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Jennifer Orgle Date

A Grant Proposal to assess the impact of women's empowerment in enhancing infant and young child feeding and sanitation practices to address stunting among children under 5 years old in the Amhara region in Ethiopia

By

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Master of Public Health

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An abstract of

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in partial fulfillment of the requirements for the degree of Master of Public Health

in Executive Master of Public Health

2020

Abstract

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By Jennifer Orgle

Stunting is the most chronic form of malnutrition and has far reaching consequences, affecting individuals, families, societies and the nation. Known to occur within the first 1,000 days of live and almost impossible to reverse after 24 months, childhood stunting is associated with impaired cognitive development, poor school performance, reduced lifetime earnings and the perpetuation of the intergenerational cycle of poverty. Globally WHO estimates that there are over 150 stunted children. With stunting rates as high as 38% nationally and 46% (6% above the WHO cut off point for 'alarming stunting rates') in Amhara region, 1 in 15 children will die before they reach their fifth birthday. Despite declining rates of stunting globally and in Ethiopia, evidence suggests that these are not enough to meet the WHO global target of 100 million stunted children by 2025(Schmidt, 2014)(Schmidt, 2014)(Schmidt, 2014)(Schmidt, 2014)(Schmidt, 2014)(Schmidt, 2014)(Schmidt, 2014).

Key among the multifaceted causes of stunting are sub-optimal feeding practices, poor sanitation, leading to Environmental Enteric Dysfunction (EED) and women's socio-economic status. Many interventions have failed to recognize the impact of women's socio-economic status on nutritional outcomes and this proposal hypothesizes that previous stunting interventions have not achieved significant impact due to the lack or limited focus of women's empowerment interventions. This is because although women tend to be the primary caregivers men control decision making and resources that impact nutrition. This proposal will test the impact of women's empowerment on enhancing infant and young child feeding and reducing infant faecal exposure in reducing stunting. It will answer the question, **"Does women's empowerment improve sanitation and feeding practices and consequently stunting outcomes?"**

Proposed interventions will reach a total of 20,000 household in 40 sub-districts in 2 districts. A study sample of 3,638 will be drawn from the intervention population and a further 1,819 from a third woreda that would act as a control site. In all, 5,457 child and caregiver pairs will be recruited for the study.

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1 INTRODUCTION

1.1 Introduction and Rationale

Stunting is the most common form of malnutrition and has far reaching consequences, affecting individuals, families, societies and the nation (Prendergast & Humphrey, 2014). Known to occur within the first 1,000 days of life and almost impossible to reverse after 24 months, childhood stunting is associated with impaired cognitive development, poor school performance, reduced lifetime earnings and the perpetuation of the intergenerational cycle of poverty and stunting (stunted women are more likely to have stunted children). Globally WHO estimates that there are over 160 stunted children (Bhutta et al., 2008; Bhutta et al., 2013; Collins, Kugler, & Gwadz, 2016). Stunting is caused by a combination of factors, including sub-optimal feeding practices, sanitation related diseases, especially Environmental Enteric Dysfunction (EED) and maternal issues (women's socio-economic status) (Prendergast & Humphrey, 2014). Poor feeding practices and diarrhea have been associated with stunting (Syed, Ali, & Duggan, 2016) and recent research suggests that up to 40% of all stunting may be caused by EED, a sub-clinical condition caused by repeated infection and suspected to result from children eating soil and mouthing objects that may be contaminated with animal feces. (Dewey & Mayers, 2011; Humphrey et al., 2015; Lunn, 2000). EED alters the architecture of the small intestines, causing leakage into the blood stream and preventing the gut from absorbing nutrients (Mbuya & Humphrey, 2016; Owino et al., 2016; Watanabe & Petri, 2016). As primary caregivers, women's ability to adequately provide feeding and care to children is impacted by their socio-economic status and gender norms that influence household decision making, including intrahousehold food distribution (Cunningham et al., 2015; FAO, n.d.; IFPRI, 2013). These in turn,

influence women and children' health and nutrition outcomes. Despite this knowledge, current interventions have largely focused on improving feeding practices and at best have combined this with interventions to address EED or improve women's empowerment. (Ersino, Zello, Henry, & Regassa, 2018). Very few strategies or plans have addressed all these underlying causes of stunting together, explaining to some extent why current practices are unlikely to achieve the World Health Assembly (WHA) goal to reduce the number of stunted children to 100 million by 2025 (WHO, 2014).

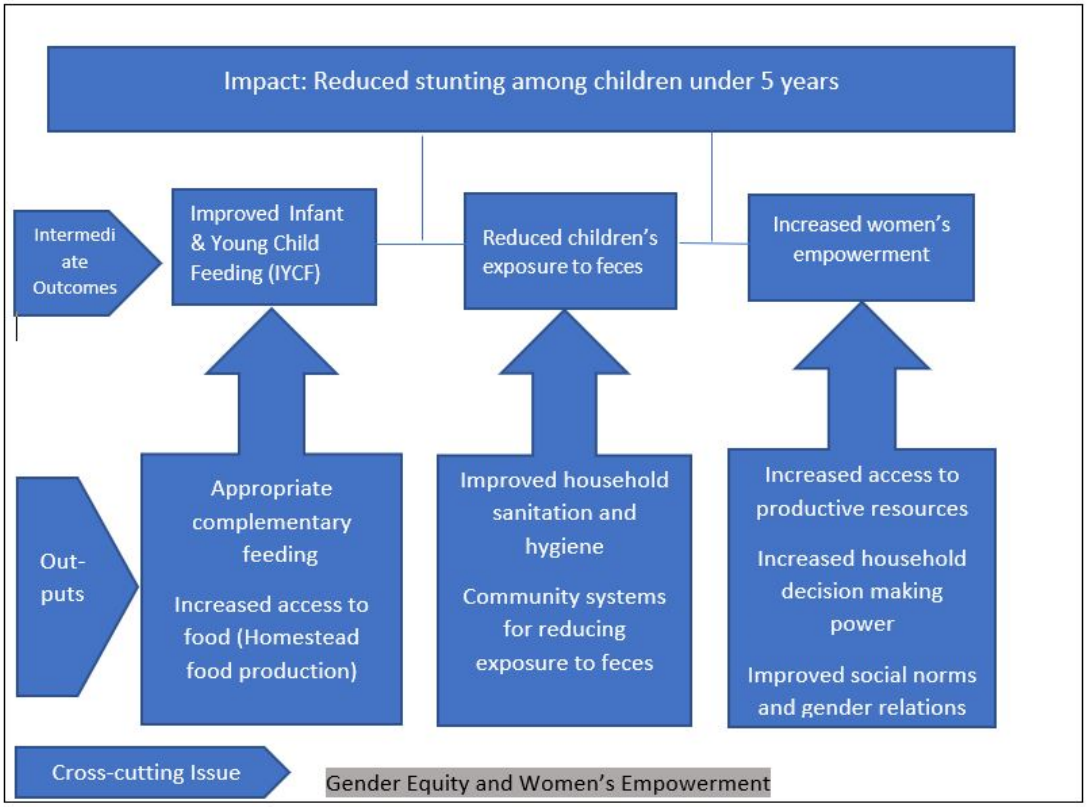
1.2 Problem Statement

Stunting has far reaching consequences, affecting individuals, families, societies and the nation (Cumming & Cairncross, 2016; Prendergast & Humphrey, 2014; UNICEF, 2015). Despite having one of the fastest growing economies in the sub-region, Ethiopia remains poor with a quarter of its population living below $1.90 (USAID, 2018). With stunting rates at 38% nationally and at 46% in the Amhara region, (Ethiopia Demographic Health Survey 2016), 1 in 15 children will die before they reach their fifth birthday (EDHS, 2016) Addressing these key underlying causes of stunting is critical to achieving stunting reduction and improved nutritional outcomes in Ethiopia. A combination of lack of dietary diversity and sub-optimal feeding practices as well as poor sanitation and animal husbandry practices, largely influenced by women's low socio-economic status influence nutritional outcomes for women and children (EDHS, 2016; Hadjuk, 2014; Headey et al., 2017; Thrive, 2011; USAID, 2014).

Without sufficient understanding of which interventions are most critical to addressing stunting at scale, current interventions will continue to have the effect of "putting a band-aid on a bullet wound".

1.3 Results Framework

Figure 1-1 Results Framework

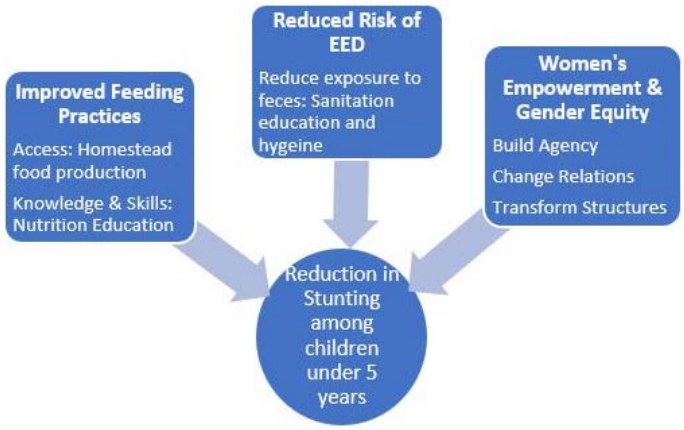


1.4 Purpose Statement

The null hypothesis (H_0) is: **"Infant and Young Child Feeding (IYCF) and Water, sanitation and Hygiene (WASH) practices are not improved with activities that strengthen women's empowerment"**; the alternative hypothesis: **"Infant and young child feeding (IYCF) and sanitation practices are enhanced with the addition of women's empowerment activities"**.

Primary Study Question: Does women's empowerment increase the effectiveness of sanitation and feeding practices, to improve stunting outcomes?

Figure 1-2 Conceptual Framework



1.5 Significance Statement

The proposed implementation research will reduce stunting among children under 5 by addressing the underlying causes of stunting in Ethiopia. Current interventions fail to sufficiently address stunting (Schmidt, 2014) and researchers are unanimous in their agreement that there is the need for additional research to better understand associations between recommended strategies and reductions in stunting (Cumming et al., 2019; Cunningham et al., 2015; Heckert, Olney, & Ruel, 2019). The proposed study will add to the body of evidence on which factors most affect stunting and influence reduction efforts. Outcomes of this implementation research will be widely disseminated among national and global policy makers as well as Public Health communities of practice.

1.6 Definition of Terms

Environmental Enteric Dysfunction (EED): (Also known as Tropical Enteropathy) Refers to a syndrome of impaired intestinal function that is common in developing countries. Factors encountered in the environment related to microbial contamination, diet, toxic factors in water or food, soil or others may predispose individuals to susceptibility to

infection with pathogens and increase the severity of their consequences. Repeated bouts of diarrhea suffered within the first two or three years of life are most closely linked to EED.

Gender Equity: The process of being fair to women and men. To ensure fairness, strategies and measures must often be available to compensate for women's historical and social disadvantages that prevent women and men from otherwise operating on a level playing field. Equity leads to equality. (Source of definition: CIGN Explanatory Note on CARE's Gender Focus, July 2012).

Gender Equality: Equality between women and men - refers to the equal enjoyment by women, girls, boys and men of rights, opportunities, resources and rewards. A critical aspect of promoting gender equality is the empowerment of women, with a focus on identifying and redressing power imbalances. Equality does not mean that women and men are the same but that their enjoyment of rights, opportunities and life changes are not governed or limited by whether they were born female or male. The United Nations regards gender equality as a human right. It points out that empowering women is also an indispensable tool for advancing development and reducing poverty. (Source of definition: Explanatory Note on CARE's Gender Focus, July 2012)

Nutrition-specific interventions: "Priority Nutrition Actions" drawn from the recommendations made by Bhutta, et al. (2008) in the medical journal *The Lancet*.105 These correspond to the key interventions that are needed to prevent and treat undernutrition. (Source of definition: UNICEF). These interventions directly address inadequate dietary intake or disease- the immediate causes of malnutrition. They include

micronutrient supplementation, deworming, treatment of severe acute malnutrition, and breastfeeding promotion. (Source of definition: World Bank).

Nutrition-sensitive: Nutrition-sensitive development promotes interventions in nutrition related sectors to achieve adequate nutrition. Nutrition-sensitive development demands maintaining nutritional outcomes as the key goals of national development policies. This involves ensuring optimal nutritional impact of all related interventions. These may include agriculture and food security programs, social protection programs and safety nets, maternal, newborn, and child health programs; other poverty reduction, employment generation, rural development, water and sanitation, and emergency response programs (Sources of definition: SUN 2011).

Optimal Infant and Young Child Feeding: This involves appropriate feeding of children 6–23 months and include, early initiation of breastfeeding (within 1 hour of birth) and exclusive breastfeeding from birth for the first six months, as well as timely initiation of and appropriate complementary feeding (from six months) with continued breastfeeding. Appropriate complementary feeding includes feeding a diverse diet from at least 4 out of the 7 food groups, at age appropriate frequencies and consistency (thickness), in a responsive manner, whiles observing safe and hygienic practices, along with continued breastfeeding for up to two years of age or beyond. (WHO, 2009)

Social Analysis and Action (SAA): An approach for working with staff and communities through regularly recurring dialogue (via participatory methods) to address their social conditions perpetuate health and nutrition challenges.

Social and Behavior Change. Social and behavior change (SBC) interventions combine activities and communication to address and/or reinforce a decision/behavior/social norms.

It also refers to the outcomes of mobilizing various actors of society to take action on a set of common issues and create a sense of shared responsibility. SBC is a multi-pronged, integrated approach that is informed by formative research of the context and uses consistent, correct, specific and clear messages and actions targeted at specific actors and reinforced at each level. This results in significant and sustained improvements in practices at individual, household and community levels.

Sustainability: The degree to which services or processes continue once inputs (funding, materials, training, etc.) provided by the original source(s) decreases or discontinues. (Source of definition: Glossary of Evaluation Terms, USAID (2009) http://pdf.usaid.gov/pdf_docs/PNADO820.pdf)

Water, Sanitation, and Hygiene (WASH): Access to safe water, adequate sanitation, and proper hygiene education can reduce illness and death from disease, leading to improved health, poverty reduction, and socio-economic development. (Source of definition: CARE's Water Wiki).

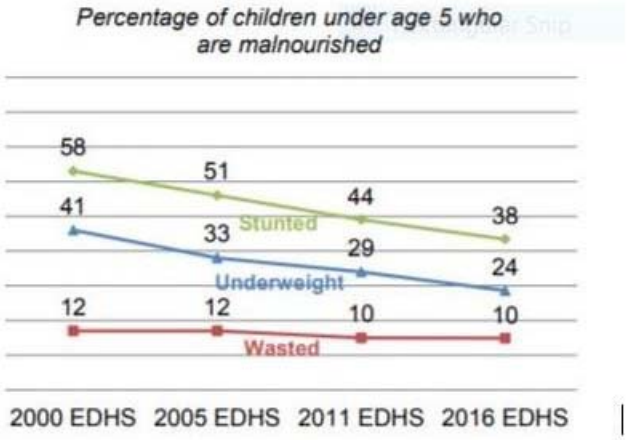
Women's Empowerment (WE): WE combine processes that increase women's sense of self-worth; their right to have and to determine choices; their right to have access to opportunities and resources; their decision making ability over their own lives, both within and outside the home; and their ability to influence the direction of social change to create a more just social and economic order, nationally and internationally. (Source of definition: UN http://www.un.org/popin/unfpa/taskforce/guide/iatfwemp.gdl.html)

2 LITERATURE REVIEW

2.1 Prevalence of stunting globally and in Ethiopia

Linear growth failure, or stunting, defined by the World Health Organization (WHO) as a height-for-age (HAZ) score < - 2 (greater than 2 standard deviations below the population median) (WHO, 2018) is the most prevalent form of undernutrition and marker of chronic malnutrition worldwide (Bhutta et al., 2013; Prendergast & Humphrey, 2014; WHO, 2017). Globally, stunting remains a priority because whilst other forms of malnutrition such as wasting can easily be reversed with a change in circumstances, stunting is almost impossible to reverse after age 2 and has more far reaching consequences (UNICEF, 2015).

Figure 2-1 Trends in Child Stunting in Ethiopia

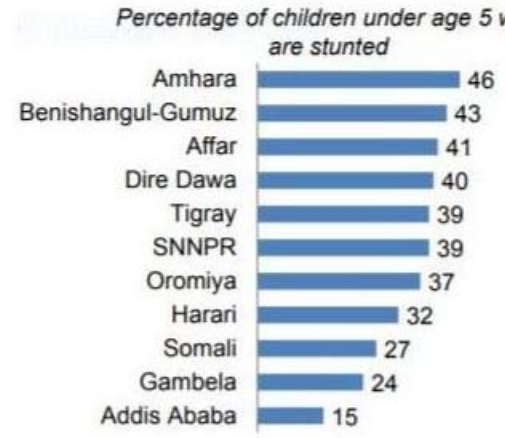


Source: EDHS2016. Retrieved on 11 October 2019 from https://dhsprogram.com/pubs/pdf/FR328/FR328.pdf

Despite the implementation of proven feeding and more commonly accepted WASH practices, a quarter of the world's children under the age of 5 are stunted (WHO, 2006; UNICEF-WHO, 2017 (Budge, Parker, Hutchings, & Garbutt, 2019). and the current predicted reduction to 127million by 2025, falls short of WHO's target of 100 million stunted children by 2025 (Schmidt, 2014). The period within which stunting takes place and may be addressed is within the first 1,000 days of life (from conception to 24

months) (Denno, Tarr, & Nataro, 2017). The period from birth to 2 years is also the most critical period in terms of physical, mental and cognitive development (Bhutta et al., 2013).

Figure 2-2 Child Stunting by Region



Source: EDHS2016. Retrieved on 11 October 2019 from https://dhsprogram.com/pubs/pdf/FR328/FR328.pdf

In East Africa, over 35% of children under 5 are stunted (Agho, Akombi, Ferdous, Mbugua, & Kamara, 2019; Akombi, Agho, Merom, Renzaho, & Hall, 2017); (WHO, 2017) making it the second highest region affected by malnutrition. Despite combined efforts by the government of Ethiopia, the United Nations and other international agencies, and consequent declining rates stunting in Ethiopia (58% in 2000, 44% in 2011), stunting, like in most low-income countries, remains a major public health problem. National stunting currently stands at a high of 38% and rates in the Amhara region where this project is proposed is as high as 46% (EDHS, 2016).

