	Is he justified in hitting his wife, if she refuses to have sex with him?	1	2	
Q34	Is he justified in hitting his wife, if she did not cook the food properly?	1	2	

R. Community group and Government safety net participation

NO.	QUESTION	RESPONSE CODES			SKIP TO
		YES, there is program but NOT participant	NO program or don't know	YES there is program AND active participant	
R1	Are any …. active community programs in your village?				
a	Agriculture (example: local program name)	1	2	3	
b	WASH (example: local program name)	1	2	3	
c	Nutrition (example: local program name)	1	2	3	
d	Maternal Health (example: local program name)	1	2	3	
e	Child Health (example: local program name)	1	2	3	
f	Education (example: local program name)	1	2	3	
g	Economic Development [*Equb* (local saving)]	1	2	3	
h	Women's Empowerment (example: local program name)	1	2	3	
i	Climate Change (example: local program name)	1	2	3	
j	Other ((example: local program name)	1	2	3	

NO.	QUESTION	RESPONSE CODES			SKIP TO
		YES, there is group but NOT member	NO group don't know	YES there is group AND active member	
R2	Are any …. active community groups in your village?				
a	Agriculture [community water shade development association, community irrigation users' association, community seed multiplication cooperative, Irrigation administration committee (Simada), farmer innovation group (Ebenat), community research group (Ebenat), Kebele PSNP committee]	1	2	3	
b	WASH [Kebele water asset administration committee, village level water users committee (for maintenance, labor cost and money contribution), WASHCO (water and sanitation committee)]	1	2	3	
c	Nutrition [mothers support group (Simada), women self help saving group for seed purchase and fruit and vegetable production (Simada), development army (1-5)]	1	2	3	
d	Maternal Health [development army (1-5)]	1	2	3	
e	Child Health [development army (1-5)]	1	2	3	

f	Education [Kebele education and training board, parent-teacher integrity, school clubs, village development army]	1	2	3	
g	Economic Development [*Equb* (local saving), rural saving and credit cooperative (RUSACCO) at village level, women self help saving groups, youth self help saving groups, women IGA groups, youth IGA groups, development army (Kebele and village), animal fattening cooperative (Ebenat), bee product market cooperative (Ebenat), essence and gum producing cooperative (Ebenat)]	1	2	3	
h	Women's Empowerment [village level women self help saving groups, village level youth self help saving groups, females IGA groups, youth IGA groups, women development team (1- 5), youth development team (1- 5), women, youth and community forum, women, youth and parents forum (both forum work to create enabling environment for women and youth economic empowerment), gender based community conversation group at village level (Tach Gaynt)]	1	2	3	
i	Climate Change [village level natural resource conservation committee, Kebele development team (1-5 at village), energy-saving stove production association (Woreda level), landless youth association (engaged on mountain forestry – Simada), Kebele level energy-saving stove production association (to be established – Ebenat and Simada)]	1	2	3	
j	Other ((example: local program name)	1	2	3	

NO.	QUESTION	RESPONSE CODES			SKIP TO
		YES, there is program but NOT participant	NO group or don't know	YES there is program AND active participant	
R3	**Are any …. government programs (social safety net) in your village?**				
a	Agriculture [water shade development, small scale irrigation, seed multiplication, innovation and research (Ebenat), PSNP]	1	2	3	
b	WASH [Kebele and village WASH]	1	2	3	
c	Nutrition [health extension program, fruits and vegetable production, development army]	1	2	3	
d	Maternal Health [health extension program and development army]	1	2	3	

e	Child Health [health extension program and development army]	1	2	3	
f	Education [village development army]	1	2	3	
g	Economic Development [rural saving and credit, self help and IGAs, development army (Kebele and village)]	1	2	3	
h	Women's Empowerment [village self help and IGA, women development team (1- 5), youth development team (1- 5) and gender based community conversation group at village level (Tach Gaynt)]	1	2	3	
i	Climate Change [natural resource conservation, development team (1-5 at village), energy-saving stove production (Woreda level), forestry, energy-saving stove production (planned – Ebenat and Simada)]	1	2	3	
j	Other (example: local program name)	1	2	3	

NO.	QUESTION	RESPONSE CODES	
		Yes	No
R4	Please tell me whether, in the last 12 months you or other members of your household has received any of the following inputs or direct assistance? *Instructions: Read all options*		
a	Food for work	1	2
b	School feeding program	1	2
c	Plot or land for household consumption	1	2
d	Seeds	1	2
e	Ag machinery	1	2
f	Livestock	1	2
g	Poultry	1	2
h	Fisheries	1	2
i	Vehicle	1	2
j	Sewing machine	1	2
k	Latrine (new or renovated)	1	2
l	Water pump (new or renovated	1	2
m	Agricultural inputs (fertilizers or seeds)	1	2
o	Other (Specify)	1	2

Record time the interview ended in 24 hour format	HOUR	|__|__|
	MINUTES	|__|__|

READ: Thank you for your time and participation. This concludes the household survey part. Next, we will take the height, weight and arm measurements of your and child under three.

