

Behavior Change of Mothers/Caretakers after an Educational Intervention in the Title II  
Supplementary Feeding Program in Malawi

A Senior Honors Thesis for the Community Health Program  
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## Abstract

Malnutrition is a serious global health concern that is linked to nearly half of all child deaths worldwide. Supplementary feeding programs that distribute food to families of malnourished children have been shown to be effective in treating malnutrition. However, the feeding practices of the Beneficiary Mothers/Caretakers (BMCs) of the malnourished children often do not align with program recommendations, which may reduce programmatic impact. This study investigated a behavior change intervention designed to improve BMC compliance with feeding recommendations in the Title II Supplementary Feeding Program in Malawi. BMCs from two geographically separate areas were randomly sampled to form a group that received the educational intervention plus supplementary food and a usual care group that received only supplementary food. Eight behaviors were assessed in the areas of food preparation, food consumption, and hygiene practices. Data from an interviewer-administered, post-intervention questionnaire were analyzed from BMCs in the intervention group (n = 239) and usual care group (n = 163.) The intervention group showed significantly higher ( $p < .01$ ) rates of compliance for all three food preparation behaviors and two of three consumption behaviors in the intervention group compared to the usual care group. However, neither of the two hygiene behaviors had different rates of compliance among the groups. These results indicate that behavior change interventions can enhance the effectiveness of supplementary feeding programs, but more of an emphasis on hygiene behaviors may be needed for maximum impact.

## Introduction

### Moderate Acute Malnutrition

Malnutrition is an underlying factor in 45% of all child deaths worldwide, and is the most significant risk factor for illness and death globally in young children (World Health Organization, 2014; You, New & Wardlaw, 2012). Every year, 7.6 million children under age five die worldwide, and about 20% of those deaths are attributable to malnutrition (World Health Organization, 2012). Many of these children suffer from moderate acute malnutrition (MAM), which is defined as a child having a weight-for-height between -3 and -2 z-scores below the median of World Health Organization child growth standards (World Health Organization, 2012). MAM increases child risk of mortality, has negative effects on physical and intellectual development, and increases risk of disease in adulthood (World Health Organization, 2012). In low-income countries, many cases of child death due to disease and infection have MAM as an underlying cause (World Health Organization, 2014). Without treatment, MAM can progress to severe acute malnutrition, which can be a direct cause of child death (World Health Organization, 2014).

MAM among children can coincide with stunting, wasting, or a combination of both. Stunting is an indicator of long-term chronic malnutrition and is defined as having a low height-for-age compared to a reference population (Drewett, 2007; World Health Organization, 2015). In contrast, wasting is a sign of short-term malnutrition, often occurring in famine conditions, and is defined as a child having a low weight-for-height (Drewett, 2007; World Health Organization, 2015). In 2010, of the 55 million preschool aged children worldwide who were wasted, 40 million of them were moderately acutely malnourished (World Health Organization, 2012).

Childhood MAM often begins between 6 to 18 months of age and the wasting and/or stunting is usually due to food insecurity stemming from inadequate breastfeeding, or introduction of complementary foods that are mainly starches and low in protein and nutrients (World Health Organization, 2012). While food insecurity is an important cause of malnutrition, poor feeding practices, sanitation and hygiene are also contributors (World Health Organization, 2012). Childhood MAM is also closely related to infection and disease; a sick child is more likely to become malnourished, and a malnourished child is more likely to become sick (World Health Organization, 2012). Malnutrition is strongly associated, and often causally linked, with acute diarrhea and acute respiratory infections, which are the two most prevalent causes of death in children under five (Rodriguez, Cervantes & Ortiz, 2011). Due to the high global burden of childhood malnutrition, reducing child mortality and malnutrition worldwide is an important component of the United Nation's Millennium Development Goals, which has resulted in increased investigation into the best method of treating malnutrition (United Nations Statistics Division, 2010).

### **Malnutrition in Malawi**

Malawi has been the target of numerous nutrition interventions, due to its high prevalence of malnutrition (Patel et al., 2005). The prevalence of stunting in children under five is 48%, and over half of the deaths in these children are due to malnutrition (Patel et al., 2005; World Health Organization, 2010). If stunting is not treated and prevented in children before age two, it can have irreversible negative growth and developmental effects (Bhutta, 2010). The prevalence of wasting in Malawi is much lower, at 4.1%, which indicates that chronic malnutrition is a larger problem than short-term famine (World Health Organization, 2010). The overall prevalence of underweight children under 5 in Malawi is high, at 13.8%, and interventions are necessary to

prevent and treat malnutrition while these children are still young, before it can have lasting developmental effects (World Health Organization, 2010).