2.1 The pathogenesis of stunting

The pathogenesis of stunting is still not well understood (Owino et al., 2016). We however know that stunting is often an intergenerational cycle particularly because women who were themselves stunted in childhood are more likely to have stunted children (Prendergast & Humphrey, 2014; Ramakrishnan, Martorell, Schroeder, & Flores, 1999), perpetuating the cycle of poverty and reducing human capital (Martorell & Zongrone, 2012). Stunting may be caused by multiple risk factors that co-occur within a complex interplay of

psychosocial factors such as poverty, low maternal education, inadequate care and nurturing from caregivers and the lack of opportunities to learn (Black et al., 2013). Prenatal undernutrition (Christian et al., 2013), poor infant and young child practices, recurrent infections and illnesses due to poor hygiene and sanitation, as well as energy-protein malnutrition and micronutrient deficiencies lead to stunting during childhood (Prendergast & Humphrey, 2014).

Stunting in early childhood has widely been associated with long-term impairments in cognitive and physical development including, increased morbidity and mortality ((Schmidt, 2014) UNICEF, 2017), and, deficits in school performance and cognitive capacity (Cumming & Cairncross, 2016; S. M. Grantham-McGregor, Walker, Himes, & Powell, 1993; Walker, Chang, Powell, Simonoff, & Grantham-McGregor, 2007; Walker, Chang, Wright, Osmond, & Grantham-McGregor, 2015)), which can lead to reduced adult earning potential (S. Grantham-McGregor et al., 2007; Hoddinott, Alderman, Behrman, Haddad, & Horton, 2013) and human capital (Victora et al., 2008). Although stunting is almost impossible to reverse after the age of 2, there is some evidence that the periods during pre-puberty and puberty offer opportunities for 'catch-up' for a child. In addition, improved diets during the period just before conception offers opportunities to influence the birth outcomes and possibly break the integrational stunting cycle (Prendergast & Humphrey, 2014).

The majority of nutrition specific interventions to improve breastfeeding, complementary feeding, or nutritional supplementation have yielded mostly small improvements in HAZ ((Dewey & Adu-Afarwuah, 2008), indicating that stunting as a multifaceted problem cannot be improved solely by an adequate diet. Other etiological factors including

inadequate water, sanitation, and hygiene (WASH) infrastructure and facilities must also be addressed (Denno et al., 2017; Dewey & Adu-Afarwuah, 2008). Diseases also only explain part of the stunting problem and treating disease will not wholly address the issue (Dewey & Adu-Afarwuah, 2008). Recent strides in improving linear growth have more clearly identified poor WASH conditions and chronic pathogen exposure as contributing to child stunting, making such conditions the focus of targeted interventions aimed at improved child linear growth. The *Lancet* framework for action (Black et al., 2013) suggests that a combination of nutrition-specific and nutrition-sensitive interventions is key to achieving optimal growth and development of children.

2.2 Infant and Young Child Feeding (IYCF) Practices in Ethiopia

Adequate child feeding and nutrition is critical to reducing child mortality and morbidity and in Ethiopia is thought to be the cause of up to 53% of under 5 mortality (Biks, Tariku, Wassie, & Derso, 2018). However, complementary feeding continues to be a challenge to good nutrition among children of 6–23 months in Ethiopia and several parts of the developing world (Abeshu, Lelisa, & Geleta, 2016)

According to the 2016 Ethiopian Demographic and Health Survey (EDHS), only 58% of children under 6 months are exclusively breastfed and only 4.2% of breastfed children of 6–23 were fed a minimum acceptable diet. In addition, only 7% overall received minimum food diversity and acceptable diet. A study of optimal feeding practices in the Amhara region by Demilew et al (2017), found that only 38% newborns were put to the breast within 1 hour of birth and only one in three children is fed the minimum meal frequency per day (Demilew, Tafere, & Abitew, 2017). In Amhara region “only, 2.1% of children

received the minimum dietary diversity and minimum acceptable diet" (Demilew et al., 2017) and outcomes are even worse for slum dwellers.

Poor feeding practices are categorized by poor timing of complementary foods introduction, insufficient number of feeds (infrequent) poor attitude of care givers, hygiene practices related to food preparation, storage and feeding as well as quality and adequacy (dietary diversity/ variety) consistency (too thin/runny or too thick) (Demilew et al., 2017; IFPRI, 2010)

Among the many causes of poor child feeding practices in Ethiopia are religious beliefs and myths which govern every aspect of life in Ethiopia influence feeding practices (D'Haene, Desiere, D'Haese, Verbeke, & Schoors, 2019; Desalegn, Lambert, Riedel, Negese, & Biesalski, 2019) and the inaccessibility of many households to adequate diets. Despite being the country that accounts for the largest number of livestock in Sub-Saharan Africa, animal source foods (ASF) make up only 1.7% of diets, with starchy staple making up about 75% of diets (D'Haene et al., 2019). Commercial fortified foods are still out of the reach of the poor and the more widely fed homemade alternatives tend to be unfortified and plant-based, lacking essential micronutrients (especially, iron, zinc, and calcium) during the age of 6–23 months (Abeshu et al., 2016; Demilew et al., 2017; IFPRI, 2010)

Over 44% of Ethiopians are Orthodox Christians and the 2007 national Ethiopian census puts that figure at 82% in the Amhara region. As a result, lives and diets are very much regulated by religious beliefs, including, up to 180 days of fasting scattered over the year which prohibit the consumption of ASF during the fasting periods (D'Haene et al., 2019;

Desalegn et al., 2019). Although pregnant women and children under 7 are largely exempted (D'Haene et al., 2019), fasting is a sign of religious devoutness and households do not want their neighbors observing the smell of cooked meat coming from their homes (CARE 2014). In addition, beliefs of the Virgin Mary attending births prevent mothers from putting babies at the breast immediately, as a sign of respect to her (CARE 2014). A formative research conducted by IFPRI (2010) in the Tigray region of Ethiopia on influencers of feeding practices identified major misconceptions regarding IYCF to include, the belief that feeding breastmilk without adding fenugreek juice results in intestinal worms. In addition, the belief that breastfeeding sick children only made them worse prevent mothers from increasing breastfeeds as recommended by WHO (IFPRI, 2010). Further, there is a widespread belief that children cannot chew and digest meat or other animal source foods or thick porridge as these would choke the child. In addition, mothers would bottle-feed sick children with the belief that bottles are more hygienic than their breasts. Finally, the training provided to HEW focuses on treatment of malnutrition rather than prevention and so there is a general lack of capacity to provide counseling on positive feeding practices to prevent malnutrition (IFPRI, 2010).

2.3 Water, Sanitation, Hygiene and Stunting

Globally, poor nutrition, water quality, sanitation, hygiene (WASH) have together been identified as key risk factors for morbidity and mortality in early childhood (Lim et al., 2012). A growing body of evidence suggests that WASH are important determinants of childhood stunting. Nutrition interventions alone fall far short of improving linear growth and other nutritional indicators, particularly among children in low-income countries who suffer repeated enteric infections acquired through unsanitary environments. In low-

income countries, diarrhea incidence is highly common in the first 2 years of life (Walker et al., 2015) when the stunting process is also concentrated. Observational studies show that repeated episodes of diarrhea or parasitic infection are associated with increased risk of stunting (Checkley et al., 2008) due to nutrient malabsorption and diversion of energy and nutrients from growth to the immune system to fight the infection (Arnold et al., 2013). Mounting evidence that nutritional interventions prevent only a fraction of growth faltering in low-income populations, has influenced to the research community to focus emerging research on the effect of WASH interventions on child growth. In relation to this, three biological pathways that link poor WASH to childhood stunting are explored; 1) repeated bouts of diarrhea (Checkley et al., 2008); 2) soil-transmitted helminth infections (Ziegelbauer et al., 2012) and 3) subclinical gut infections or environmental enteric dysfunction (EED) (Abeway, Gebremichael, Murugan, Assefa, & Adinew, 2018; Dewey & Adu-Afarwuah, 2008; Esrey, Habicht, & Casella, 1992; Humphrey, 2009; Lin et al., 2013; Lunn, 2000; Mbuya & Humphrey, 2016). Although there is evidence that strongly associates specific diarrheagenic pathogens and helminthiasis with growth faltering in children, there is a growing appreciation of the key role that EED plays in the causal mechanism linking WASH to child growth (Lin et al., 2013). There are also multiple social and economic mechanisms by which poor access to WASH can increase the risk of stunting.

2.4 Environmental Enteric Dysfunction

2.4.1 Overview

Environmental enteric dysfunction (EED) is a subclinical condition of the small intestine that alters its architecture and functionality, flattening the intestinal villi and changes the

gut microbiota, causing persistent inflammatory status within the body (Crane, Jones, & Berkley, 2015; Denno et al., 2017; Korpe & Petri, 2012; Ordiz et al., 2016; Owino et al., 2016; Ramakrishna, Venkataraman, & Mukhopadhya, 2006). First discovered in the 1960s, the condition was first named Tropical Enteropathy (Cumming & Cairncross, 2016; Korpe & Petri, 2012; Lunn, Northrop-Clewes, & Downes, 1991). The name was changed to Environmental Enteropathy in the late 2000s when it was realized that the environment had more to with it and could be found in other climates besides the tropics (Crane et al., 2015; Cumming & Cairncross, 2016). The result of EED is reduced capacity of the villi to absorb nutrients and permeability of the intestinal barrier allowing the translocation of microbes into the blood stream (Budge et al., 2019; Crane et al., 2015; Korpe & Petri, 2012; Oz, 2017; Prendergast et al., 2015). EED is thought to be caused by chronic exposure to bacterial pathogens in their environment from human and animal feces (Budge et al., 2019; Crane et al., 2015; Humphrey et al., 2015; Korpe & Petri, 2012; Lunn, 2000; Mbuya & Humphrey, 2016; Mduma et al., 2014; Oz, 2017; Prendergast et al., 2015; Reid, Orgle, et al., 2018). The combined effect of these processes may impair a child's ability to effectively utilize nutrients in the existing diet for growth and development (Arnold et al., 2013). Repeated bouts of infection may result in permanent bowel infection of the mucosal tissue and may impact the mucosal immune systems.

Enteric dysfunction, is often present early in life (condition has been found in children as young as age 8 months (Lunn, 2000). The condition presents with or without any overt clinical symptoms and therefore referred to as 'a silent enemy' (Crane et al., 2015). EED affects mostly children in the developing world with implications for linear growth and may be an underlying factor in over 21% of child deaths (Budge et al., 2019; R. K.

Campbell et al., 2017; Crane et al., 2015; Mbuya & Humphrey, 2016). Children with EED are twice as likely to become stunted than children without the condition (R. K. Campbell et al., 2017). EED is also thought to reduce the efficacy of oral vaccines in low and middle income countries and explains higher levels of serious infection in malnourished children (Crane et al., 2015; Korpe & Petri, 2012).

Although there is limited evidence documented from research or programs on the effect of the household environment on child nutritional outcomes, poor sanitation, hygiene and water quality collectively constitute a household environment which can predispose young children to the risk of developing EED. Increasing evidence suggests EED is a critical factor underlying poor growth, potentially bearing the greatest effect in the stunting pathway (Campbell et al., 2003) and there are indications that EED rather than diarrhea (and related clinical conditions) is an underlying cause of stunting as children are more likely to recover from bouts of diarrhea than from the more chronic condition, EED (Syed et al., 2016).

2.4.2 Pathogenesis of EED

Although EED is yet to be well understood, there are indications that chronic inflammation is linked to EED and may be caused by resistant exposure to and ingestion of feces (Esrey et al., 1992; Lin et al., 2013; Syed et al., 2016). In low-income settings, fecal, and thus pathogenic, contamination of the domestic environment including the soil or floor is common, making infant ingestion of microbes widespread. A study in Bangladesh indicated that those who shared their sleeping quarters with animals were also more likely to have higher levels of EED (Lin et al., 2013)

In addition, the contamination of every-day items in the home environment such as toys, feeding and cooking utensils, as well as the hands of caregivers or infants themselves promote fecal contamination (Budge et al., 2019; Reid, Orgle, et al., 2018)

Furthermore, domestic animals in these environments are also a major source of contamination, increasing pathogen load and the likelihood of microbial ingestion (Berrilli et al., 2012). Studies in rural Bangladesh (George et al., 2015) and Malawi (Ordiz et al., 2016) both showed that children in households with animals in the sleeping area had significant associations with EED. A study of infants in Lesotho also showed a stronger correlation between children's growth and family access to a latrine than with clean water (Esrey et al., 1992). The IFPRI, Alive and Thrive project evaluation (2014) from Bangladesh, Vietnam and Ethiopia showed a negative association between presence of feces in the household with child height for-age Z scores in Ethiopia (β= -0.22) and suggests that a combination of "free roaming animals and poor hygiene and practices" may contribute to EED (Headey et al., 2017)

Studies that included observations in a number of countries found children eating soil that may be contaminated by animal or human feces from wandering animals or laundry water from soiled baby diapers are more at risk from EED and gut infections than from drinking unclean water (Humphrey et al., 2015; Ngure et al., 2013; Reid, Orgle, et al., 2018). Table 2-1 below indicates the presence of significantly higher amounts of E.coli in chicken feces and soil from laundry area (from soiled nappies) than from contaminated water.

Table 2-1 Observation of a one year old Zimbabwean child at play on a typical day

	Quantity	E. coli*
chicken feces	1 gm	13,800,000
laundry area soil	20 gm	2,340
contaminated water	400 ml	800

Source: (Ngure et al., 2013) Used with permission

2.5 Association between EED and stunting

Although the exact mechanism by which intestinal permeability and inflammation affect growth is uncertain, several feasible mechanisms have been suggested to link the causal pathway between EED and stunting, as shown in Figure 5 (Budge et al., 2019). EED has in recent years been implicated in several studies as the missing piece linking WASH to child growth (Humphrey, 2009). One observational study in Bangladesh has shown that children living in households with improved WASH are both less likely to have EED, (measured by lactulose: mannitol ratios in their urine) and are less likely to be stunted (Lin et al., 2013).

Another proposed causal mechanism to EED is continuous exposure to fecal matter through the fecal-oral route of transmission, leading to small intestine bacterial overgrowth, which in itself has been associated with growth faltering (Donowitz et al., 2016). On the other hand, chronic fecal exposure may cause changes in gut microbiota quality (Petri et al., 2008; Watanabe & Petri, 2016); microbiota immaturity correlated with both

malnutrition and stunting in Bangladesh (Lin et al., 2013; Subramanian et al., 2014) and Malawi (Blanton et al., 2016).

2.6 Community Knowledge, Attitude and Practices

Findings from the qualitative evaluation of the USAID ENGINE (2014) project in 4 Ethiopian regions (including Amhara) concluded that only 2% of households studied in the 42 woredas had access to improved sanitation facilities, which is much lower that the already low national rates of 8.3 %. Living quarters are typically made up of a cluster of houses of different families on the same compound, who may or may not be related (USAID, 2014). Unsanitary conditions, including open defecation (as many households do not own/ use latrines) and feces from roaming animals also attract flies that settle on children (Hajduk 2014). An observation during the USAID ENGINE project evaluation (2014) counted up to 60 flies on one child.

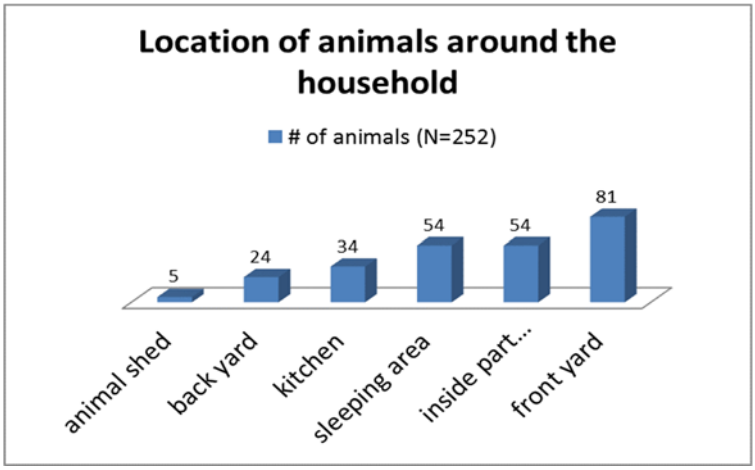
Image 1: Child playing with sheep feces nearby (Photograph cited in Hajduk 2014: used with permission)

Many households sleep and cook in the same dwelling as their animals (CARE, 2014; Hadjuk, 2014; USAID, 2014). In most cases there is some sort of demarcation between the human and animal spaces. In addition, small animals such as chickens and goats are left to wander in the compound (CARE, 2014; Hadjuk, 2014; USAID, 2014). Women and children can also be observed mixing cow dung for cow dung cakes (used for

fuel) with their bare hands. A 2014 study conducted to assess possible pathways of fecal-oral contamination among children under 2 as well as, parenting and animal husbandry practices in the Amhara region of South Gondar (Hajduk 2014)

Figure 2-3 Location of animals around the household

Source - Hajduk 2014 (Used with permission)



Due to mothers' heavy workload, they often leave children to be attended to by secondary care givers who are usually an older sister or may be left playing by themselves on the floor of the compound. Mothers admit knowing that in these circumstances, children may eat soil, animal feces or their own feces (Hajduk 2014).