S. Mother's Anthropometry and Hemoglobin

Read: Now I would like to take your height and weight measurements.

MEASUREMENTS FOR MOTHER				
NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	RESPONSE	SKIP TO
S1	Mother's Age	Copy from Page 5 C1	|__|__|	
S2	Pregnancy status	01=Pregnant 02= Not pregnant *but* lactating 03= Not Pregnant and *not* lactating		If 01= skip to S5
S3	Mother's height in centimeters	Write in measurement (centimeters) 98.8 = Don't know	|__|__|__|.|__| cm	
S4	Weight of Mother	Write in measurement (kilograms) 988.8 = Don't know	|__|__|__|.|__| kg	
S5	MUAC Measurement	Write in measurement (centimeters) 98.8 = Don't know	|__|__|.|__| cm	

Consent for Anemia.

As part of this survey, we are asking people to take an anemia test. Anemia is a serious health problem that usually results from poor nutrition, infection or chronic disease. This survey will assist the program to develop programs to prevent and treat anemia.

We ask that all women born between 1964 and 1998 take part in anemia testing and give a few drops of blood from a finger. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test.

The blood will be tested for anemia immediately. The result will be kept strictly confidential [no names will be taken] and will not be shared with anyone other than members of our survey team.

You can say yes to the test or you can say no. It's up to you to decide. Do you have any questions?

S6	Do you agree to participate in the anemia test?	01=Granted 02= Refused	Enumerator sign name _____	If 02→ Module Z
S7	Mother's Hemoglobin (Fingerprick sample)	Write in response 98.8 = Machine Error	|__|__|.|__| g/dL	

Z. Child's Anthropometry and Hemoglobin

Read: Now I would now like to take length and weight of child's name.

NO.	QUESTIONS	CODING CATEGORIES	RESPONSE	SKIP TO
Z1a.	Child's Date of Birth	Copy from Module B 99 99 99 = don't know	|__|__| |__|__| 20|__|__| dd mm yy	
Z2	Childs age in Months	Copy from Module B Write age in completed months	|__|__| months	

		00= Less than 30 days 98= Don't know		
Z3	What is the sex of (child's name)? Copy from Module B	01= Male 02= Female		
Z4	What is the weight of child	Write in kilograms 98.8= Don't Know	|__|__|.|__| kg	
Z5a.	What is the length/height of thechild?	Write in centimeters 988.8= Don't know	|__|__|__|.|__|cm	
Z5b.	Was the height or length of child taken	01= Height 02= Length 08= Don't know		
Z6	Is bilateral oedema present in the child?	01= Yes 02= No		

Consent for Anemia (READ)

As part of this survey, we are asking people to take an anemia test. Anemia is a serious health problem that usually results from poor nutrition, infection or chronic disease. This survey will assist the program to develop programs to prevent and treat anemia.

We ask that all children born between October 2008 to present take part in anemia testing and give a few drops of blood from a finger. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test.

The blood will be tested for anemia immediately. The result will be kept strictly confidential and will not be shared with anyone other than members of our survey team.

You can say yes to the test or you can say no. It's up to you to decide. Do you have any questions?

NO.	QUESTIONS	CODING CATEGORIES	RESPONSE	SKIP TO
Z7	Will you allow (CHILD NAME) to participate in the anemia test?	01=Granted 02= Refused	Enumerator sign name _____	If 02→Z9
Z8	Hemoglobin (Fingerprick sample)	Record reading 98.8= DK/Test error	|__|__|.|__| g/dL	
Z9	DO NOT READ: Write down which measurement was taken of child Result of Measurements Circle one option	01=Measured weight only 02= Measured height only 03= Measured anemia only 04= Measured weight and height only 05= Measured weight and anemia only 06= Measured height and anemia only 07= Measured weight, height and anemia 08= Child not present 09=Refused 10=Other(Specify)_____		

READ: Thank you for participation. Do you have any final questions? Have a good day.