### **Supplementary Food and Interventions to Address Malnutrition**

The World Health Organization suggests treating MAM by providing children with locally available, nutrient dense foods (World Health Organization, 2012). When the mothers or caretakers of malnourished children are not able to provide the child with the energy and nutrients they need, supplementary foods can be provided. Supplementary foods are formulated to have a specific energy density, and a composition of micronutrients, protein and fat to best meet the needs of a specific target population (World Health Organization, 2012). The supplementary food discussed in this thesis is a porridge made from a mixture of Corn Soy Blend flour (CSB) and vitamin A and D Fortified Vegetable Oil (FVO). CSB is a fortified blended food that is formulated to address MAM in children ages 6 to 59 months. CSB is the supplementary food used by the United States Agency for International Development (USAID) and its partners, including the World Food Program (De Pee & Bloem, 2009). USAID CSB contains 69.5% cornmeal, 21.8% soybean flour, 5.5% soybean oil, and 3% micronutrients and antioxidants (De Pee & Bloem, 2009). In Malawi, CSB tends to be a widely accepted supplementary food; studies have found that CSB is accepted and liked by Malawian mothers and children because it resembles traditional Malawian food (Flax et al., 2010; Wang et al., 2013). In 2007, the World Food Program distributed 192,000 metric tons of CSB worldwide to treat malnutrition (De Pee & Bloem, 2009).

### **Effectiveness of Supplementary Feeding Programs**

There is strong evidence to suggest the efficacy of supplementary feeding programs in reducing child malnutrition (Matilsky et al., 2009; Vautier et al., 1999). Evidence from 40,223 children participating in supplementary feeding programs implemented for eight months in

Liberia, and six months in Burundi and Goma, showed a 77% recovery rate (weight-for-height greater than 85% of the median) from malnutrition (Vautier et al., 1999). Matilsky et al. (2009) showed similar recovery rates in Malawian children aged 6-60 months with MAM, measured by achieving a weight for height z-score greater than negative two. Matilsky et al. (2009) tested two types of supplementary foods, and found that CSB resulted in 72% recovery and fortified spreads resulted in 80% recovery, which is consistent with the results of other studies (Patel et al., 2005). Fortified spreads are Ready to Use Supplementary Foods, which are provided in pre-packaged serving sizes and require no preparation. CSB needs to be cooked into a porridge and fed to the child in the correct amounts, which could account for the lower recovery rate observed (Matilsky et al., 2009). Additionally, CSB requires time and fuel to cook, which can be a barrier for many mothers (Patel et al., 2005).

Although there is compelling evidence that supplementary feeding programs can improve growth outcomes, most studies do not provide information about how the mothers prepared the food and whether or not they fed it to the malnourished child (Patel et al., 2005; Matilsky et al., 2009). It is crucial to collect information about how mothers utilize supplementary foods in order to improve the efficacy of the programs. There is a need for studies that specifically collect information about mothers' compliance with the recommendations of the programs (Patel et al., 2005; Matilsky et al., 2009).

### **Challenges with Compliance in Supplementary Feeding Programs**

Data collection about compliance with feeding program recommendations is critical, because mother/caretaker compliance is an issue that has been identified in many supplementary feeding programs. Simply providing families of malnourished children with supplementary food often is not sufficient to ensure it will be utilized as recommended to treat malnutrition (Patel et al., 2005; Bonvecchio, 2007; Hotz & Gibson, 2004). In sub-Saharan Africa, most supplementary

feeding programs provide families with supplementary food in bulk, and it is the responsibility of the family to feed it to the child in the correct amounts. For malnutrition treatment to be effective, the child must receive the right amount of supplementary food, prepared in the recommended way, to ensure they get the correct amount of energy, vitamins and minerals. However, research in Malawi has shown that mothers of malnourished children often do not comply with recommended preparation and rationing of the supplementary food. This observational research has identified specific behaviors that may be reducing program efficacy, which involve the measurement and use of ingredients, cooking time, and sharing or selling of the food (Kumwenda, Nhlema, & Maganga, 2014).

Another major threat to the efficacy of supplementary feeding programs is “leakage”, which refers to the consumption of the supplementary food by people other than the malnourished child (Patel et al., 2005; Bonvecchio et al., 2007). Families often share the supplementary food among other members of the household, or sell it outside of the household (Patel et al., 2005). Supplementary feeding programs have found that 50-75% of the supplementary food is not consumed by the intended beneficiary child (Patel et al., 2005). To account for this discrepancy, the World Food Program recommends doubling the ration from the necessary 500kcal per child per day to 1,000kcal (Wang et al., 2013).

Studies in Malawi by Wang et al. (2013) and Flax et al. (2010) have reported 21% and 15% of caregivers share supplementary food with people who are not the beneficiary child. However, there is very limited research on Malawian mothers’ compliance with supplementary feeding program recommendations and additional studies that observe feeding practices of mothers enrolled in supplementary feeding programs are needed.