Image 2: Unsanitary conditions attract flies that settle on children

Source - Hajduk 2014 (Used with permission)

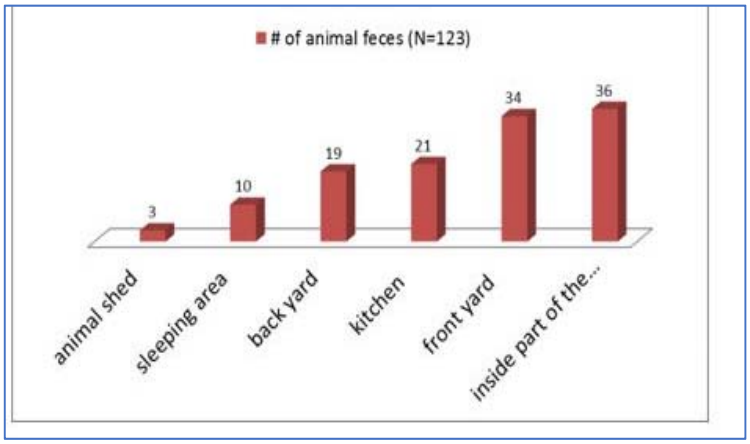
A study conducted in eastern Zambia by Reid and colleagues (2018), using observation of 30 households showed that nearly 50% of children observed "ingested 6.1 ± 2.5 (mean ±SD) pieces of soil or stone" from compounds shared with roaming animals. Observation also found that

of the 30 households, 28 had access to latrines but over 60% did not use them (Reid et al 2018).

Barriers to reducing the risk of children from fecal exposure are usually dictated by social norms, perception, time and financial factors (Reid, Orgle, et al., 2018).

Figure 2-4 Location of animal feces around the household

(Source - Hajduk 2014: Used with permission)



Although many parents agree that eating feces is dangerous for their children they believe the benefits households realize from keeping animals in such close proximity far outweighs any risks posed to the heath of the children (CARE 2014). Besides, households do not know of alternatives to keeping animals in such close proximity (USAID, 2014). In Ethiopia, when asked about which animal feces they considered dangerous to the health of children, they mentioned cat, chicken, donkey and dog feces. In their view, feces from these animals have an offensive smell because they eat everything (Hadjuk, 2014). They considered the feces of cattle as not so dangerous because cattle are ‘blessed” and while their feces do not smell, they are very useful in composting, plastering houses, and for fuel (Hajduk 2014). For some parents, the risk of animals co-habiting with children included common colds caused by the bad smell of feces. Others cited the physical attacks on children by the animals. The study also found that more educated parents however made positive associations between

children's illnesses and exposure to animal feces. Caregivers often do not wash their hands before feeding children (USAID, 2014).

In general, however, parents in all countries studied (Reid, Orgle, et al., 2018; USAID, 2014) felt a need for and wanted more separation between children and animals. Despite this, many felt this was impossible given their environments and economic circumstances.

2.7 Potential WASH interventions to address stunting

Several observational studies have noted significant associations between WASH and stunting. For example, an observational study in Lesotho showed that the biggest factor contributing to positive child growth was ownership of a latrine by the child's family (Esrey et al., 1992) and in Bangladesh, another study found higher rates of stunting among children whose households had more fecal contamination (Lin et al., 2013). Despite these positive associations, intervention research has failed to detect consistent, statistically significant reduction in stunting (Cumming & Cairncross, 2016; Langford, Lunn, & Panter-Brick, 2011). For instance, a meta-analysis of data from 14 studies in 10 low and middle-income countries indicated that a cluster-randomized controlled trials which implemented WASH intervention, over a 9-12 month period, resulted in small benefits of WASH interventions (solar disinfection of water, provision of soap, and improvement of water quality, specifically) on length growth in children under five years of age (Dangour et al., 2013).

2.8 Potential interventions to address EED and Stunting

The economic and human costs associated with chronic enteric infections and their potential effects on national and global childhood growth and development makes the calls to find effective approaches to interrupting oral-fecal microbial transmission pathways

very urgent (Petri et al., 2008). With about 1.8 billion of the world's population continuing to drink fecally contaminated water (only 68% of the world's population has access to clean water) or living in with constant exposure to feces, efforts to reduce the risk of EED will continue to be an uphill task for a long time (Denno et al., 2017)

It has been suggested that nutritional interventions such as adequate dietary intakes may contribute to strengthening the epithelial barrier integrity and the immune response; compensating for malabsorption, reallocation or losses of key nutrients during infections. Subsequently, adequate nutrition may likely accelerate gut repair following infections; and favoring the growth of beneficial gut microorganisms (Dewey & Mayers, 2011). Evidence is however mixed on improvements in gut function following nutrition interventions (Crane et al., 2015; Thurnham, Northrop-Clewes, McCullough, Das, & Lunn, 2000; van der Merwe et al., 2013) (Manary et al., 2010) and it is unclear from published reports whether such nutrition studies met their stated objectives.

A key conclusion from the 2014 USAID funded ENGINE (Empowering New Generations to Improve Nutrition and Economic Opportunities) project suggests that hygiene education projects should have an equal focus on 'awareness' and 'behavior' (support to communities to adopt simple and doable practices), to enhance existing positive practices and systems that reduce children's exposure to feces and those that ensure that proposed interventions do not increase women's time load.

Whiles some piloted interventions, that promoted safe and hygienic play spaces for children (Reid, Orgle, et al., 2018; Reid, Seu, et al., 2018), and the Sanitation, Hygiene, Infant Nutrition Efficacy (SHINE) trial, showed some positive impact on reducing child exposure to feces, the efficacy of such interventions in reducing the presence of EED or

stunting among children need to be explored further (Budge et al., 2019; Cumming et al., 2019; Pickering, 2019). Whilst play-yard interventions have focused on households, 'WASH Pals' have suggested that a community wide approach may be more effective (achieving a "herd effect") (Budge 2019). Considering that women are primary care givers and may be responsible for maintaining play-yards, these household interventions may also impact negatively on women's workload, although further research is needed to explore this (Reid, Seu, et al., 2018). Community-wide play space may also be easier to keep clean rather than individual spaces and may provide opportunities to leverage community wide participation and behavior change (Budge 2019).

The 2013 Lancet series concludes that it is almost impossible to address stunting without addressing its underlying causes. Bhutta and colleagues (2008), in the Lancet Maternal and Child Undernutrition Series recently estimated that sanitation and hygiene interventions implemented with 99% coverage would reduce diarrhea incidence by 30%, which would in turn decrease the prevalence of stunting by only 2.4%.Traditional WASH practices such as increasing access to clean water and basic sanitation have generally focused on individual households rather than entire populations (Cumming et al., 2019). In a non-randomized experimental study conducted in Ethiopia, a WASH intervention delivered with sanitation education, handwashing with soap, availability of sanitary facilities, clean environment, and separate housing of animals showed a mean gain of 0.33 Z scores in height over a 5-year period among young children age 6-36 months (p=0.02) when compared to the control group (Fenn, Bulti, Nduna, Duffield, & Watson, 2012). Results from WASH-Benefits study indicated that HAZ scores at 2 years were higher in the combined water, sanitation, handwashing, and nutrition intervention versus control

(Arnold et al., 2013). In that study, the intervention effect became more significant at 2 years after the intervention when changing infant behaviors increased exposure risks over time (Luby et al., 2018). Further, a SHINE related study on 'Independent and Combined effects of improved water, sanitation, and hygiene, and improved complementary feeding on child stunting and anemia' showed no effect on diarrhea. The study however showed stunting reductions of up to 8 percent points among children who received infant and young child feeding interventions but no effect on stunting outcomes from WASH interventions. (Humphrey et al., 2019).

Latest results from the 3 largest-scale, high quality trials found that basic WASH interventions had no impact on stunting and minimal mixed effect on diarrhea (Cumming et al., 2019; Humphrey et al., 2019). In their response to the report by Cumming and his colleagues (2019), Wilson-Jones et al (2019) conclude that the findings from the 3 large-scale studies (WASH-Benefits, SHINE) reinforce the need to examine the outcomes in a wider context (Wilson-Jones et al., 2019). Cumming and Wilson-Jones and their colleagues agree on the need for more comprehensive and multisectoral approaches.

During the first 2 years of life when young children are most vulnerable to environmental contaminants, identifying dominant fecal–oral exposure pathways is the first step in identifying effective WASH interventions. Several studies in low- and middle-income countries have demonstrated this. In Zimbabwe, one study to assess fecal–oral exposure among young children highlighted the risks associated with the consumption of soil – geophagia – and animal waste in peri-domestic areas (Cumming et al., 2019). A number of studies in Mali (Toure, Coulibaly, Arby, Maiga, & Cairncross, 2013) and in Bangladesh (Islam et al., 2013) have also highlighted the risk to this age group posed by often highly

contaminated weaning or complementary food. Studies show that the practice of unsafe disposal of children's feces, often considered to be less pathogenic than those of adults (Brown, Barner, & Shepherd, 2003) is also on the increase. It is important for WASH interventions that target such critical exposure points for young children to be implemented in combination with nutrition-specific interventions such as improved feeding practices to eliminate stunting.

The problem of fecal matter and animal husbandry needs to be largely considered if we are to eliminate stunting (Budge et al., 2019). The importance of timing in implementing such WASH interventions cannot be over emphasized. With the knowledge that EED may be caused by fecal-oral contamination, researchers have suggested that a key intervention to reduce risk of contamination is to identify and disrupt the fecal-oral pathway for transmission especially during the period when stunting takes place (within the first 2 years of life) (Mbuya & Humphrey, 2016; Owino et al., 2016).

Thus, although WASH interventions by themselves have little impact on stunting, testing and scaling up sanitation practices across entire populations may significantly contribute to reduced risk of EED. There is a general consensus that WASH interventions that effectively disrupt pathogen exposure, particularly those that address the contribution of animals to domestic contamination, should be at the heart of comprehensive nutrition-specific and nutrition-sensitive intervention efforts for the reduction of stunting in developing countries (Budge et al., 2019; Cumming et al., 2019; Humphrey et al., 2015; Owino et al., 2016). Despite this knowledge and consensus, there have been few WASH programs to date that address infant and child pathogen exposure (Budge et al., 2019) and current evidence suggests that basic WASH interventions by themselves, are unlikely to

achieve impact on stunting in low income countries (Cumming et al., 2019; Humphrey et al., 2019). It is important for such future interventions to be baby-focused, targeting child growth during the first 1000 days where exposure is rife. In environments with high levels of contamination, disrupting a single pathway may not be productive (Cumming et al., 2019). Disrupting multiple transmission pathways, including, recognizing that specific interventions are required for specifications transmission routes may be significant (Budge et al., 2019; Wilson-Jones et al., 2019).

More research is needed to unfold how WASH interventions might be targeted or modified to best support efforts in the nutrition sector. Reaching and protecting children at risk of stunting may require interventions that go beyond the scope of the traditional package of WASH interventions, to ensure they are targeted before or when growth faltering occurs and are protected against exposure to enteric pathogens (Cumming et al., 2019).

2.9 Women's Empowerment and Child Nutritional Outcomes

Emerging research has shown that the low status of women and their disempowerment are highly associated with poor health outcomes (Lailulo, Susuman, & Blignaut, 2015). Evidence also indicates positive associations between increases in women's empowerment and improved nutrition outcomes and in recent years, empowering women has become an important part of nutrition-sensitive programs aimed at improving child nutrition outcomes in low- and middle-income countries (IFPRI, 2013).

Baseline and Formative Research conducted by the CARE Nutrition at the Center program indicated that women in the Amhara region have limited to no access to credit, education and other opportunities (CARE, 2014). This, as well as women's unequal power relations and negative gender norms limit women's autonomy over household decisions and ability

to purchase nutritional foods may explain the high rates of stunting in that region. These factors that disadvantage women also create barriers to adopting positive practices (CARE, 2014).

A cluster-randomized controlled trial conducted in Burkina Faso to assess the effect of women's empowerment (WE) on reducing wasting and improving anemia among children 3-12 months, showed that WE, particularly spousal communication contributed to reductions in stunting (Heckert et al). A WE study in Nepal, which measured project outcomes against 3 of the 10 Women's Empowerment in Agriculture Index (WEAI) domains also found significant associations with increased child nutrition (Cunningham et al., 2015). In a more recent study (Cunningham et al., 2019) using the WEAI's Five Domains of Empowerment (5DE) sub-index, measures, it was found that empowered women had better WASH practices and consequently improved nutritional outcomes (child LAZ) than non-empowered women (Cunningham et al., 2019). Other studies in conducted in Pakistan (Shafiq et al., 2019), and in India (Gupta, Vemireddy, & Pingali, 2019), (using a context specific abbreviated women's empowerment in Agriculture index (A-WEAI) and Burkina Faso (van den Bold et al., 2015) all indicate a positive association WE and improved child nutrition. In India and Bangladesh, a study by Bhagowalia et. al (2018) also found a link between women's empowerment (and education) and maternal and child nutritional outcomes.

Conversely, the low socio-economic status of women in Ethiopia (2016 Ethiopia DHS), have been found to impact women's ability to take health and nutrition decisions, resulting in poor health and nutrition outcomes (Lailulo et al., 2015). Women's status is linked to a deeply patriarchal society where harmful traditional norms and practices generally deprive

women of essential productive resources (such as land, education, employment, health services, as well as protection of their rights) (Lailulo et al., 2015). This generally results in a lack of confidence and a generally accepted lower autonomy among girls and women, starting at a very early age. In essence, boys are brought up, with reinforced autonomy, whiles girls are 'socialized' to be submissive and accept roles that prepare them for a successful marriage (cooking and household chores), affecting their decision making power, and ability to speak up for themselves (Lailulo et al., 2015).

A study conducted in Southern Ethiopia examining associations with gender, household-structure and nutrition/health related variables showed associations between key WE indicators and maternal and child nutrition and health (Ersino et al., 2018). Study findings also showed that the low status of women and their disempowerment are highly associated with poor health outcomes. A study by Ersino et. al in Ethiopia also found a national nutrition program that has been in place since 2008, did not appear to have impacted malnutrition rates for child and maternal undernutrition, especially children. This may be explained by the prevailing Gender and socio-economic-demographic structure of the households, (such as power imbalances) and dietary habits. (Ersino et al., 2018). Religious beliefs and practices also exacerbate such practices that continue to keep women at the bottom of the socio-economic ladder (FAO, n.d.). Religious traditions strengthen men's roles and ownership of land, cattle and even decisions regarding the small animals women tend by placing women in subservient roles. Women can also not plough land and in the very rare chance that she owns land, has to rent it out and receive 30% of what a man would receive for renting out the same land (FAO, n.d.).

Despite associations made between WE and increased health and child nutritional status, the evidence is limited and there is still the need for additional studies to support the hypothesis that implementing WE interventions in nutritional programs will improve child nutritional outcomes (Cunningham et al., 2015; Heckert et al., 2019)

2.10 Women's Empowerment Interventions

Women's reproductive functions as well as gender roles make them primary caregivers of children in the household. As a result, women's status, including, ability to make decisions and negotiate intra-household dynamics directly impact theirs and the health and nutritional status of their children (Shiwakoti R 2017). Improving the empowerment of women increases their autonomy and household decision making authority (IFPRI, 2013; Shafiq et al., 2019). Women must however be enabled to play this role.

There is increasing evidence that women's empowerment interventions, especially those that promote economic empowerment and education have positive impact on women's health and nutrition and consequently child nutritional status and efforts to improve human capital (CARE, 2014; Jones et al., 2020; Shiwakoti R 2017; USAID, 2015; Yoong J., 2012). Maternal education increases women's autonomy in that it opens their minds to their rights as well as to information. Michie et. al (2011), in proposing the Behavior Change Wheel, also identify the 3 critical elements that influence behavior to be Capability, Opportunity and Motivation (Michie, van Stralen, & West, 2011),. Similarly, CARE and implementers of the Women Empowerment in Agriculture have identified critical elements as Agency (personal capacity), relations with power holders and structures (including at household, husband and mother in law) and the enabling environment (favorable policies and laws) (CARE Women's Empowerment Framework)

2.11 Village Savings and Loans Associations (VSLA)

Over the years, a number of platforms have been successfully piloted and implemented by development agencies to facilitate women's empowerment processes. These include Village Savings and Loans Associations, first implemented by CARE (CARE reports) in 1997 to promote economic empowerment by creating access to credit and increasing incomes for poor and marginalized women. The approach boosts participants' self-confidence and decision-making, whiles broadening their social and economic networks to positively affect peer learning and social support to adopt new and positive practices (Amaning TK, 2019; Karlan, Savonitto, Thuysbaert, & Udry, 2017).

2.12 Social Analysis and Action (SAA)

Negative social and gender practices that have adverse effects on health and nutritional outcomes are often entrenched in social and gender norms and beliefs and entrenched in power structures and relations. CARE's Social Analysis and Action process promotes gender equity through facilitated community dialogue to address gender, power and social norms that affect health and nutrition security, including negative household sanitation practices and inequitable intrahousehold food distribution (CARE SAA manual). The tool creates safe spaces for discussion, bringing together all stakeholders in the community – including men, grandmothers and traditional leaders – to respectively challenge these norms and promote positive practices. The process results in commitments by households and influential leaders to address inequalities and negative social and gender norms. Subsequently, community members and leaders are supported by facilitators to create plans for implementing those plans. (Michie et al., 2011))

2.13 Measuring Women's Empowerment

The first comprehensive standardized tools for measuring Women's empowerment, the Women's Empowerment in Agriculture Index (WEAI), was launched by the International Food Policy Research Institute (IFPRI), the Oxford Poverty and Human Development Initiative (OPHI) and USAID's Feed the Future in February 2012 (IFPRI, 2012). Following this, the complementary tool, Project Level Women's Empowerment in Agriculture Index (Pro-WEAI) was jointly launched in April 2018 with Gender, Agriculture and Assets Project, Phase 2 (GAAP2) to measure women's empowerment in project settings. It identifies areas of disempowerment and designs strategies for addressing these and monitoring outcomes from their implementation. The tool is made up of 12 indicators that measure 3 types of Agency (Intrinsic agency (power within); Instrumental agency (power to) and Collective agency (power with) (IFPRI, 2018) that align with the 3 domains of CARE's Gender Empowerment Framework (GEF).

2.14 Conclusion

Studies, globally and in Ethiopia, attribute high levels of stunting to a combination of factors, mainly poor feeding practices, poor sanitation and animal husbandry practices, as well as negative social and gender norms. Previous stunting interventions have not been sufficiently gender transformative and may explain the lower than expected outcomes of interventions. It is suggested that, as primary care givers of children, interventions that empower women to participate in household decisions and address intrahousehold power dynamics will result in better nutritional outcomes for women and children. Further, current data does not sufficiently establish associations between WASH/ EED and stunting. Researchers are unanimous in their agreement that there is the need for additional research

to better understand these associations (Cumming et al., 2019; Cunningham et al., 2015; Heckert et al., 2019). It is therefore expected that this proposed study will add to the body of evidence that would enable policy makers make informed decisions and investments to address stunting.

3 METHODOLOGY

3.1 Background of Funding for Nutrition

Mounting evidence of the consequences of malnutrition more broadly, and stunting specifically, have done little to increase global spending on nutrition. Current investments in global nutrition are inadequate and constitute a major hurdle to achieving the global target of 40% reduction in stunting among children under 5 years by 2025 (Gates, n.d.). A partnership of the Gates Foundation, World bank, Results for Development Institute and 1,000 Days, have estimated the need for $8.50 per child per year to meet the global stunting targets. Consequently, it would cost $49.5 billion over a period of 10 years, (an increase of $4.8 billion in annual spending from the current funding) to scale up key stunting interventions to meet the Sustainable Development Goal (SDG) goal 2 (Shekar et al., 2017). Despite unprecedented global commitment to improving nutrition in recent years, the spending gap persists and official development assistance (ODA) spending remains at only 0.5%[1].

So far, limited funds are primarily earmarked by donors, either for research or implementation of projects, leaving few opportunities for action-research. On a positive note, major bilateral donors have successfully attracted global attention to the problem malnutrition. This has resulted in a wide range of partnerships and commitments by institutions such as the "World Health Assembly (WHA), who adopted the Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition (MIYCN) in 2012 and the UN, who negotiated the Sustainable Development Goals in 2015. Others include

[1] Eleanor Crook Foundation RISE for Nutrition RFA 2018

the UN General Assembly, who proclaimed 2016-2025 the UN Decade of Action on Nutrition"[2]. The United Kingdom's Department for International Development (DFID) and the United States Agency for International Development (USAID) have also played key roles in setting the global agenda and prioritizing nutrition across multi-sectors. Further, DFID and USAID have mobilized global commitment and secured multi-stakeholder commitment to fund implementation. [3].

In 2003, the African governing states, through the Comprehensive Africa Agriculture Development Program (CAADP), committed at least 10% of their national budgets to Agriculture and Food Security[4]. Private foundations and multilateral agencies such as the World bank and the African Development Bank (AfDB) have also joined the push to improve global nutritional status. Current funders also include a number of private, individual and innovative foundations such as the Bill and Melinda Gates Foundation and Child Investment Fund Foundation. Others are the UK based Power of Nutrition, Global Child Nutrition Foundation and others. At the Global Nutrition Summit in 2017, Eleanor Crook Foundation (ECF) pledged to invest $100m in nutrition by 2030.

3.2 Summary of Grant Announcement

The Eleanor Crook Foundation (ECF), a US-based family foundation that supports innovative solutions to hunger and malnutrition, launched the Research, Innovate, Scale and Establish (RISE) for Nutrition grant portfolio in 2016. The goal of RISE is "to improve

[2] Eleanor Crook Foundation RISE for Nutrition RFA 2018
[3] ECF RISE for Nutrition RFA 2018
[4] ECF RISE for Nutrition RFA 2018

the nutritional status of vulnerable populations in East Africa"[5] by bridging the gap between proven nutrition interventions and getting those interventions to those who need them most. The aim of the Request for Applications (RFA) is to design, implement and test innovative research projects that increase the effectiveness of nutrition interventions in East Africa and have a potential to take them to scale. Based on WHO and Global Fund definitions, "Implementation Research" is defined by ECF as research that seeks to field test the "feasibility, acceptability, effectiveness and/or efficiency of innovations to enhance the effectiveness of an intervention". ECF defines scaling as "deliberate efforts to benefit significant numbers of people and communities with access to effective nutrition innovations that have been tested through rigorous research". Further, according to ECF, sustainability is "the ability to maintain services and benefits over time".

ECF will award up to three, 3.5 year grants of up to $1,350,000 each, from any of ECF's priority countries in East Africa (Ethiopia, Kenya, Rwanda, Uganda, South Sudan, Somalia, Tanzania, Sudan). Selection of grantees will be made through a 5-step process (call for concept notes; shortlisting of semi-finalists to develop full proposals; scoring and selection of finalists; and a final grant refinement process for ECF and prospective grantees to agree on final implementation and research modalities).

This grant proposal is submitted by CARE (Cooperative for Assistance and Relief Everywhere) USA, for funding in response to the RISE for Nutrition Request for Applications (RFA) by the ECF for 2018. In addition, the RFA provides opportunity for CARE to carry out research in the context of implementing a project aimed at reducing stunting through specific interventions. As a development organization, CARE is well

[5] ECF RFA 2018

placed to scale up proven practices across the 86 countries and 5 geographical regions in which CARE works, thus proven interventions to scale and multiplying impact.

3.3 Methodology for the Grant Review Process

Reviewers with diverse expertise and experience were drawn from academia and practitioners in the fields of global health and development. Reviewers' experience include maternal and child nutrition and health, nutrition and food security, gender, and proposal development. All reviewers received the grant proposal in the second week of March 2020 and were given 1 week to provide feedback. Reviewers were provided with a review pack consisting of;

1. ECF Request for Applications (RFA) (Appendix A)
2. Review Guide/Summary containing the RFA outline of technical content and format as well as the selection criteria and ECF Scaling Conceptual Model (Appendix B)
3. Reviewer comments template based on ECF's own criteria for selection of grantees (Table 3-1) Request for reviews and responses were shared through email and individual feedback was provided by reviewers to the grant writer/applicant.

Table 3-1 Grant Review Criteria Template

Reviewers' Name:				
Criteria	Required Score	Definition	Assigned Score	Reviewer Comments
Strength of project design	30%	The clarity and strength of the evidence-based description of need in the target area; Rigor and soundness of • proposed hypothesis, • study design methodology; Clarity in participant targeting and sampling; Effectiveness of efforts to leverage existing government systems and staff; Strength of proposed monitoring and evaluation efforts.		
Impact	30%	The relevance, creativity and novelty of the proposed innovation and how well it addresses an existing gap or challenge; Likely feasibility and achievability of positive results and the likelihood that the implementation research will generate substantial, scalable and sustainable impact on the issues existing in the global nutrition space.		
Scale and	20%	The extent to which realistic scaling and sustainability of the proposed innovation is considered according to the 'ECF		

sustainability		Grantee Guidance Series: Theory of Sustainability and Theory of Scale' (found in Appendix B: Review Guide)		
Partner capacity and past experience	20%	The demonstrated capacity of the partner to effectively manage and implement the proposed project; Ability to leverage high-capacity academic research or other institutional partners; Clear demonstrated past performance in nutrition-specific projects and institutional research capacity; Likelihood of ECF being able to work alongside the applicant as an equal thought partner.		

3.4 Grant Reviewers

A total of 5 grant reviewers with varying expertise and specialties pertaining to this thesis were selected.

Table 3-2 List of Grant Reviewers

Name	**Professional title and affiliation**	**Relevant expertise**	**Role**
Amy Webb Girard PhD.	Associate Professor, Rollins School of Public Health, Emory University	Over 20 years' experience in global health, epidemiology and maternal and child nutrition research, program development and evaluation including grant proposal development	Thesis Chair

Thomas Schaetzel PhD.	Director, Nutrition, CARE USA	Nutrition expert with over 30 years' experience in global health, agriculture and maternal and child nutrition programming and research as well as grant proposal development.	Thesis Field Advisor
Maureen Miruka PhD.	Director, Gender, Youth and Livelihoods, CARE USA	Food security and gender expert with over 20 years field experience in gender programing and research implementation in several lower and middle income countries.	Review Gender component of the research
Eugenia Maku Ocansey-Demuyako PhD.	Nutrition Scientist, International Micronutrient Malnutrition Prevention and Control Program (IMMPaCt), Centers for Disease Control and Prevention (CDC)	Nutrition specialist with a broad range of nutrition research experience in international settings, including, population based surveys and assessments; and the design, monitoring and evaluation of micronutrient and nutrition programs.	Review research methods
Glavdia Greatchens Delva, MD, MPH.	Senior Laboratory Specialist at the International Laboratory Branch (ILB), Centers for Disease Control and Prevention (CDC)	Laboratory Scientist with more than 10 years of experience in Public Health laboratory systems strengthening, disease surveillance, research investigation, population-based surveys and in in low, middle- and high-income settings; and implementing cutting-edge serologic and molecular technologies for infectious diseases surveillance.	Review research methods

3.5 Protection of Human Subjects

3.5.1 Human subjects involvement, characteristics and design

a) **Human subjects involvement characteristics:** The proposal seeks to implement and test interventions that reduce fecal oral contamination and, consequently, stunting among children under 5 in Ethiopia. A quasi-experimental, cross-sectional design will be used for the study. A total study sample of 4,730 children under 5 years will be selected from project participating households to participate in the study from all 3 woreda; Ebinat, Simada (intervention sites) and Tach Gayint (control site). Project interventions will however target mothers/ primary care givers whose actions directly affect the lives of children.

Design: The study sample population will be drawn from the total population of 20,000 households to be reached by project interventions. The sample size of the study would allow equal group sizes for the study. The current prevalence of stunting in Amhara Region is 46%. (Ethiopia Demographic Health Survey 2016). A 10% reduction in the stunting prevalence is assumed for the study arm 2 as a result of the 42 month intervention. Assuming a 90% confidence, and power of 0.80, 297 individuals will be needed in each group to detect a 10% difference between groups in study arms 2 and 3. A 5% difference is expected for study arm 1 comparison with the non-intervention group (study arm 3), requiring 1,213 individuals per group with the same confidence and power parameters. Comparisons between study arms 1 and 2 would represent a 5% difference in stunting prevalence, requiring 1,213 individuals (same as for the study arm 2 and 3 comparison), again based on the same parameters. We will increase the

number of individuals in each group to 1,819 (50% increase) to allow for the design effect associated with multi-stage sampling. Sample size calculations are based on a confidence of 90% ($\alpha = 0.10$) rather than the more common 95%. Accepting a larger probability of α reduces the probability of wrongly failing to conclude that a difference exists between groups when in fact it does. In a clinical setting the emphasis is on being sure the tested intervention is beneficial if it will replace a current regimen, but for a social program the emphasis is on being sure not to miss an effect that could be beneficial (CDC 2011). In addition, social program evaluation also have the added advantage of a smaller sample size than sample sizes required to achieve a higher confidence level, thus reducing costs.

Inclusion Criteria

- Participating households with children between 6 and of 59 months
- Participating child must be residing with their biological mother or other primary care giver (e.g. grandmother/ aunt/ other female relative)
- Participating woman/ household should have resided in the study area for, at least, the past 6 months

Exclusion Criteria

- Children with severe or moderate malnutrition (wasting or underweight)
- Children with other chronic diseases or conditions, including HIV/AIDS and disabilities.

b) Justification of the involvement of children and women: Stunting takes place in the first 1,000 days (from conception to 24 months) of a child's life. These first 1,000 days are therefore a critical window for policy makers, implementers, care givers and other stakeholders to take timely action. Opportunities missed during this phase of child development is difficult to recover. Although it is almost impossible to reverse, there are still opportunities in the child's life to address some of the effects of stunting. Women bear children and are the primary caregivers of children. Whilst stunting affects children, children are helpless participants – they do not have the ability to control their stunting in anyway. It is often the actions or non-actions of their care givers that results in child stunting. It is therefore critical that proven practices and recommended behavior be directed towards caregivers. As a result, women and children are central to this program intervention and study.

c) Approval of the Study/ Interventions before Project Implementation and Research: An application for Ethical clearance will be submitted to the Institutional Review Board (IRB) in Addis Ababa in Ethiopia. The IRB will review and approve the project interventions and tests to be carried out before the initiation of the project

3.5.2 Recruiting and informing subjects of study or program

a) **Plan for Recruitment:** CARE will work in partnership with Bahir Dar University College of Medicine and Health Sciences. A Memorandum of Understanding (MOU) will be signed between CARE and the University to outline the roles and responsibilities for the study. Recruitment of human subjects will be

performed by CARE country office in Ethiopia. Participating households will be identified using a combination of existing (CARE) program enrollee information (e.g. program lists or households rosters), health center records and with assistance of government officials, local leaders and or village health volunteers. All households with children under five years of age, meeting the inclusion criteria, will be eligible to participate in program activities. Recruitment and training of the enumerators and the study team will be done jointly by staff from CARE and the University, and will include:

- Taking and documenting Anthropometric measurements
- Use of electronic devices for data entry
- Identification of the selected participants for the interview
- Informed consent forms
- Questionnaire administration and interviewing techniques
- Child safeguarding

All field staff and coordinators will participate in a two-week training including orientation to the study design, household and community-based activities, sensitization of the selected participants and communities, the selection process of participating groups in the selected research areas, and the informed consent process. The training will include classroom-based training and field-based practical training and pilot testing. A comprehensive manual will be used to train field staff. This manual will include topics on length and weight measurements, facilitating focus group

interviews, conducting in-depth interviews, instructions on how to complete each question, tape recording, note taking and how to enter data directly on tablets.

b) **Consent:** Mothers/caregivers or responsible household representative will have the study procedures and purpose of the program explained to them in the local language/ dialect and will be given the opportunity to ask questions. In addition, their consent to proceed would be sought, in written or oral form (and recorded) before data and human specimen (urine) collection or test processes (including administering oral sugars) begin. Participants are at liberty to opt out of the study at any time or to refuse to have their children tested at any time.

3.5.3 Human Specimens and data collection processes

a) Data to be collected: Anthropometric data and urine samples will be collected from participating children. Data and samples will be used to measure stunting and test for the EED, respectively. In addition, questionnaire will be used to collect data on project outcomes areas such as feeding and sanitation practices as well as household and community demographics and norms, including women's empowerment to understand the context and determine if and how these factors affect study outcomes.

b) Data Collection Process: Anthropometric measurements will be taken by trained research assistants using calibrated length boards and digital weighing scales to measure length and weight, respectively, using WHO recommended protocols based on the age of participating children. Child anthropometric measurements (weight, height) will determine nutritional status, specifically, height for age (stunting), for

children 18-59 months, at baseline and compared at end line. Trained nurses and laboratory technicians will administer Lactulose: Mannitol (L:M) tests to diagnose the presence or absence of EED in children. The dual sugar absorption test is the most widely accepted non-invasive test for EED. (Jimenez & Duggan, 2017) Although laborious, the test determines 2 key components – the intestine's ability to absorb ingested nutrients and the intactness of the gastrointestinal barrier which prevents microbial translocation into the blood stream. The test consists of oral administration of 2 sugars/ carbohydrates – lactulose and mannitol and testing of secreted sugars in urine samples. Urine samples will be collected before and 6 hours after administering oral sugars. Collected samples from the field will be transported to the University of Bahir Dar laboratory for analysis. Samples will be tested for the presence of gastrointestinal permeability and the infection of the mucosa of the GI systems in relation to EED in both intervention and control zones. (Jimenez, L., & Duggan, C. P. (2017). Lactulose is a large sugar that is normally not absorbed by a healthy gut. Mannitol, on the other hand, is a small sugar readily absorbed by the gut. The presence of lactulose in the urine indicates a leaky gut and mannitol in the urine shows the intestinal absorptive capacity. Higher L:M ratios may be indicative of abnormalities in absorption or, and, intestinal inflammation. As a result of the complication of the test, (including collecting urine that is not contaminated with feces), only children 24 – 59 months will participate in this test. Further, the sample of children participating in the test will be reduced to 20% to accommodate high costs associated with EED (L:M)

testing. As a result, a total sample of 1,091children between the ages of 24 – 59 months will be targeted for EED tests.

Anthropometric measures and L:M tests performed at baseline will be compared with tests at the end of the 3.5-year intervention period to determine changes in both stunting rates and intestinal status (presence or absence of EED). These measures and tests will help determine the effect of project interventions on EED and stunting.

Outcome data will be collected against pre-determined indicators to asses changes in feeding practices and women's empowerment at baseline and end line using questionnaires. These are based on UNICEF and WHO key recommended indicators for assessing optimal feeding practices. Women's Empowerment will be measured using key Pro-WEAI indicators to measure project outcomes designed in line with the 3 domains of CARE's women's empowerment framework.

All questionnaires and interview guides will be translated into Amharic and translated back into English (backward translation) to ensure that questions address issues exactly as intended and the original meaning of concepts is not lost in translation. Following this, the questionnaire will be pre-tested in the field to ensure that each question is understood by participants and in the same way by every enumerator and to maintain the validity and reliability of the tools. Survey tools will also be pre-tested in a nearby community and reviewed and revised before rolling out. In addition to laboratory experts and nurses who will conduct Anthropometric and EED measurements, enumerators will be recruited and trained to conduct interviews.

c) **Custody of human samples and materials:** Trained laboratory technicians from the Bahir Dar University College of Medicine and Health Sciences and health staff of the project will have access to both human samples and other data. Human specimens will be stored at the laboratories of the university hospital. Due to the sensitivity of these samples, only staff whose access to the materials is essential will have access to these human samples and materials.

d) **Data Entry and Management:** Questionnaire data and test results from anthropometric and EED tests will be collected using pre-programed tablets with the KOBO software. To address possible unreliable internet in the field, all tablets will use a sim card. Data will be uploaded into the central database (at the Department of Public Health Nutrition, of the Bahir Dar University) whenever data collectors are able to connect to the internet. This will allow enumerators to travel to reliable internet sources to upload data. Incorrect entries and missing data will be checked and verified on a systematic basis using range checks for values beyond permissible values and missing values. Digitally recorded data plus written notes will be written up and transcribed by enumerators immediately following interviews (within 24 hours) and uploaded to the secure server and a backup server. All data files will be routinely backed up and only the study team will have access to data. A first level of data cleaning will be performed by the field team using Statistical Analysis System (SAS) and a final analysis of clean data will be conducted by a statistician from the Bahir Dar university. CARE's preferred use of the SAS package results from the organization's access to the SAS software through an existing donor who designed the software. Computation of key indicators

will follow soon after data cleaning. Each team will have one supervisor who will ensure data quality in the field (completeness of surveys, accuracy of anthropometric technique and anemia procedure). Quality control will also be ensured during data entry and analysis through double data entry, standardized data entry screen manuals (data dictionary).

e) **Pretesting and Pilot Testing:** All questionnaires will be translated into Amharic and translated back into English (backward translation) to ensure that questions address issues exactly as intended and the original meaning of concepts is not lost in translation. The questionnaire will then be pre-tested in the field to ensure that participants and enumerators have a common understanding of questions. This would ensure validity and reliability of the tools. After the first part of the training, a one-day pre-test and pilot will be conducted in a nearby community. Following the pre-test/pilot test, slight changes may be made to the survey instrument, as it relates to interpretation and meaning of questions. Any significant changes to the survey tool or deviation of the sampling design will be recorded and an amendment submitted to the IRB for approval. Pilot testing will be performed to test all aspects of the field work.

f) **Statistical Analyses:** Data analyses will be performed by the Bahir Dar university statisticians with support from the research team at CARE. Quantitative data analyses will be performed using SAS to generate descriptive data and differences by intervention arm. A statistical analyses plan will be drawn prior to analyses, in close consultation with other partners. All analyses will consider the design of the cross-sectional survey while adjusting for important study characteristics.