### **Behavior Change Nutrition Education in Supplementary Feeding Programs**

In order to maximize compliance with supplementary feeding program recommendations, the World Health Organization recommends providing mothers with nutrition education and counseling (WHO, 2012). Behavior change communication is a useful nutrition education strategy, and is defined as an evidence-based process of communicating to promote behaviors in order to achieve better health outcomes (The Manoff Group, 2012). Behavior change communication can be especially effective in supplementary feeding programs, because it focuses on improving the knowledge and feeding practices of mothers, maximizes compliance with program recommendations and can ultimately improve children's nutritional status (Mbuya et al., 2013). Behavior change communication should rely on formative research with the beneficiaries of supplementary feeding programs, so that it is relevant to their specific context and concerns (The Manoff Group, 2012). The problems with compliance in supplementary feeding programs can be partly combated by providing the mothers with behavior change communication about how to properly give their child the supplementary food, and why it is crucial to give the food only to the malnourished child (Bonvecchio et al., 2007).

Behavior change communication alone directed at mothers/caretakers has the potential to improve their children's nutritional status, but there is stronger evidence supporting a comprehensive approach of behavior change communication combined with supplementary feeding programs (Fabrizio, Liere & Pelto, 2014; Bhandari et al., 2001; Inyati et al., 2012; Roy et al, 2005). Three studies compared groups of malnourished children assigned to conditions that received only intensive nutrition education, intensive nutrition education and supplementary foods, or no intervention/non-intensive nutrition education (Roy et al, 2005; Bhandari et al., 2001; Inayati et al, 2012). All three of the studies found the group that received supplementary food and intensive nutrition education together had better nutritional outcomes than the other

groups, and two of the studies found a significant effect on child weight (Bhandari et al., 2001; Inayati et al., 2012). Roy et al. (2005) found that after a three-month intervention period and 6 months of further observation, 86% of children in the education and supplementary feeding group had significantly improved their nutritional status, compared to 59% of the children in the nutrition education group, and only 30% of the children in the control group.

In addition to concluding that intensive nutrition education combined with supplementary feeding resulted in the best nutrition outcomes, Inyati et al. (2012) went a step further and also included a group of children who received supplementary food and non-intensive nutrition education. They found that mildly wasted Indonesian children in the group receiving non-intensive nutrition education and supplementary food ( $n = 50$ ) had only a marginal increase in weight compared to the group with non-intensive nutrition education and no supplementary food ( $n = 50$ ). This suggests that supplementary food was not used in a way that caused significant weight gain when it was not supported by intensive nutrition education. After a 5-month follow-up assessment, researchers observed that the children from the groups who had received intensive nutrition education were more able to maintain or increase their nutritional status than the children in the groups that received non-intensive nutrition education, which further supports the hypothesis that behavior change among mothers and caretakers can promote child nutrition (Inayati et al., 2012).

All three studies described above concluded that the improved nutritional outcomes in the education and supplementary feeding groups resulted from improved feeding behaviors and increased utilization of the supplementary foods by the mothers, but only the study by Roy et al. (2005) in Bangladesh actually investigated maternal behaviors. Roy et al. (2005) observed three maternal feeding behaviors key to their program that the mothers were taught during the nutrition

education sessions. The behaviors were to feed the child more than three times per day, feed each child with separate feeding pots, and cook extra complementary food for the child. For all three of the behaviors observed, both the mothers in the nutrition education group and in the education with supplementary feeding group significantly improved their compliance with the recommended behaviors from baseline. This suggests that it was the actual behavior change that promoted the improved nutritional outcomes, not only the supplementary food (Roy et al, 2005). A separate study in Mexico developed a behavior change communication intervention to decrease problems with supplementary food utilization (Bonvecchio et al., 2007). The authors found a significant increase of 40-65% in reported and observed behaviors for three of the four behaviors they emphasized. One of the behaviors emphasized was targeting the supplementary food specifically to the malnourished child, which they found increased from 52% to 91% in one their sample communities after the intervention (Bonvecchio et al., 2007).

In summary, there is evidence that behavior change communication can improve compliance with supplementary feeding program recommendations and utilization of supplementary foods (Roy et al, 2005; Bhandari et al., 2001; Inayati et al, 2012; Bonvecchio et al., 2007). However, only a handful of studies have investigated the actual feeding behaviors of mothers within supplementary feeding programs. There is a need for additional studies confirming the efficacy of behavior change communication combined with supplementary feeding programs.

### **Role of Community Health Workers in Implementing Behavior Change Education**

Community health workers (CHWs) have been effective in disseminating behavior change communication in nutrition education programs for mothers and may offer value in addressing non-compliance with supplementary feeding programs in Malawi (Mbuya et al., 2013; Santos et al., 2001). In Malawi, CHWs are employed by the Malawi Ministry of Health

and provide a link between the healthcare system and the citizens, to help Malawians receive access to healthcare services (Phuka et al., 2014). As recommended by the World Health Organization, CHWs should be members of the communities in which they will work, and should be selected by and answerable to their communities (Phuka et al, 2014).

CHWs have been shown to transmit knowledge effectively through behavior change communication in supplementary feeding programs in Haiti (Mbuya et al., 2013). Mbuya et al. (2013) found through tests of knowledge-sharing efficacy of CHWs and knowledge of CHWs and mothers, that mothers were able to learn 70% of the CHWs shared correct knowledge. In another study, CHWs provided education to low-income mothers of 815 children aged two to five in a two year long supplementary feeding program in South Africa (Walsh et al., 2001). The CHWs provided mothers with knowledge about balanced meals, food purchasing and preparation, and child nutrition through workshops, demonstrations and home visits. The percentage of severely underweight children in most sample areas decreased dramatically compared to the control areas, which received the supplementary feeding intervention with no education (Walsh et al., 2001).

Santos et al. (2001) created a theoretical framework for how CHWs and other healthcare providers involved in behavior change interventions in supplementary feeding programs impact nutritional status of malnourished children. Santos et al.'s hypothesized program impact pathway is as follows: "1) nutritional counseling training would lead to improvements in the knowledge and skills of health care providers regarding the assessment and management of nutritional and feeding problems; 2) improved provider knowledge and skills would enhance the ability of the providers to provide appropriate caregiver advice; 3) enhanced provider advice would improve caregiver's nutritional management attitude and behavior; 4) caregiver's improved attitude and

behavior would increase the child's nutritional intake; 5) improved intake would increase anthropometric growth." This conceptual framework applies to the CHW model used in the current study. After using this framework to develop and implement a nutrition counseling strategy in Southern Brazil, Santos et al. (2001) found improved knowledge and performance in doctors, improved knowledge and compliance with feeding recommendations in mothers, and increased child weight gain.

### **Significance of this Thesis**

Overall, there is evidence that supplementary feeding programs can have an effect on malnutrition, and that behavior change communication education can enhance that effect.

However, the existing research is limited in several important ways. First, there is insufficient research on behavior change communication combined with supplementary feeding programs, and therefore additional studies are needed to clarify the role behavior change communication plays in treating malnutrition. Second, most current studies assess the effect of supplementary feeding programs on growth outcomes and do not collect data about the behaviors of mothers. More research on feeding behaviors of mothers within supplementary feeding programs is needed, because often there are high rates of non-compliance with program recommendations. Specifically, more research in Malawi is needed, because there are a number of supplementary feeding programs due to the high prevalence of child malnutrition, but high rates of non-compliance with program recommendations are observed (Kumwenda et al., 2014).

Recognizing this gap in the literature, this thesis investigates the effect of behavior change communication education disseminated through CHWs on behaviors related to feeding practices of Malawian mothers/caretakers enrolled in a USAID supplementary feeding program. The results of this thesis will help to inform the development and implementation of supplementary feeding programs so that programs can use their resources most effectively to

combat malnutrition. USAID's food programming has helped more than three billion people in 150 countries since 1954 (Webb et al., 2011). The results of this thesis will directly contribute to a parent study's evaluation of the USAID Title II supplementary feeding program in Malawi, which will contribute to USAID's program improvement so that it can better serve its beneficiary populations.

### **USAID Title II Food Program**

This thesis uses data collected from the Food Aid Quality Review study, which is an evaluation of USAID's Title II supplementary feeding program in Malawi, which addresses MAM in children under age five. This feeding program operates in partnership with the Malawi Ministry of Health, and several private voluntary organizations including Project Concern International, Save the Children, and Africare. These private voluntary organizations work in specific regions of southern Malawi, and identify malnourished children under the age of five based on their mid-upper arm circumference. Children with a mid-upper-arm circumference of 11 to 12.5 cm are considered to have MAM (Maleta, 2006). The mothers or caretakers of the malnourished children (beneficiary children) are called Beneficiary Mothers/Caretakers (BMCs) and are given a ration card so they can collect Corn Soy Blend (CSB) and Fortified Vegetable Oil (FVO) from a food distribution point, monthly, for four months. At every food distribution point visit, the mothers receive education about the correct use of the supplementary food from Community Health Workers (CHWs). The CHWs also supervise and provide education to Lead Mothers (LMs), who provide additional social support to the BMCs and make home visits to provide further health education.