3.5.4 Potential Risks to Participants

a) This study poses minimal risks to participants with the exception of the following;

- **Time Commitment:** Care givers and participating households may lose some income from not going out to earn their daily wage or income. In addition, the time commitment to the study may cost households in terms of the time and benefits of household chores such as fetching water and food preparation.

- **Invasion of Privacy:** With enumerators coming into their households, there may be some invasion of privacy and obligation on the part of households to exhibit behavior which is not their normal way of doing things.

- **Physical Discomfort:** Children may be hungry over the 6 hour period between administering the sucrose and urine collection when they may not be allowed to eat. In addition, collecting urine from children under 5 could be challenging. The L:M test requires a lot of cooperation and understanding from children and their care givers, which would potentially be very difficult with very young children. Other aspects of the process, such as ensuring urine of infants is not contaminated with feces can be an extremely painstaking and inundating. (Crane et al., 2015).

b) Means taken to minimize risk and discomfort

- Data collectors and supervisors will be trained on how to minimize the survey time per household and how to collect height/weight measurements with as little discomfort as possible.

- Children younger than 18 months will not participate in the study and those participating will be made as comfortable as possible.
- All collected data will be strictly confidential, and blind. The survey will not record any individual's identifying information such as household location, or last name and assigned identifying numbers will only be accessible by select evaluation staff.
- Participating mothers and caregivers will be given fair reimbursements for their time of no more than $10 per day of lost wages.

3.6 Benefits of the Research or Program to Human Subjects and Society

a) **Benefits to Participants:** Community members who consent to participate in the study will be compensated for their time, efforts and discomfort, including, having their activities observed, adhering to research protocols and the discomfort suffered by children during L:M tests. Compensation will include ready referrals and treatment of study participants identified with medical conditions during regular monitoring and project interventions. In addition, each of the households will be compensated in cash in lieu of lost daily wage.

Communities where interventions take place will benefit from project interventions such as nutrition, WASH and women's empowerment education and behavior change interventions. In addition, study outcomes would be shared with participating communities and local government administrators to inform polity and allocation of resources. Finally, participants from the control area will benefit from the scale up of the most effective interventions (proven through this study) in Phase 3 of the project.

b) Public Health Implications and Benefit to Society: The goal of the proposal is to reduce stunting among children under 5 in the intervention area, by combining three approaches. While many interventions aimed at reducing stunting have focused on feeding practices and in some cases WASH interventions, few have focused on reducing child oral-fecal (reducing risk of EED to address stunting) and fewer still have combined these interventions with addressing gender inequalities and social norms that impact child nutrition to make such interventions more effective. Learning and outcomes from the project evaluation would form the basis of CARE's model for reducing the risk of EED among children to reduce stunting. Further, this will add to the growing knowledge body of the role of EED in stunting and nutritional outcomes. Besides improving nutritional outcomes for participants, project outcomes will enable implementers to make evidence-based recommendations for reducing EED to policy makers.

4 INCORPORATING REVIEWER COMMENTS

I would like to thank my reviewers for the time and effort they have each put in to review my grant proposal and provide detailed feedback to enable me to improve and complete my Thesis. Each of these reviewers is an expert in the field that this study covers. I also recognize how busy they are and so I am particularly appreciative for their expertise, time and patience in reviewing this work.

4.1 Reviewer 1: Amy Webb Girard

Comment 1: ***Description of Challenge*** - Include in the background some statistics on these behaviors in this context – what do feeding practices look like; what does sanitation look like – it will make the link to stunting apparent. The outcomes framework includes IYCF practices so you still need to describe them; think through the causal map – your theory of change implies that reductions in stunting will be achieved through improved feeding and hygiene practices. As such you should discuss these to some degree and the potential changes you would expect / require achieving changes in stunting and EED.

Response 1: Background statistics on IYCF, sanitation and gender have been included. In addition, there are more detailed descriptions of the challenges and practices in Ethiopia. These changes are reflected in Section 5.2. on Pages 73-76.

Comment 2: ***Description of Challenge*** - EED and Stunting may be your impact indicators, but other outcomes are important if you want to understand your impact pathway. As I have said before it would be very helpful to see your detailed impact pathway – which

essentially shows us the how of the project – how will the proposed intervention function to achieve impacts.

Response 2: I have addressed this by discussing other outcomes such as feeding and sanitation practices as well as gender and women's empowerment on Page 76 in Section 5.2. In addition, a BDI logic model that demonstrates the pathways between interventions, determinants of behavior and how these impact required behavior to result in the impact goal has been added in Figure 5-1 on Page 77.

Comment 3: ***Description of Challenge*** – (in reference to causes of stunting and associations with fecal exposure) add Prendergast and Humphries' review

Response 3: A description of the Prendergast and Humphries' causal pathway for 'stunting syndrome' which includes the causal pathways between the outcomes of study has been added as indicated in the first paragraph of Section 5.3 on Page 76

Comment 4: ***Description of Challenge*** - The low status of women in Ethiopia (2005 and 2011 Ethiopia DHS) - quantify this in terms of DHS data. The low status of women, as indicated by X, Y, Z

Response 4: This has been addressed on Page 76 by referring to DHS report and other resources.

Comment 5: ***Description of Challenge*** - (largely linked to a deeply patriarchal society with harmful traditional norms) – "ensure this is properly sited and ensure all references sited in the text are included in the references cited section"

Response 5: This section has been properly cited in the last paragraph of Section 5.2 on Page 76. Other references have all been properly cited.

Comment 6: ***Description of proposed interventions*** **-** I understand you have space limitations, but you need to provide some additional details on the intervention components themselves"

Response 6: I have provided more detailed descriptions of interventions for each study arm on in Section 5.3 on pages 76-77. In addition this is elaborated in the pathways in the BDI logic model on Page 77.

Comment 7: ***Study arm 2*** - Why add this layer of complexity if you are wanting to test the added value of gendered approach? VSLA's add an economic angle that confounds the intervention. Think about the hypothesis you are testing, the outcomes you are using to assess impact and what set of arms allow you to test this? You want your arms to differ ONLY on the component you are testing. So if you are testing reduce exposure to feces, nutrition support to improve IYCF, and women's empowerment then you need to decide if you are testing them individually against each other or in some combination and justify that.

Response 7: VSLA is a critical part of CARE's WE approach as it contributes to networks and access to credit (economic empowerment which potentially contributes to building agency (confidence and solicits respect from spouses). In addition, one of the indicators for the Pro-WEAI tool developed to measure WE in project contexts, including nutrition, measures incomes as they provide resources to purchase nutritious food. It is only

implemented in Study arm 2 which has the WE component. As a result, VSLA intervention was not taken out from Section 5.3.2, on Page 79.

Comment 8: ***Study arm 3 (Control)*** – (in reference to basic nutrition education that would take place in the control area) "Is this already happening? If so by whom? What do these promote? Which nutrition actions? Will social media be in the other study arms as well? If not then you are no longer comparing apples to apples b/c the delivery platforms are very different".

Response 8: Basic nutrition education is already being rolled out nationally through Health Extension Workers, as part of government's National Nutrition Program NNP), and both intervention and control zones are exposed to this. This project will not implement additional interventions in the control site. This is found in Section 5.3.3 on page 79.

Comment 9: ***Study arms*** – "Why do study arms 1 and 2 have the same interventions? This does not make them comparable"

Response 9: As seen in intervention descriptions in Sections 5.3.1 and 5.3.2 on pages 78 and 79**, s**tudy arms do not have the same interventions. While both implement IYCF and sanitation, study arm 2 is the only one that has WE. This allows us to determine how much more effective these interventions become when the WE component is added. Hypothesis is that WE increases effectiveness of IYCF and sanitation practices.

Comment 10: ***Participant targeting and sampling*** – I believe this section is more in reference to implementation of activities -- how will you engage participants in the intervention – how will you recruit; what will be the eligibility criteria for participation in

activities; how many kebeles per woreda? If not all kebeles in a woreda how will kebeles be selected for receiving intervention activities? Move the sample size estimations and evaluation design to the M&E section.

Response 10: Changes have been made on Pages 81 to include participant engagement and recruitment as well as eligibility criteria and number of kebeles and households to be impacted. Sample size estimate description have also been included in Section 5.5.2 on pages 81 and 82 and further elaborated in the Monitoring Section 5.9 on Page 85.

Comment 11: ***Participant targeting and sampling*** - And once you move the evaluation content to the relevant section please ensure you clearly state the design – Quasi experimental with repeat cross sectional surveys; and include inclusion / exclusion criteria for participation in the survey.

Response 11: Suggested design stated as proposed and inclusion and exclusion criteria included in this section as proposed on page 85.

Comment 12: ***Participant targeting and sampling*** – so this is the sample size for the evaluation – but how many do you plan to reach with the intervention – would be based on the population of eligible households in the communities; likely available from census data or general government demographic data?

Response 12: This has been stated as 10,000 mother/ caregiver and child pairs in each of the 2 intervention sites, with a total reach of project 20,000 as indicated in the Targeting section in Section 5.5.1 on Page 81 and Monitoring and Evaluation Section 5.9 on Page 84 and 85.

Comment 13: ***Scalability and Sustainability***- This seems very vague -- boilerplate / cookbook and not specifically related to this particular project. Provide explicitly / specific details regarding HOW the CARE team will engage local stakeholders in the respective ministries. What processes will be used to engage them in design, decision-making, evaluation; how frequently will stakeholders be engaged in sharing information

Response 13: Text has been revised to include more specific details in Section 5.6 on Pages 82 and 83.

Comment 14: ***Coordination*** – (Review meetings) – "clarify who is part of the meetings"

Response 14: Participants for the review meeting have been clearly indicated in Section 5.8 on Page 84.

Comment 15: ***Co-creation process*** – (Formative research) Given you have decided on the specific interventions and activities – describe how you will use the formative research.

Response 15: Agree that formative research would be redundant as we already have data from previous formative research. It has been taken out of Page 87.

4.2 Reviewer 2: Thomas Schaetzel

Comment 1: ***Description of Challenge*****:** Clarify citation on Manoff group publication linking EED with fecal exposure in Ethiopia

Response 1: This citation has been corrected, as seen in Section 5.2, in the last paragraph of Page 77. This refers to an evaluation commissioned by the USAID ENGINE project to

the Manoff group as the consulting agency. The citation has now been corrected to read as 'USAID 2014'.

Comment 2: ***Intervention Arm 1*** Are inputs such as seeds meant only for groups 1 and 2? Although this may be necessary for this study, is this a sustainable approach?

Response 2: Yes this intervention was meant only for groups 1 & 2. The issue of sustainability came up with another reviewer as well. Upon reflection, and considering the unsustainable nature of handouts, the distribution of free inputs to households intervention has been dropped. These will only be given for demonstration sites as learning points. This is reflected in Section 5.5 "Description of innovation" on pages 78 and 79.

Comment 3: ***Study arm 3*** (In reference to the design of SAA to facilitate improved gender and social norms) Be more explicit about this. How does gender inequality affect nutrition practices? Which practices? Is this because of women's lack of participation in decision-making?

Response 3: The connections between gender inequality and nutrition practices and outcomes are better elaborated in the earlier section 5.2. 'Description of the Challenge' section on page 78 and 79 and in the BDI logic model on Page 77.

Comment 4: ***Description of proposed innovations*** – (Proximity of geographical locations of sites) – unclear as it is now. It seems to imply that they are near, so travel is easy, but that they are far, so that contamination will not occur. Is that it?

Response 4: Clarified to indicate that distances are close enough for implementation coordination but still sufficiently far apart to avoid contamination of other sites with interventions meant for specific areas as indicated in the last paragraph on Page 77.

Comment 5: ***Study arm 2*** **(**with reference to study arm to reduce risk of EED) How will you measure the "risk of EED"? In order to demonstrate a relationship between the "risk of EED" and stunting reduction you need to be able to quantify, or at least demonstrate the risk of EED.

In addition, this assessment may not be possible as a result of the design. The impact in study arm 1 is not just EED intervention—it's the entire package of nutrition education, gardening, etc. PLUS EED intervention.

Response 5: The presence of EED in children will be done by lactulose: mannitol tests which have been indicated in the Monitoring/ Study design section (5.9) on Pages 85 and 86. The language has also been refined to show that EED risk will be measured using action taken to separate children from feces (disrupting EE-fecal pathway) as a proxy. I have included a section in the earlier sections (Description of Challenge) which indicates that certain practices (like sharing animal quarters and exposure to feces) increases the risk of a child developing EED.

The innovation is not to test only EED as a stand-alone intervention. Some studies suggests that addressing stunting may require a package of feeding practices and actions that reduce exposure to EED (reducing risk). This proposal supports this argument.

Comment 6: Study Arm 3 – (study arm to assess impact of women's empowerment (WE): How will "women empowerment" be measured? Unless you have some index, or other metric, the actual assessment is "the impact of participating in SAA on sanitation practices" rather than "the impact of women's empowerment on sanitation practices".

Response 6: This will be measured using the Pro-WEAI tool as explained in Section 5.9 (Monitoring and Evaluation) on Page 86 and in Outcome 3 of the logframe in Appendix I. This is broader than "the impact of participating in SAA on sanitation practices" and addresses "the impact of women's empowerment on sanitation practices". WE includes participation in groups (like SAA and VSLA) as an indicator but also includes economic empowerment, decision making.

Comment 7: *Coordination* - State which department in the Bahir Dar University the project will work with

Response 7: This change has been effected and specified in Section 5.8 on Page 84 as Department of Public Health Nutrition, College of Medicine and Health Science, Bahir Dar University

Comment 8: *Ethical Risk* - Risks to human subjects – be more explicit about what is meant by 'challenges' of the process of measuring EED and the 'discomfort expected'

Response 8: The Risk section is not required by the RFA and so this section has been dropped from Chapter 5 but described in Chapter 3 (Methods) under the sections, **Physical Discomfort** and **Means taken to minimize risk and discomfort** in Section 3.5.4 on Pages 51 and 52.

Comment 9: ***Monitoring and Evaluation*** (Formative research to understand relationships and causalities) "this is too vague. What relationships? What causalities? What issues will be addressed through formative research? Seems like it needs to be thought out more thoroughly"

Response 9: Formative research will not be required under this intervention as we will leverage current data from prior formative research and evaluations done in relation to recent CARE projects.

Comment 10: ***LogFrame*** **(Source of Information)** Data from health centers - What data? Specifically, what information will be needed, and how will it be used

Response 10: As described in the logframe on the "Source of Information" section in Appendix I. This is in relation to mother and child health and demographic data recorded at health center. The data would be accessed to triangulate information on child health and age among others.

Comment 11: ***Behavior Change Wheel model*** – provide more explanation

Response 12: Proposing a specific model limits the co-creation process to be undertaken with the donor. Specific behavior change model to be used will be dependent on the behaviors, determinants and actors identified or validated during the co-creation process. The behavior change wheel is therefore not being proposed any longer.

Comment 13: ***Results Framework*** **-** Suggest replacing "Improved Nutrition practices" with "improved infant and young child feeding"

Response 13: This has been revised in Results framework in Appendix D on Page 98 and across the proposal

Comment 14: ***LogFrame Outcome* 1** - Promote increased access to nutrition services - Not sure exactly what this means. Is it to improve the quality of these services (affects demand)? What are the current reasons for lack of access? – needs more thought than just telling moms to go and access services

Response 14: Expecting that building capacity of to provide moms with quality breastfeeding and complementary feeding support will contribute to mom's confidence in HEW and the seeking services. Text changed to reflect this in 'Illustrative Activities' under Outcome 1 in Appendix I on Page 101.

Comment 15: ***LogFrame: Outcome 2*** (Lactulose and Mannitol test) – "Explain how this will be done"

Response 15: This explained in-depth in the revised Monitoring and Evaluation text in Section 5.9 on Pages 85 and 86.

Comment 16: ***LogFrame: Outcome 3 indicators***– "should these include food purchases"

Response 16: Revised to include 'food purchases' in Appendix I on Page 102

Comment 17: ***Output 1:1 indicators*** (mention of 10 nutrition practices) – "is this not IYCF? Is there a document where all 10 are listed?"

Response 17: Changed as indicated in the logframe in Appendix I on Page 103 to include IYCF (this includes timely initiation of BF; continued BF till 6 months; FATVAH; food groups etc.) found in GtF manual

Comment 18: ***Output 1.2 indicators*** (Increased access to nutritious foods through increased incomes) What is expected to cause increase

Response 18: Incomes from **s**avings from VSLA will increase incomes and increase ability of women to purchase more nutritious food as explained in the VSLA descriptions on Page 80 as well as Appendix F.

Comment 19: Output 3.1 – ***indicator*** – "Is this 'good farming practices' or 'good gardening practices'?"

Response 19: Revised to 'good gardening as indicated in the Logframe in Appendix I on Page 105.

Comment 20: ***Output 3.2*** – "no metrics"

Response 20: Addressed. Metrics included in Appendix I on Page 106

Comment 21: ***Output 3.3 indicator*** – ('Number of women participating in economic activities) – "Is this saying that a negative social norm/practice prevents women from participating in economic activities?"

Response 21: This was not well articulated. Revised text in Output 3.3 of Appendix I on Page 106.

4.3 Reviewer 3: Maureen Miruka

Comment 1: ***Description of Challenge*** - Suggested language to convey the impact of lack of gender focus in national nutrition program on outcomes

Response 1: Indicated as "Despite women's primary role of feeding the household, men hold the decision making power and control resources that impact nutrition" in Section 5.2 on Page 74.

Comment 2: ***Proposed Intervention 1*** - Will improved practices knowledge be imparted in demo plots? Are we not we moving away from giving inputs- dependency- so they learn at the plots and practice at home--- so the inputs are only for the demo plots?

Response 2: Accepted as an unsustainable intervention. Revised intervention to now focus on technical support through demonstration plots and government agriculture extension agents as demonstrated in Section 5.3.1 on Page 78.

Comment 3: ***Proposed Intervention 3*** - Define or add footnote on what Women's empowerment is since it constitutes an important arm of the study. Also suggest shifting of description of VSLAs up so that someone can see before referring to the Appendix.

Response 3: Footnote describing WE included and VSLA description brought up to the top of paragraph on Intervention arm 3 as indicated in Section 5.3.3 on Page 79.

Comment 4: ***Proposed Intervention 3*** - Suggestion to use CARE's Farmer Field and Business School approach to Gender and Women's empowerment which has a stronger focus on agriculture and markets

Response 4: Did not include this as the target group is not women farmers. Whiles there is every encouragement for women to sell surplus produce, the focus is more on nutrition than markets

Comment 5: ***Study Site/ Arm 1 - Intervention 1*** This bit (in reference to 'homestead food production') should be stronger for improved production and its links to nutrition both from dietary diversity and improved purchasing power.

Response 5: I have included interventions that build women's skills to purchase more nutritious food. This is explained in the VSLA descriptions in Appendix F on Page 100.

Comment 6: ***Study Site/ Arm 2 - Intervention 2*** - The FFBS will be more useful here since it has all these components in addition to the WASH

Response 6: As explained earlier, I believe using CARE's Growing the Future manual is more useful because it is tailored specifically for promoting nutrition outcomes. The GTF, rather than FFBS includes 'environmental enteric disfunction' education which is the focus of the WASH intervention in this proposal. This was therefore not changed.

Comment 7: ***Study arm 3*** - As they stand now, interventions sound like outcomes, rather than interventions – revise language

Response 7: Revised language to read more like interventions in the Logframe in Appendix I.

Comment 8: ***Research ethics*** - There's a lot of debate here on do no harm in case there's GBV and just the fact that that you are not exposing them to any intervention- so studies

reserve the last 6 or so months of the project to do the gender transformative activities then since all the data has been collected. You may want to do the same… so its funded within this study.

Response 8: As the program's evaluation will take place in the last 6 months, it is unlikely that we can introduce gender transformative interventions in non-gender arms 1 & 2 without compromising project outcomes. As indicated in Section 5.6.1 (Scalability) on Page 82, there are plans to scale up the tested model (with gender transformation interventions) in the proposed Phase 3 stage of the program to the current non-women empowerment sites.

Comment 9: ***Research ethics*** - Discomfort of children to EED tests - What do you mean by this?

The risks of challenging deeply entrenched social norms exist both by men who may feel threatened, and by women who have internalized their insubordination . And that's where SAA comes in, but you need to indicate there can be backlash. And GBV- but that we have all these thought out and embedded.

Response 9: Appears to have been a bit of misunderstanding that the risks were in relation to project interventions in general. This section was in relation to EED tests specifically. Nonetheless, the 'Research Risks' section is deleted as it is not required by the RFA. Minimization of testing risks are however clearly outlined in Chapter 3 (Research Methods), section 3.5.4. on Page 52.

Comment 10: ***Scalability and Sustainability*** - Yes, plus applying FFBS+SAA to challenge social norms and attitudinal changes which are lasting

Response 10: Suggested language included in the second paragraph of Section 5.6. (Scalability and Sustainability) on Page 82.

Comment 11: ***Appendix C - CARE's GE framework*** - Nice to see this here. Its para and/or the entire diagram needs to come further up; then it will be actualized by all the activities that we are going to do. If it is not too much work, all the three domains and the formal & informal spheres can be crafted of it all the interventions, that way it becomes your framework for intervention since we are talking women's empowerment

Response 12: Page limit prevents this from being shifted up. The 3 domains are touched upon in the text and integrated in indicators in the logframe in Appendix I.

4.4 Reviewer: Maku Ocansey Demuyako

Comment 1: ***Location of intervention*** - Suggested language – replace 'work' with 'will be implemented'

Response 1: Accepted as indicated in the sentence "Stunting rates in Ethiopia among children under 5 are 38% and in the Amhara region where this project will be implemented, stunting rates are 46% (Ethiopia Demographic Health Survey 2016)" on Page 73

Comment 2: ***Description of Challenge*** - Are the statistics of stunting in relation to children under 5 or under 2? Please make sure you specify.

Response 2: This has been clarified as ‘children under 5’ on Page 73.

Comment 3: ***Description of challenge*** - Please be specific about source of DHS – write it out as Ethiopia DHS. It is also not in the list of references. Quite a number of your references cited are not referenced at the end of the document either. Please check and insert these.

Response 3: This has been properly cited and other references properly cited across the text from Page 73, including specifying EDHS. Also ensured citations included in references.

Comment 4: ***Scalability and Sustainability*** - This section is written as CARE’s general approach, but I think it should be specific to the proposed project in Ethiopia. You could say something like ”The government of Ethiopia’s primary mandate is to……” You also need to tell readers who CARE’s network of communities in Ethiopia are and how you plan to engage them for scalability and sustainability

Response 4: This section has been re-written to make it specific to the project, including specifying CARE’s network and detailing the contribution of each partner to the collaboration. This is indicated in Section 5.6 (Scalability and Sustainability) on Pages 82 and 83.

Comment 5: ***Co-creation process*** **-** Behavior Change Wheel - Is this a known model by all readers? You could add more detail like which organization designed it or a reference for it

Response 5: This has been raised by other reviewers. Proposing a specific model limits the co-creation process to be undertaken with the donor. Specific behavior change model to be used will be dependent on the behaviors, determinants and actors identified or validated during the co-creation process. The behavior change wheel is therefore not being proposed any longer.

Comment 6: ***Activities*** - You will be training trainers in the first quarter so might not be feasible to begin educating VSLA members in the same quarter.

Response 6: Feedback duly accepted. Training for VSLA members delayed to the fourth quarter of Year 1 as indicated in Activity 1.9 in Appendix J on Page 108.

4.5 Reviewer 5: Glavdia Greatchens Delva

Comment 1: ***Location of intervention*** - Indicate citation for Ethiopia stunting statistics

Response 1: Citations have been indicated on Pages 73 and 74

Comment 2: ***Description of Challenge*** - Are the statistics of stunting in relation to children under 5 or under 2? Please make sure you specify

Response 2: This has been clarified as stunting statistics in relation to 'children under 5' as indicated on Page 73.

Comment 3: Description **of interventions** - Somewhere here you need to define the target population (age range, sex, socio economic status) and I think you need to state your theoretical framework

Response 3: A detailed demographic information of the target population is provided in Section 5.5.1(Participant Targeting), on Page 81 and 'Inclusion' and 'Exclusion' criteria on Page 85 in Section 5.9 (Monitoring and Evaluation).

Comment 4: ***Description of interventions*** - I also suggest reviewing the guidance provided in the concept note regarding the "Description of the proposed innovation". Provide information on Hypothesis, Justification of the selected innovation and How the selected innovation will address the identified gap and enhance the effectiveness of existing intervention, if any?

Response 4: These have been addressed in the revised text and BDI model now included on Page 73 in Section 5.2 (Description of proposed innovation).

Comment 5: ***Definition of proposed innovation*** - I think this section (interventions) has to be part of the methodology

Response 5: Comment not integrated. The RFA guidelines require interventions to be described in the Proposed Innovation section as it currently is on Pages 77 and 78. The methodology section has also been revised to include additional description of interventions on Page 78.

Comment 6: ***Proposed methodology*** - This section needs to be fleshed out a bit more - for example, you could explain here which intervention will be carried out to address the effectiveness of reducing the risk of EED.

Response 6: Revised to be more detailed as now indicated in Section 5.4 on Pages 78-80.

Comment 7: ***Targeting and sampling*** - Description of design method - This statement needs to be in the methodology section. Per example, you could say it is a quasi-experimental study design with 3 arms … (2 intervention and 1 control). Is the study cross-sectional? Or case-control? It is more likely a non-randomized case-control prospective study. Please verify.

This kind of interventions fits well for a randomized case-control and prospective study.

Response 7: This study will use a Quasi-experimental design with pre/post repeat cross sectional surveys for evaluation as indicated in the Proposed Methodology section 5.4 on Page 80 and in the Study Design portion in Section 5.9 (Monitoring and Evaluation) on Page 85.

Comment 8: ***Scalability and sustainability*** - Here you need to explain how the effectiveness of interventions at Phase One will be evaluated before progress to Phase Two, and how Phase Two interventions will be assessed before proceeding Phase Three and scaling-up. Please review the guidance provided in the ECF-RFA document page 5 to 7.

Response 8: Section 5.6.1 has been revised to include the comments above on Page 82.

Comment 9: ***Coordination*** - I suggest describing here the activities that will be undertaken by the local government, the universities and others stakeholder. How the activities will be coordinated within and between partners.

Response 9: This has been done. Roles clearly articulated in Section 5.8 (Coordination) on Pages 83 and 84.

Comment 10: ***Monitoring and evaluation*** - Even if the output, outcome and impact indicators are described in the logical framework below, it is important to list here your impact indicators, the numerator, denominator and expected outcomes for each of them. Which will be collected to calculate cost-effectiveness: qualitative? Quantitative? If quantitative, what type of analysis: descriptive? Inferential? Exploratory? Please review the concept note guidance for additional insights

Response 10: RFA does not require such in-depth descriptions of indicators. Proposal page limit will also not allow this.

Comment 11: ***Results Framework*** - Please improve the esthetic of this image before submission

Response 12: Improved in Appendix D on Page 98.

5 GRANT PROPOSAL RESEARCH PLAN

5.1 Organization and Project Information

Lead Agency: Cooperative for Assistance and Relief Everywhere (CARE);

Focal Point: Jennifer Orgle

Implementing Partners: Bahir Dar University College of Medicine and Health Science, Department of Public Health Nutrition; Decentralized departments of the Ministries of Health and Agriculture in Ethiopia; Ethiopian Orthodox Church

Location of the research: Ebinat, Simada and Tach Gayint woredas (sub-districts) of the Bahir-Dar district in the Amhara region of northern Ethiopia. According to the Ethiopia Demographic Health Survey (EDHS) (2016), stunting rates in Ethiopia among children under 5 are 38% and in the Amhara region where this project will be implemented, stunting rates among children under 5 years are 46%.

5.2 Description of Challenge

With 23% million children stunted and 51 million (Budge et al., 2019) wasted globally, achieving Sustainable Development Goal (SDG) 2 remains a global priority for the development community. At 38%, stunting rates (in children under 5) in Ethiopia are very high and even more alarming in the Amhara region where CARE works, which, at 46%, has the highest stunting rate in Ethiopia (Ethiopia Demographic Health Survey 2016). With far reaching consequences such as poor cognitive development among children and their resulting inability to perform well at school and be gainfully employed as adults, as well as a vicious cycle of stunted mothers giving birth to stunted babies, efforts at economic

development and poverty reduction in Amhara may be a mirage, if underlying causes are not addressed.

Prendergast & Humphrey (2014) identify multiple causes and consequences of stunting in the short-, medium- and long-term and the potential windows of opportunity in this chain, where interventions can be targeted to reduce the problem. These include the pathways between the 4 "interlinked phases of growth" (fetal, infant, childhood and pubertal"), characterized by poor feeding practices and inadequate dietary nutrient intake, poor WASH practices, resulting in EED and maternal factors. (Prendergast & Humphrey, 2014)

Previous interventions aimed at reducing stunting through infant and young child feeding (IYCF) practices alone, or combined with WASH, (with a focus on EED) have not demonstrated sufficient stunting reduction outcomes. Other interventions that have combined child feeding and women's empowerment (WE) (USAID, 2015) have shown more significant impacts, but not enough to meet the WHO global target of 100 million stunted children by 2025 (Schmidt, 2014).

This proposal suggests that the failure of previous work to yield significant impact on stunting is due to the lack or limited focus of women's empowerment in nutrition sensitive interventions. As a result, proposal will test the effectiveness of integrating interventions that address the 3 key issues (IYCF; EED; WE). It will answer the question, **"Does the addition of women's empowerment improve sanitation and feeding practices and consequently stunting outcomes (above and) beyond a package of water, sanitation hygiene, food security and nutrition education activities?"**

In Ethiopia, negative feeding practices such as late initiation and discontinued breastfeeding, (only 58% of children under 6 months are exclusively breastfed and in Amhara, only 38% of newborns were put to the breast within 1 hour of birth) and lack of dietary diversity (only 7% of children, nationally and 2.1% in Amhara receive minimum food diversity and acceptable diets (Demilew et al., 2017; EDHS, 2016). Among the many causes of poor child feeding practices in Ethiopia is the inaccessibility of many households to adequate diets. Commercial fortified foods are still out of the reach of the poor and the more widely fed homemade alternatives tend to be plant-based, and lack essential micronutrients (Abeshu et al., 2016; Demilew et al., 2017).

In Ethiopia, the common practice of "free roaming animals and poor hygiene", including sleeping with animals in the household and open defecation, have been linked to child linear growth (Headey et al., 2017); (D. I. Campbell, McPhail, Lunn, Elia, & Jeffries, 2004; Lin et al., 2013; Mbuya & Humphrey, 2016; Prendergast & Humphrey, 2014). A 2014 evaluation concluded that only 2% of households in Amhara had access to improved sanitation facilities (USAID, 2014). The low socio-economic status of women in Ethiopia, largely linked to a deeply patriarchal society with harmful traditional norms (Lailulo et al., 2015) impact both nutrition and WASH practices and have been linked to poor health outcomes and stunting ($p<0.05$) (Ersino et al., 2018; Esrey et al., 1992; Prendergast & Humphrey, 2014; Prendergast et al., 2015). Despite women's primary role of feeding the household, men hold the decision making power and control resources that impact nutrition. This is thought to explain the lack of significant progress in Ethiopia's national nutrition plan (Ersino et al., 2018).

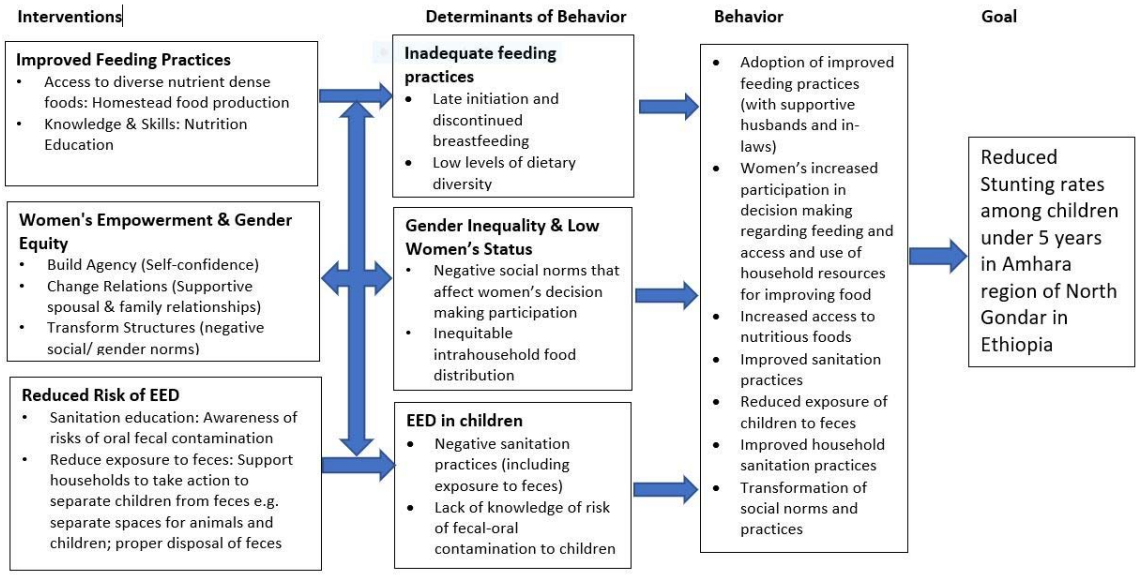
Participation in decision making is an indicator of women's empowerment and in Ethiopia, whiles women's participation in decision making ranges from 78.7% and peaks at 84.3% depending on age, education and wealth quintiles, men's participation in decision making is constant in the upper 90s (95-99%) from the age of 15, irrespective of education or socio-economic status.(EDHS 2016) Gender issues such as cultural barriers that prevent women from consuming or accessing nutritious food and accessing services whiles pregnant have also been linked to 3-5 times higher child mortality rates in Ethiopia (Abraha, Myléus, Byass, Kahsay, & Kinsman, 2019). In addition, inequitable distribution resources (such as land and credit) limit women's participation in household decision making, resulting in poor health and nutrition outcomes for themselves and their children (Lailulo et al., 2015). Religious beliefs also further entrench negative IYCF and gender practices (D'Haene et al., 2019; Desalegn et al., 2019; FAO, n.d.). Despite this knowledge, there are gaps and no conclusive assessment of the impact of women's empowerment in strengthening proven practices to significantly reduce stunting.