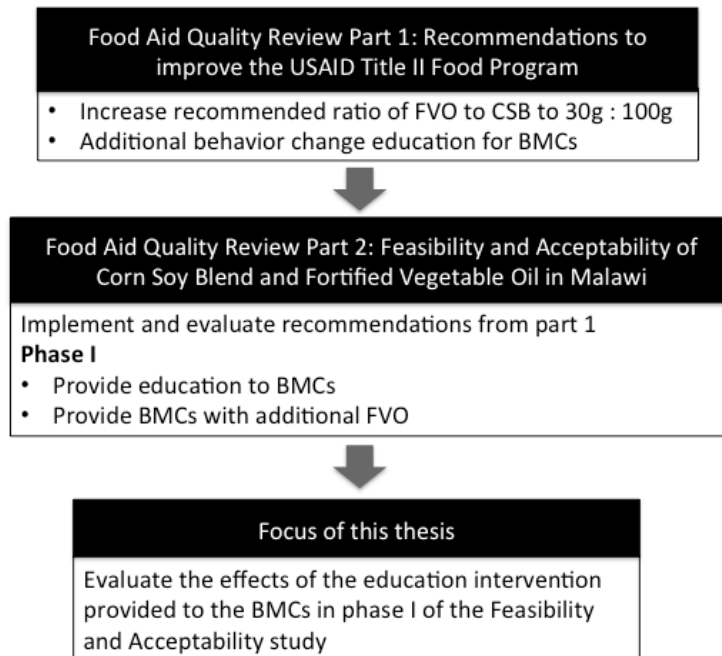
### **Overview of Parent Study: The Feasibility and Acceptability Study of CSB and FVO in Malawi**

In 2009, USAID asked the Friedman School of Nutrition Science and Policy of Tufts University to conduct the Food Aid Quality Review evaluation. Part one of the evaluation was a

two-year review to provide recommendations to the Title II Food Program to better meet the needs of its beneficiaries in a cost-effective way (Web et al., 2011). In part two of the Food Aid Quality Review, recommendations from part one were implemented and evaluated in the Title II food program in Malawi. This thesis examines data collected in part two of the Food Aid Quality Review, as part of a parent study, titled the *Feasibility and Acceptability Study of Corn Soy Blend and Fortified Vegetable Oil in Malawi*.

One change implemented in the parent study was to increase the recommended ratio of FVO to CSB in the porridge mixture prepared by BMCs. The extra oil provides more calories to the beneficiary child and promotes the absorption of fat-soluble vitamins. Additional behavior change education for the BMCs was also recommended and implemented. Although the Title II Food Program includes some education for BMCs, issues with compliance were observed during a formative evaluation before the intervention. In the evaluation, many of the mothers were observed preparing the porridge incorrectly, feeding it to the beneficiary child in incorrect amounts, sharing it among other members of the household, and selling it (Kumwenda et al., 2014). Subsequently, phase I of the parent study consisted of the additional education and extra FVO, and was implemented in 12 food distribution points. The BMCs in the intervention group were given extra oil, and received additional education from CHWs and LMs about the proper way to prepare and feed the porridge to the beneficiary child. The usual care group continued to receive their CSB and FVO in the same amounts as before, and did not receive any education other than what the private voluntary organizations in the Title II supplementary feeding program were already providing. In this thesis, data collected after phase I from 402 BMCs in the intervention and usual care groups were analyzed to evaluate the educational intervention implemented as part of the Food Aid Quality Review.

Figure 1. Overview of the Food Aid Quality Review, and how this thesis contributes to the parent study and larger project



## Research Questions and Hypotheses

### Primary Research Question

In the Feasibility and Acceptability Study in Malawi, are the food preparation, consumption and hygiene behaviors of BMCs enrolled in supplementary feeding programs more consistent with recommended guidelines in the group that received an educational intervention compared with those in the usual care group who did not receive this intervention?

Hypothesis 1: The BMCs in the group that received the educational intervention will exhibit feeding practices that are more consistent with the recommended guidelines of the supplementary feeding program, compared with the usual care group.

### Secondary Research Question

Do the intervention and usual care group vary significantly on key demographic characteristics, or on their exposure to the food distribution point and education?



Hypothesis 2: The intervention and usual care groups will have similar demographic characteristics and will have similar descriptive statistics for select items assessing their exposure to the food distribution point and education.

## **Methods**

### **Design**

This cross-sectional study was conducted using data from a questionnaire administered to BMCs who received an educational intervention to improve compliance with feeding protocols, and usual care BMCs who did not receive the intervention in the parent study (see figure 2).

### **Sampling**

The BMCs in the parent study all had beneficiary children under 5 years old enrolled in the Title II supplementary feeding program, and lived in the Mulanje, Chiradzulu, Machinga or Bakala districts in Southern Malawi. The BMCs were randomly selected for data collection from the private voluntary organizations' lists of all the beneficiaries that came to the food distribution point on the most recent food distribution occasion. Participants were randomly selected from villages surrounding the food distribution points using multi-staged cluster sampling. Each food distribution point served as a major cluster, and the villages assigned to each distribution point served as sub-clusters. A probability proportional to size technique was used whereby participants from villages or food distribution points with larger populations had greater chance of being selected.