5.3 Description of the proposed innovation

We hypothesize that previous stunting interventions have not achieved significant results as they have generally not included a strong focus on gender transformative interventions

This research implementation proposal will test the impact of women's empowerment on increasing the effectiveness of proven interventions. The project falls into the **Phase 2 stage of the ECF Research, Innovate, Scale and Establish (RISE) for Nutrition grant portfolio**.

Figure 5-1 Behavior-Determinant-Intervention Logic Model (BDI)



The innovation will be implemented in 40 kebeles (smallest administrative unit) in the Simada and Ebinat woredas (20 kebeles each) in the Amhara region in North Gondar in Ethiopia. A third woreda, Tach Gayint, has been selected to act as the control site to test effectiveness of proposed interventions. The woredas have been selected for their similarity in demographic and socio-economic characteristics. They are also sites where CARE has previously implemented projects. CARE's prior experience in these sites provides several start-up advantages, including previously collected formative research data and established partnerships which can be can quickly leveraged to inform detailed project design and save costs. In addition, the distances between the woredas are close enough to allow easy travel and coordination during project intervention but sufficiently located away from each other without the compromise of contamination of intervention from one group to the other.

Figure 5-2 Map of Amhara region, Ethiopia[6]

5.3.1 Study Site/ Arm 1 - Intervention 1 (Improved IYCF + Reduced Exposure to Feces)

Using CARE's Growing the Future (GtF) manual, (see Appendix H), households in **Ebinat and Simada** will receive nutrition education and Sanitation (EED) education to improve feeding practices and create household/public awareness to reduce children's exposure to feces. The GtF manual, uses an "Explore", "Reflect" and "Act" approach to learn. This presents concept to participants, encourages reflection through open discussion and finally the adoption of new behavior for improved feeding and action to reduce children's exposure to feces. Participants also receive skills and technical support to undertake homestead food production to increase access to nutrient-rich diverse foods through production and sanitation actions.

[6] Map of Amhara showing intervention and control sites. Source: CARE 2014. Nutrition at the Center Project Baseline report

5.3.2 Study Site/ Arm 2 – Intervention 1 + Women's Empowerment[7]

Participants in Simada will be organized into Village Savings and Loan Associations (VSLA) (Please see Appendix F for full description) to receive project interventions. In addition to providing a delivery mechanism, VSLAs promote economic empowerment by providing access to credit which in such contexts is inaccessible to women. Using the CARE developed Social Analysis and Action for Food and Nutrition Security (SAA-FNS) toolkit staff will promote gender equity and women's empowerment[8], by facilitating dialogues that bring together all stakeholders in the community (including men and traditional leaders) to question negative norms that dictate food choices and intrahousehold food distribution (who eats what, when and how) and promote positive practices.

5.3.3 Study Site/ Arm 3 (Tach Gayint) – Control site

The control site will receive no interventions from the project. The woreda however receives basic nutrition education through government nutrition education program carried out by Health Extension Workers.

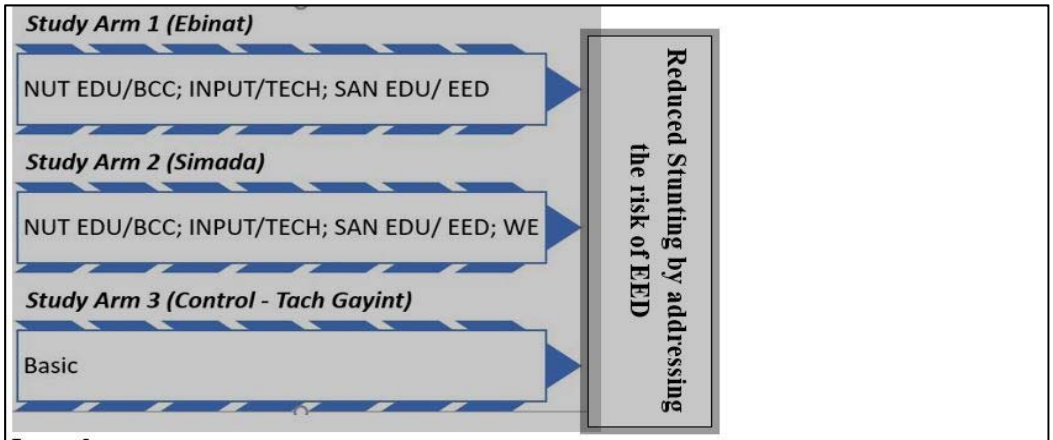
5.4 Proposed methodology

A three and half year program will be implemented using with interventions allocated to the 2 intervention woredas and activities implemented at the kebele level. At the end of a 3 year implementation, the 2 woredas will be compared with each other and with the control site to test the effectiveness and impact of combined interventions in reducing stunting, in

[7] CARE simply "defines women's empowerment as the sum total of changes needed for a woman to realize her full human rights"

[8] Measured using Project Women's Empowerment in Agriculture Index (Pro-WEAI)

particular, the effect of women's empowerment in strengthening other proven approaches to reduce stunting. Evaluation will utilize a repeat cross-sectional pre/post design to compare project outcomes with baseline data. In addition, mid-term evaluation will be conducted to collect a qualitative and quantitative data to assess the effectiveness of project interventions and strategies in meeting project goal and outcomes.



Legend

a) NUT EDU/BCC = Nutrition education and behavior change interventions for improved maternal and child feeding practices and dietary diversity

b) INPUT/TECH = Inputs and technical support to undertake homestead food production interventions and increase incomes to increase access to food

c) SAN EDU/ EED = Education of the risk of oral-fecal contamination for infants and young children and support to identify and implement feasible and acceptable actions that reduce children's exposure to feces and consequently their risk to EED

d) WE = Women's Empowerment interventions

e) BASIC = Basic nutrition education

Interventions will take place in 2 woredas/ districts (Ebinat & Simada), whiles a third woreda (Tach Gayint) will provide a counterfactual for the study.

5.5 Participant Targeting and Study Sampling

5.5.1 Targeting

The program activities will target households with a woman of reproductive age (15-49 years) who is the primary caregiver of at least one child less than 5 years. Study arm 1 will be implemented in 20 (representing approximately 27,000 households) of the 40 kebeles in the Simada woreda. 10,000 care giver (woman of reproductive age) and child households will be allocated to study arm 1. A second group of 10,000 care giver and child households from 20 out of the 36 kebeles in the Ebinat woreda will be allocated to arm 2. Ten kebeles in the Tach Gayint woreda, representing approximately 12,000 households will serve as the control population. Qualifying mothers/ givers and children will be purposively identified with the help of HEWs that CARE has existing partnerships with. Participating mothers/ care givers of children under 5 and households in study arms 1 and 2 (Ebinat and Simada woreda intervention sites) will be engaged in a combination of interventions to improve IYCF, sanitation and Women's empowerment.

5.5.2 Sample size calculation

The current prevalence of stunting in Amhara Region is 46%. A 10% reduction in stunting prevalence is assumed for study arm 2 as a result of the 42 month intervention. At 90% confidence, and power of 0.80, 297 individuals will be needed in each group to detect a 10% difference between groups in study arms 2 and 3. A 5% difference is expected for study arm 1 comparison with the non-intervention group (study arm 3), requiring 1,213 individuals per group with the same confidence and power parameters. Comparisons between study arms 1 and 2 would represent a 5% difference in stunting prevalence,

requiring 1,213 individuals (same as for the comparison), again based on the same parameters. As such, for the evaluation, we will increase the number of individuals in each group to 1,819 (50% increase) to allow for the design effect associated with multi-stage sampling.

Sample size calculations for the evaluation are based on a confidence of 90% ($\alpha = 0.10$) rather than the more common 95%. Accepting a larger probability of α reduces the probability of wrongly failing to conclude that a difference exists between groups when in fact it does. In a clinical setting the emphasis is on being sure the tested intervention is beneficial if it will replace a current regimen, but for a social program the emphasis is on being sure not to miss an effect that could be beneficial (CDC 2011). In addition, social program evaluation also have the added advantage of a smaller sample size than sample sizes required to achieve a higher confidence level, thus reducing costs.

5.6 Scalability and Sustainability

Scalability. With proven interventions from this phase, CARE will expand its partnership with government and civil society organizations, in the Phase 3 stage **of the ECF Research, Innovate, Scale and Establish (RISE) grant,** through a Collective Impact (CI) approach. The approach which engages multiple partners, positions CARE as the backbone/ facilitating organization to support government and partners to integrate proven interventions into government's national nutrition and safety net programs. The approach will reach 60,000 households with children with children under 2 years from 100 kebeles in the Ebinat, Simada and Tach Gayint woredas by the end of year 7 (end of 3.5 year phase 3)**.** Beyond Phase 3 (from year 8), it is expected that government would

have built adequate capacity during Phase 3 to scale this up to the entire Amhara region and eventually across the country. One of major platforms CARE has built partnerships with is the Ethiopian Orthodox Church (EOC). Several cultural norms are deeply rooted in religious beliefs. As a result, EOC priests are important custodians of religious and cultural practices that influence social norms. CARE will engage the EOC as key partners in behavior change processes. Further, CARE and our partners will disseminates proven practices through our networks and global positions, such as membership of the steering committee of the SUN civil society alliance.

Sustainability. Context-specific interventions that build on existing structures such as Health Extension agents and Women's Development Armies as well as Agriculture extension agents and other community based organizations to build capacity and transfer skills to participants and their households ensures sustainability. Engaging men, boys and other influential actors through SAA dialogues and as champions and agents of change, will enable the project to address power relations and potential feelings of insecurity. It also ensures ownership and sustainability of social norm transformation.

Finally, VSLAs have been proven to be self-sustaining as they build confidence and skills for economic empowerment, replication of groups and the transfer of knowledge and skills to new groups. The added advantage of access to credit is both an empowerment process and an incentive for women to continue to meet beyond the lifetime of donor-funded projects. In some of the countries where CARE works, VSLA members have run for office. Working with both male and female members of their groups as their constituency,

they have engaged in local governance and influenced budget allocation and social norms to promote best practices.

5.7 Implementation plan (Gantt chart) – Please see Appendix J.

5.8 Coordination

The implementation of the project will led by CARE through a partnership with the Department of Public Health Nutrition, College of Medicine and Health Science, Bahir Dar University, the Ethiopian Orthodox Church (EOC) at district/ woreda level, as well as decentralized health (CHWs) and agriculture (Agriculture extension agents) departments. In addition, local NGOs with extended experience working in implementing sites will be selected as implementing partners. CARE's team, led by a Project Manager and made up of officers responsible for M&E, Knowledge management and communication, Advocacy and 4 field facilitators (2 for each of the implementing sides) with have primary responsibility to the donor and manage coordination. The study component of the project, including training of enumerators, development of study protocols, preparation and submission of IRB requests, as well as baseline and end line surveys will be sub-contracted to the Department of Public Health Nutrition, College of Medicine and Health Science, Bahir Dar University. The EOC will play a critical role of addressing religious norms and providing platforms for disseminating best practices to men and women. Other implementation stakeholders such as government decentralized agencies, community members and local NGO partners will be engaged through a Partner agreement with clearly defined roles. These stakeholders will constitute a coordination platform that meet

quarterly for reviews, coordination and planning to ensure effective and smooth implementation of the project.

5.9 Monitoring and Evaluation

A three and half-year comprehensive monitoring and evaluation plan, based on the proposed logical framework (Please see Appendix I) will be developed at the start of the project. This includes a Baseline survey, Mid-term review and an End of project evaluation. A total study sample size of 5,458 caregiver/ mother and child pairs will be recruited to be surveyed at baseline, mid-term and end of project as per the sample size estimates described in the previous section. Out of the total population of 20,000 households in 40 intervention kebeles, to be reached by project interventions, 1819 children under 5 years from Ebinat woreda will be recruited and allocated to study arm 1. Another group of 1819 children under 5 years from Simada will also be recruited and allocated to study arm 2. Finally, a third group of 1819 children will be recruited from the control woreda (Tach Gayint) as study arm 3.

Inclusion criteria: Participating households will each have a child of 5 years or younger; participating child must be residing with their biological mother or other primary care giver (e.g. grandmother or aunt); If there are more than 2 children under 5, the younger child older than 6 months will be selected.

Exclusion criteria: Children with severe or moderate malnutrition (wasting or underweight); children with other chronic diseases or conditions, including HIV and disabilities.

Study Design and Data Collection: A Quasi experimental design with repeat cross sectional surveys will be used for data collection. Data collected from intervention sites would be compared to data from control sites. Anthropometric measurement will collect data to measure Stunting and EED will be measured through Lactulose: Mannitol (L:M) tests to diagnose the presence or absence of EED in children. In addition, the Pro-WEAI tool (IFPRI 2018) will measure be used to women's empowerment.

Anthropometric measurements will be taken by trained research assistants using calibrated length boards and digital weighing scales to measure length and weight, respectively, using WHO recommended protocols based on the age of participating children. Child anthropometric measurements (weight, height) will determine nutritional status, specifically, height for age, at baseline and compared at midterm and end line. Specially trained nurses and laboratory technicians will administer Lactulose: Mannitol (L:M) tests to diagnose the presence or absence of EED in children. The dual sugar absorption test is the most widely accepted non-invasive test for EED and determines 2 key components – the intestine's ability to absorb ingested nutrients and the intactness of the gastrointestinal barrier which prevents microbial translocation into the blood stream. The test consists of oral administration of 2 sugars/ carbohydrates – lactulose and mannitol which are secreted in urine. The urine is tested for the presence of gastrointestinal permeability and infection of the mucosa of the GI systems in relation to EED.

Quantitative data will be collected against key knowledge, perception and practice indicators to asses changes in feeding practices and women's empowerment at baseline and end line using questionnaires. UNICEF and WHO key recommended indicators

included in the logframe (in Appendix I) will be used to assess feeding practices. Women's Empowerment will be measured using key Pro-WEAI to measure the 3 domains of CARE's women's empowerment framework. Questionnaires will be used to conduct key informant and in-depth interviews, as well as focus group discussions. All questionnaires and interview guides will be translated into Amharic and translated back into English (backward translation) to ensure that questions address issues exactly as intended and the original meaning of concepts is not lost in translation. Following this, the questionnaire will be pre-tested in the field to ensure that each question is understood by participants and in the same way by every enumerator and to maintain the validity and reliability of the tools. Survey tools will also be pre-tested in a nearby community and reviewed and revised before rolling out. In addition to laboratory experts and nurses who will conduct Anthropometric and EED measurements, enumerators will be recruited and trained to conduct interviews.

5.10 Organizational Capacity

For over 70 years, CARE has worked around the globe to save lives, defeat poverty and achieve social justice. In 2018 CARE worked in 95 countries and reached 56 million people. By 2025, CARE and partners would have helped 150 million people from the most vulnerable and excluded communities to overcome poverty and social injustice. As part of this commitment 50 million poor and vulnerable people will be supported to increase their food and nutrition security and their resilience to climate change.

Through our many years of Nutrition programming, CARE has developed proven models, influenced the health and nutrition agenda of several countries and demonstrated strong

leadership in global nutrition, particularly in national and global Scaling Up Nutrition movements and the **UN Decade** of **Action** on **Nutrition**. In addition, CARE's many years' experience and reputation for delivering lasting impact through our programming has earned us respect among our peers and positioned us as a partner of choice for governments, donors, research institutions and peer organizations.

5.11 Co-creation process

Results from the baseline survey to be conducted at the beginning of the project will form the basis of a cocreation workshop to finalize project design process. The workshop will engage key stakeholders of the project including government representatives at national and decentralized levels, the university of Bahir Dar and partner implementing partners. This co-creation process will be informed by data from earlier formative research and gender analysis conducted by CARE in the implementing sites. The process will also review proven interventions and utilize jointly agreed behavior framework model to identify or validate barriers, enablers/ opportunities, motivators and actors. This would help refine interventions and finalize project design and plans.

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APPENDICES

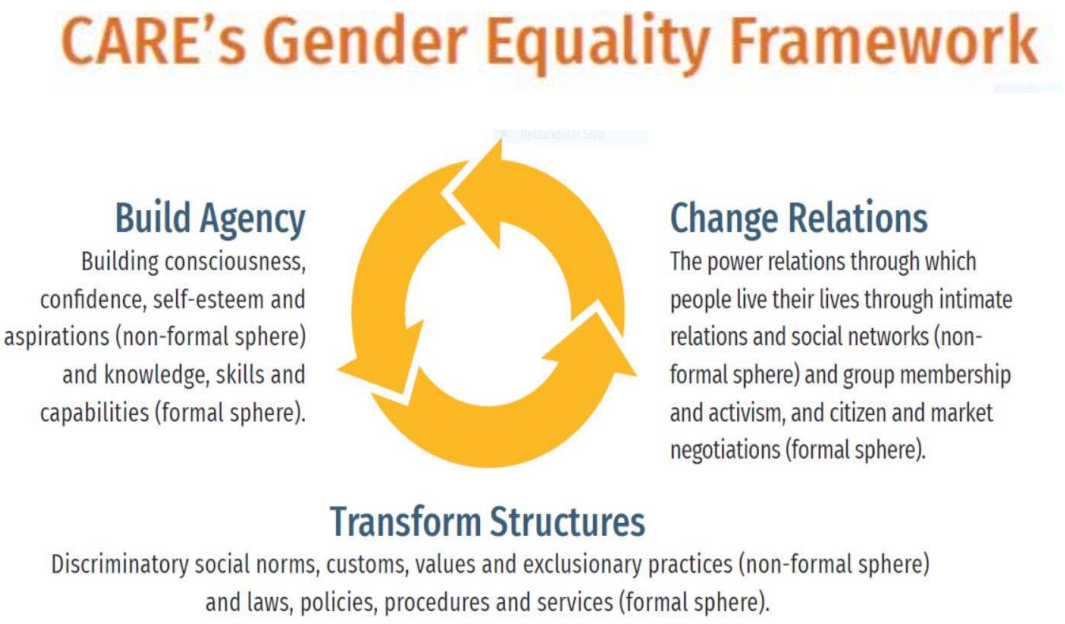
Appendix A: Eleanor Crook Foundation Request for Applications

Adobe Acrobat Document

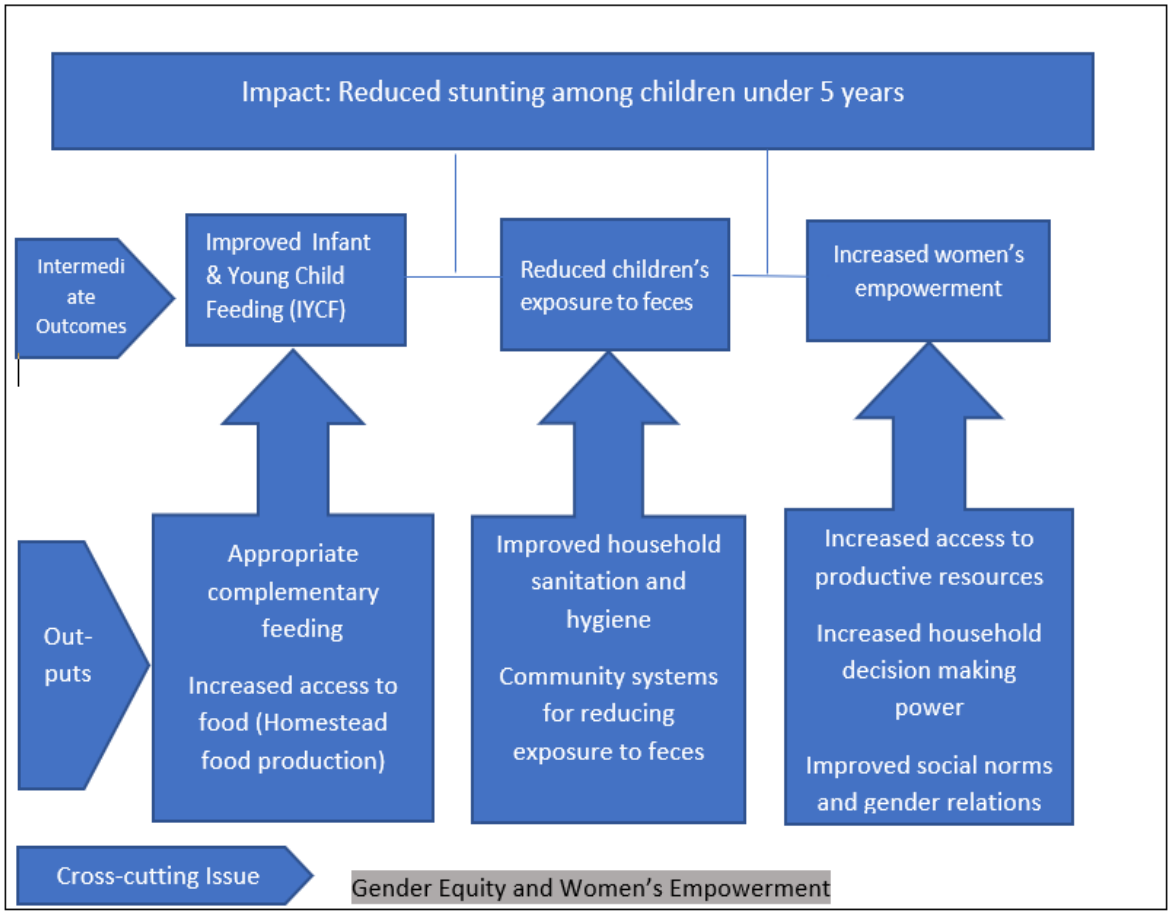
Appendix B: Review Guide/ summary

Microsoft Word 97 - 2003 Document

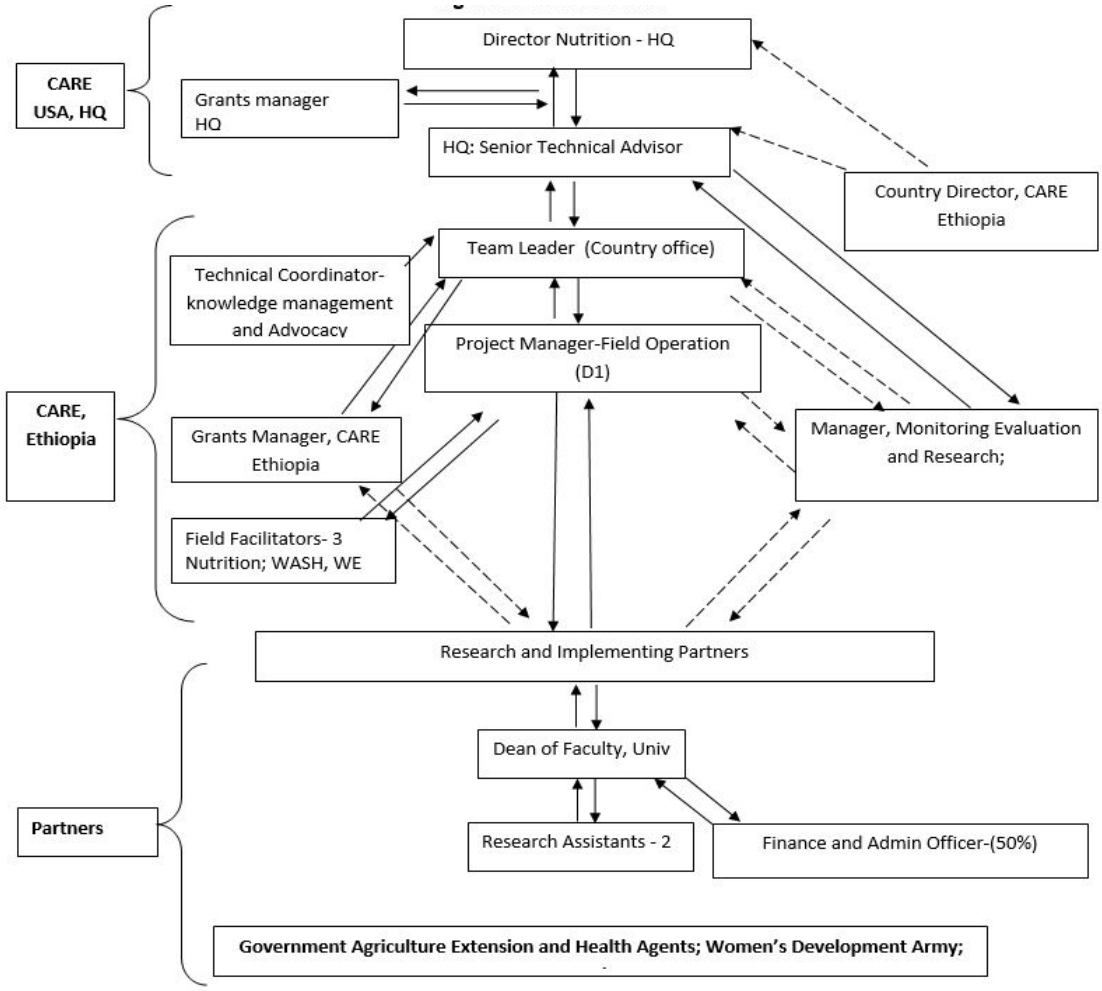
Appendix C: Gender Equality Framework



Appendix D: Project Results Framework



Appendix E: Management and Staffing Plan



Legend: ----------→ : Dotted line responsibility/ communication; ——→ :Direct responsibility/ communication

Appendix F: Village Savings and Loans Association (VSLA) Description

Microsoft Word 97 - 2003 Document

Appendix G: Food and Nutrition and Security - Social Analysis and Action Brief (FNS-SAA)

Adobe Acrobat Document

Appendix H: – Growing the Future Manual (GtF)

Adobe Acrobat Document

Appendix I: Logical Framework

Outcome and Output Indicators

Results	**Illustrative Activities**	**Indicators**	**Source of information**
IMPACT			
Reduced stunting among children under 5 years in participating communities (Height-for-age z-score (<2SD))	• Promote improved IYCF • Reduce risk of EED among children • Increase Gender transformation and Women's Empowerment	% of stunted children compared to baseline	Anthropometric measurement – Baseline, mid-term and end line survey
OUTCOMES			
Outcome 1: Improved nutrition practices for children under 5 years in implementing communities	• Carry out comprehensive nutrition education and counselling targeted at primary caregivers and public nutrition awareness campaigns • Increase availability and access to nutritious food through homestead food production and increased incomes	• % of children exclusively breastfed (0-5m) • % of children aged 6-23 months who are fed a daily diet from 4+ food groups • % of children (6-23 months) who are fed age-appropriate # of daily meals • % increase in GMP (baby wellness clinic) attendance	Data from previously conducted formative research Baseline, mid-term and end line data

Results	Illustrative Activities	Indicators	Source of information
	• Improve food preparation and feeding practices through demonstration cooking and feeding • Build capacity of HEWs to provide improved IYCF counseling and support		Health Center records
Outcome 2: Reduced children's exposure to feces	• Create awareness of impact of negative sanitation practices • Support community and households to establish systems for separating animals from children's play and living spaces	• % of children in study group who test negative for intestinal permeability • % of children who test negative for intestinal inflammation	Lactulose and Mannitol test (for EED) conducted at baseline and end line (see detailed description above)
Outcome 3: Increased women's empowerment	• Promote women's economic empowerment (activities include access to credit, and a range of income generation activities) • Community gender dialogues	% of mothers/ caregivers who report taking decisions about food distribution in the home Increased purchases of nutrient dense foods in the home % mothers/ caregivers who report who report having engaged in negotiation with spouse of	Baseline, formative research and end line survey (Interviewer administered questionnaire)

Results	Illustrative Activities	Indicators	Source of information
	• Engaging men to create awareness and elicit their buy-in and support to address negative gender practices	community leader Enabling environment Improved spousal relations (CARE's Gender Empowerment Framework (GEF)	Pro-Women's Empowerment in Agriculture Index (Pro-WEAI)
OUTPUTS			

Output 1.1.
 	
Increased knowledge and skills to improve infant and young child feeding (IYCF) behavior
	• Training of CHW, WDA, VSLA leaders as trainers and counselors for IYCF
	• Education of mothers and care givers
	• Demonstration cooking
	• Development of household menus
		• # of women of reproductive age who can correctly cite 5 out of 10 recommended feeding practices (including e.g. timely initiation of BF; exclusive and continued BF till 6 months; timely initiation of complementary feeding; FATVAH; food groups etc.)
		• % of VSLA groups completing full course of "Growing the Future" lessons in 12 months
		• % of participants whose status reflects recommended practice for:
		  • Breastfeeding
		  • Meal frequency
			Baseline, mid-term and end line survey;
			Monitoring data

Results	Illustrative Activities	Indicators	Source of information
		• Dietary diversity • Meal consistency/thickness • Responsive feeding	
Output 1.2. Households establish homestead gardens and small animal	• Demonstration gardens established • Skills building and support provided to households to establish homestead gardens • Innovative gardening practices such as sack gardens introduced to landless households • VSLA groups provided with basic bookkeeping and marketing skills	• # of households managing a family garden • % of households eating food from their own family garden • # of households having purchased animal source foods in previous week, disaggregated by gender • # of households who have fed dark-green leafy vegetables in previous week Disaggregated by gender	Baseline, formative research and end line survey; Monitoring data (Interviewer administered questionnaire)
Output 2.1 Mothers/ caregivers make plans to keep animals and children's dwelling places separately	• Sanitation education provided to households (mothers, fathers and care givers) with a focus on handwashing and EED • Media educated on sanitation • Partnership with media to carry out community wide sanitation campaigns	• % of households who can cite 2 key dangers/ risks to health posed to children from eating feces • # of participating households who have shared information with other community	Baseline, formative research and end line survey; Monitoring data

Results	Illustrative Activities	Indicators	Source of information
		members on the dangers of children eating fecally contaminated soil	(Interviewer administered questionnaire)
Output 2.2.Community systems for reducing exposure to feces established.	Households supported to develop household plans for separating children's play spaces from animals Collaborate with EOC and community leaders to develop feasible and acceptable mechanisms and byelaws for separating animal housing from household sleeping spaces	• % of households who safely dispose of feces since baseline (beginning of project) • % of households who have constructed separate spaces for children and animals since baseline • % of communities where, open defecation is reduced	Baseline, formative research and end line survey; routine monitoring (Interviewer administered questionnaire and observation)
Output 3.1. Women participating in social and economic groups	Organize participating women into VSLA groups (in Simada). Encourage and support all project beneficiaries to join or self-select to join groups.	No. of mothers or make decision regarding food % of women using good home gardening practices	Baseline, formative research and end line survey; routine monitoring (Interviewer administered questionnaire and observation)

Results	Illustrative Activities	Indicators	Source of information
Output 3.2. SAA dialogues lead to household and community plans to address negative gender norms (including consequences on child health nutritional outcomes)	Hold SAA sessions to discuss	Number of men and community/ religious leaders consistently attending SAA sessions (at least 50% of all sessions) Number of men who become gender champions	Project records of SAA session attendance and reports
Output 3.3. Educational plans that address negative feeding and gender norms developed with Ethiopian Orthodox church		Number of negative social and gender norms identified during baseline that have changed	Baseline, formative research and end line survey; (Interviewer administered questionnaire and observation)

*Formative research data is from previously conducted formative research study.

Appendix J: Implementation Plan/ Gannt Chart

	Activities	Year 1 Quarter				Year 2 Quarter				Year 3 Quarter				Yr. 4 Quarter				Responsible	Comment
		1	2	3	4	1	2	3	4	1	2	3	4	1	2				
A	**Project Implementation**																		
1	**Improve nutrition and feeding practices**																		
1.1	Application for ethical clearance	**x**																CARE; Bahir da University	A consultant to be recruited for the baseline survey may lead the process for securing IRB clearance.
1.2	Baseline and Formative research (Preparation, implementation and reporting)	**x**	**x**															Consultant with CARE and university	
1.3	Identify implementing communities	**x**																Project Manager; Field facilitators; district government officers; Community health workers	

	Activities	Year 1 Quarter				Year 2 Quarter				Year 3 Quarter				Yr. 4 Quarter				Responsible	Comment
		1	2	3	4	1	2	3	4	1	2	3	4	1	2				
1.4	Identify participating households/ children	x																Project Manager; Field facilitators; Community health workers	
1.5	Form VSLA groups	x																Project Manager; Field facilitators	
1.6	Carry out comprehensive nutrition education and counselling targeted at primary caregivers and public nutrition awareness campaigns		x	x	x	x	x	x	x	x	x	x						Project Manager; Field facilitators; Community health workers	
1.7	Training of trainers for VSLA and WDA leaders and on IYCF - use of group education materials, and use of home visit counseling	x	x															CHWs, CHW supervisor, CARE staff, district hospital technical staff	
1.8	Implementation of homestead food production			x	x	x	x	x	x	x	x	x	x	x				Project Manager; Field facilitators; Agriculture extension agents	
1.9	Education of VSLA members on IYCF through monthly group meetings				x	x	x	x	x	x	x	x	x	x				Field facilitators; Community health workers; WDA	

	Activities	Year 1 Quarter				Year 2 Quarter				Year 3 Quarter				Yr. 4 Quarter				Responsible	Comment
		1	2	3	4	1	2	3	4	1	2	3	4	1	2				
1.10	Implementation of skills obtained through training/meetings by VSLA groups (food preparation and feeding practices through demonstration cooking and feeding)				x	x	x	x	x	x	x	x	x	x				Field facilitators; VSLA and WDA leaders	
1.11	Promote increased access to nutrition and health services		x	x	x	x	x	x	x	x	x	x	x	x				Project Manager; Field facilitators; Community health workers	
2.	**Improve hygiene and sanitation practices to reduce risk or EED among children under 5**																		
2.1	Create awareness of impact of negative sanitation practices		x	x	x	x	x	x		x	x	x	x	x				Field facilitators; Community health workers	
2.2	Support community and households establish systems for separating animals from children's play and living spaces			x	x	x	x	x		x	x	x	x	x				Project Manager; Field facilitators; district mayors; Community leadership; Community health workers	
3.	**Promote gender equity and women's empowerment to increase women's decision making power in the home and to influence intra-household food distribution**																		

	Activities	Year 1 Quarter				Year 2 Quarter				Year 3 Quarter				Yr. 4 Quarter				Responsible	Comment
		1	2	3	4	1	2	3	4	1	2	3	4	1	2				
3.1	Promote women's economic empowerment (activities include access to credit, and a range of income generation activities)		x	x	x	x	x	x		x	x	x	x	x				Field facilitators; VSLA and WDA leaders	CARE project manager
3.2	Community gender dialogues; awareness on women's rights			x	x	x	x	x		x	x	x	x	x				Field facilitators; VSLA and WDA leaders	Support from CARE Women's Empowerment program staff
3.3	Engaging men to create awareness and elicit their buy-in and support to address negative gender practices (organize discussions with couples on decision-making processes about household food and impact on pregnant mothers, infants/children)			x	x	x	x	x		x	x	x	x	x				Field facilitators; VSLA and WDA leaders	Support from CARE Women's Empowerment program staff
B. Research/ Study																			
B.1	Monitoring			x	x	x	x	x		x	x	x	x	x	x			Project manager; M&E officer, Field facilitators	In collaboration with Bahir da university

	Activities	Year 1 Quarter				Year 2 Quarter				Year 3 Quarter				Yr. 4 Quarter				Responsible	Comment
		1	2	3	4	1	2	3	4	1	2	3	4	1	2				
B.2	Identification of households participating in study			x	x													Project manager; M&E officer, Field facilitators	In collaboration with Bahir da university
B.3	Training of enumerators and laboratory technicians	x					x							x	x			Project manager; M&E officer, Bahir da university	Training of enumerators and technicians will take place at baseline for the whole project and in year 2 at mid-term and in year 4 at final evaluation
B.4	Project Evaluation; Collection of data and human specimen		x					x							x			Project manager; M&E officer, Bahir da university	Data collection will take place at baseline, mid-term and final evaluation
B.5	Data Analysis		x					x							x			Project manager; M&E officer, Bahir da university	Data analysis will take place at baseline, mid-term and final evaluation
B.6	Reporting and dissemination														x			Project manager; M&E officer, Bahir da university	