### **Educational Intervention**

The Tufts University Friedman School of Nutrition Science and Policy commissioned a team of behavior change communication experts to design the educational intervention. The intervention built on the preexisting educational structure of the Title II supplementary feeding program, in which the private voluntary organizations train the CHWs, who then train the LMs,

who teach the BMCs. The general flow of information in the intervention was from CHWs to LMs to BMCs, but the CHWs also directly taught the BMCs at the food distribution point (see figure 2). In order to carry out the phase I education intervention, the Behavior Change Communication team educated the CHWs with their educational intervention, and supervised the information flow to LMs and BMCs. Each LM was assigned a group of ten BMCs based on district, and these LMs provided social support and home visits for the BMCs (Appendix B). The usual care group did not receive any education from the intervention, but continued receiving the “usual care,” which was the small amount of education that they had previously received from the private voluntary organizations.

The Behavior Change Communication team also conducted formative research to understand the knowledge, attitudes and practices around supplementary feeding of the BMCs, LMs, and CHWs. This research is summarized in a report detailing key issues and areas of non-compliance with recommended supplementary feeding practices (Kumwenda et al., 2014).

Based on the formative research, the Behavior Change Communication team created educational materials targeted to participants at each level of information flow (CHW, LM and BMC), each emphasizing the same key messages (see Table 1). The educational materials framed malnutrition as a health problem with CSB and FVO as an effective treatment if used according to instructions, and addressed mothers’ behaviors that were inconsistent with the recommendations. They stressed that the FVO needs to be used to cook the CSB and not for other purposes, the food should not be shared within or outside the households, it should not be over or undercooked, and it should be rationed daily so it lasts until the next food distribution.

A standardized training protocol was developed and used by the Behavior Change Communication team to train the CHWs to ensure consistency of educational messages across

multiple training sessions. The CHWs then trained the LMs, and also educated the BMCs each time they came to the food distribution point for their food rations. They explained how to measure ingredients and cook the porridge and stressed that the BMCs should follow the recipe for the porridge. Hygiene behaviors surrounding food preparation were also included, but the primary emphasis of the intervention focused on preparation and delivery behaviors. At the food distribution point, the BMCs were also given measuring utensils for the CSB and FVO. They received a 500ml cup with a special marking to show where the 100 grams of CSB flour should reach, so they could measure the correct amount at home. A total of 300 CHWs and 2716 LMs were trained across 4 districts. It is unclear how many BMCs were educated because they were not trained directly by the Behavior Change Communication team; however, 239 from the intervention group were randomly sampled for data collection (Figure 2).

### **Data Collection Methods**

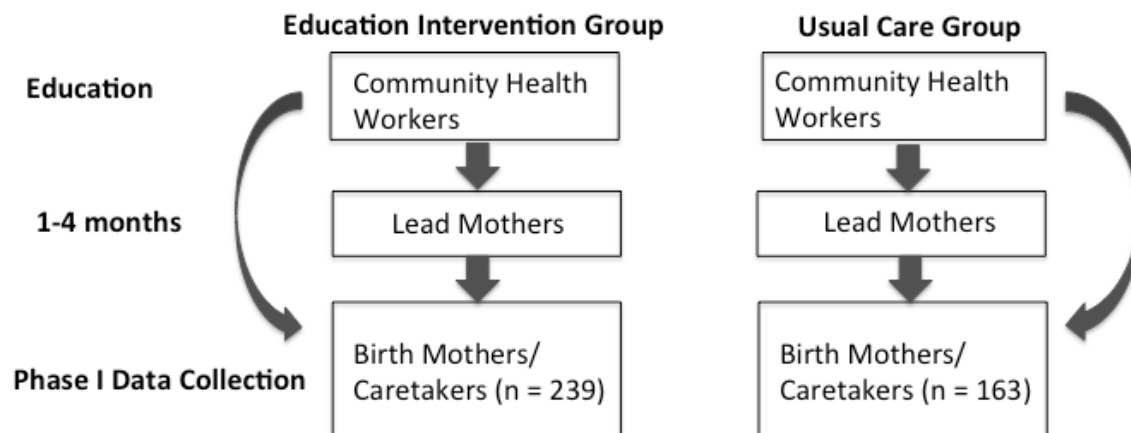
The data analyzed in this thesis is from the Questionnaire for Mothers of Under 5 Beneficiaries (Appendix C) administered to BMCs after the phase I intervention. Phase I data was collected between March 2014 and April 2014, which was approximately 1-4 months after the participants received the educational intervention. Twenty to thirty Research Assistants trained by the parent study administered the questionnaire; they formed teams that were each assigned a district. Research Assistants traveled to the houses of the BMCs to conduct the interviews and at each household went through an IRB-approved consent process. Each interview took 65 minutes on average, and consisted of the Research Assistant verbally asking the BMC self-report items on the questionnaire. Most of the questions had a predetermined list of possible answers that was exhaustive. However, the Research Assistants asked the BMCs the questions in an open ended way, and then selected the appropriate choice on the questionnaire. During the interview, BMCs also demonstrated how they cooked the CSB/FVO porridge and

Research Assistants took note of amounts of ingredients used. Research Assistants also observed how the supplementary food was stored in the household.

Table 1. Survey items selected for analysis from Questionnaire for Mothers of Under 5 Beneficiaries and the corresponding messages emphasized in the behavior change communication intervention.

<b>Survey Item</b>	<b>Corresponding Educational Message in Behavior Change Intervention</b>
<b>Preparation Behaviors</b>	
Show me how much CSB flour you used.	A single portion should include a quarter cup (machera) of flour (182 mL)
Show me how much oil you used.	6 tablespoons, or 6 bottle tops of sobo (local Malawian product) (36 mL)
How long did you boil/cook the porridge for last time you prepared it?	The porridge needs to be cooked for 30-45 minutes.
<b>Consumption Behaviors</b>	
Who consumed the porridge last time you prepared it?	Supplementary food is given to the malnourished child as a treatment; therefore, the mother should give priority to the malnourished child to ensure they recover.
Who in your household usually eats the porridge?	Only the beneficiary child should eat the porridge.
How many times per day does your child normally consume CSB porridge?	The 8kg of CSB and 2.6L of FVO that the mothers receive is measured to last at least one month. The porridge should be prepared according to the measuring standards at least 2 times per day and not more than 3 times per day.
<b>Hygiene Behaviors</b>	
Can I see where you store your CSB?	CSB and FVO is a treatment for the child, so it should be stored separately from other household things. It should be stored off the floor or hanging in a dry place, in a closed/sealed container.
Can I see where you store your oil?	It should be off the floor in a closed/sealed container

Figure 2. Overview of information flow and data source



### Primary Outcome

Dependent Variable: The purpose of this study was to compare compliance with recommended feeding behaviors for BMCs in intervention and usual care groups. Data from eight questions from the interviewer-administered Questionnaire for Mothers of Under 5 Beneficiaries was included in the analysis (see Appendix C for items and response categories). The questions assess compliance with recommendations considered to be essential for proper supplementary feeding practices. The survey questions were written by investigators at the Tufts Friedman School of Nutrition Science and Policy and were pilot tested with 30 BMCs at food distribution points far from those selected for data collection. After piloting, a feedback session occurred and the questionnaire was adjusted accordingly. The survey items were also pretested with a few women within the study sited directly before data collection, and final adjustments were made. They were also reviewed with local enumerators to ensure the wording and meaning of the questions would not be lost when they were translated. The eight questions analyzed in this study were selected from the questionnaire because they asked about behaviors that were specifically emphasized in the education the BMCs received (see Table 1). The eight questions were divided into three categories that assess mother's behaviors relating to the preparation of

the food, beneficiary child consumption, and hygiene/storage of the food. Those interviewed in phase I included both BMCs who received education about the feeding program (n=239) as well as BMCs in the usual care group (n=163) who did not receive this education.

The independent variable was the educational intervention that the BMCs in the intervention group received. Responses to questions assessing behavior for the intervention group were compared to the responses of the usual care group.

### **Data Analysis**

Primary Research Question: To assess differences in BMC behavior, statistical analysis was performed on each of the eight questionnaire items separately. For all questions, the responses that were not consistent with recommended guidelines were grouped, and compared to the answer that followed the recommendation. The percentages of BMCs who responded with the correct answer(s) only were calculated out of the total number of BMCs who answered the question, rather than out of the total sample size.

The items assessing porridge cooking time and how many times per day the child normally consumes the porridge had a single recommended answer choice. The proportions of BMCs who responded with the recommended behavior were compared with the BMCs who responded with a different answer choice. These proportions were compared statistically using a test of proportions. For the item assessing frequency of feeding, both the answers of “two times per day” and “three times per day” were consistent with the recommendations. The proportion of BMCs who responded to either of those answer choices were grouped and compared to the proportion of BMCs who responded to any of the other choices.

The following items were check-all-that-apply answers: “who consumed the porridge last time it was prepared”; “who in your household usually eats the porridge”; “can I see where you store your CSB”; and “can I see where I store your oil”. For these questions, the BMCs could

select more than one answer, but in order to be considered as following the recommendations, the BMCs had to report/show only the recommended answer. Even if they selected the recommended answer and additional answers, they were counted as not reporting/showing the recommended behavior. For the questions about storage of oil and CSB, both the answer choices “off the floor, closed/sealed” and “hanging, closed/sealed” were consistent with recommended guidelines. For all of the check-all-that-apply answers, the proportion of BMCs who only gave the recommended response was compared with the proportion who gave any of the other answers. The questions “show me how much CSB flour you used,” and “show me how much oil you used,” are continuous variables; therefore, the means of the intervention and usual care groups were compared with independent samples t-tests.

Secondary Research Question: To compare socio-demographic characteristics of the intervention group and usual care groups, descriptive statistics such as medians and percentages were presented (see Table 2). Medians were used because the distributions of the demographic variables were highly skewed. Descriptive statistics were also shown for the intervention and usual care groups for five questions in the questionnaire that assess the BMC’s exposure to the food distribution point (see Table 3). It was necessary to see if the groups were equivalent in their responses to these questions, because most of the education occurred at the food distribution point, and BMCs that have had more exposure to it may have received more education. Some response choices to the questions were grouped for simplicity (see Appendix C for original response choices). P-values were calculated with a test of proportions, which compared the proportions of BMCs in intervention and usual care groups who gave each response.

Approval for data use and analysis associated with this thesis was obtained from the Tufts University Institutional Review Board (appendix D).

## Results

### Sample Characteristics

Table 2 presents the demographic characteristics of the intervention and usual care groups, which were similar overall. The median age of the 402 BMCs in this study was 27 years, and the median age of the beneficiary children was 8 months. The wide range of BMC ages (from 15 to 64) demonstrated that there was variability in mother and caretaker age. Overall, less than 20% of BMCs had completed primary education (Table 2).

Table 2. Demographic characteristics of intervention and usual care group BMCs (Birth Mothers/Caretakers) of malnourished beneficiary children from Southern Malawi (n = 402)

Demographic Variable	Intervention (n=239)		Usual Care (n=163)		Total (n=402)	
	Median (n)	Range	Median (n)	Range	Median (n)	Range
BMC Age (years)	27 (237)	17, 64	27 (162)	15, 59	27 (399)	15, 64
Household Size	5 (238)	2, 12	5 (162)	2, 13	5 (400)	2, 13
Total Children Under 5 in Household	2 (238)	1, 4	2 (162)	1, 7	2 (400)	1, 7
Beneficiary Child Age (months)	9 (238)	0, 57	8 (162)	0, 53	8 (400)	0, 57
BMC Education	% of BMCs n = 239		% of BMCs n = 163		% of BMCs n = 402	
None	7.5		6.8		7.2	
Some Primary	73.6		73.6		73.6	
Completed Primary	8.4		6.8		7.7	
Some Secondary	10.0		12.3		11.0	
Completed Secondary	0.4		0.6		0.5	



### **Exposure to Food Distribution Points and Education**

Table 3 presents descriptive statistics from questions assessing BMC exposure to the food distribution point, where the majority of the education occurred. The intervention and usual care group were comparable for most of the questions. However, there were some significant differences. In the intervention group, 30% of the BMCs had a beneficiary child who had previously been enrolled in the supplementary feeding program, compared to 24% of the usual care group ( $p < .05$ ). Of those children who had previously been enrolled, more children in the usual care than intervention group had been enrolled exactly one time, previously ( $p < .05$ ). More children in the intervention group than usual care group had been enrolled three or more times previously ( $p < .05$ ).

In the intervention group, 95% of BMCs reported that the mother of the beneficiary child usually collects the ration for the child, compared to 89% of the usual care group ( $p < .05$ ). In the usual care group, 9% reported that another family within the household usually collects the ration, compared with only 3% of the intervention group ( $p < 0.05$ ).

Table 3. Descriptive statistics from questionnaire items that assess BMC exposure to food distribution points and education, compared for 402 BMCs in education intervention and usual care groups

Item and Response choices	Intervention Group (n=239)		Usual Care Group (n=163)	
	<i>n</i>	% of BMCs	<i>n</i>	% of BMCs
Before this time was child enrolled to receive the supplementary food ration?	239		162	
yes		30		24*
If yes, how many times before this time was child enrolled to receive the ration?	72		38	
never before/only this time		1		0
one time		61		68*
two times		14		16
Three or more times		24		16*
Who usually collects the ration for the child?	239		162	
mother of the beneficiary child		95		89*
father of the beneficiary child		0		1
other family member within household		3		9*
caretaker/relative not within household or other		1		2
When was the last time you received CSB and Oil ration for the child?	239		162	
0-30 days ago		67		70
31-60 days ago		28		25
Over 61 days ago		5		6
don't know/can't remember		0		0
Since your child was enrolled this time, has someone gone every month to collect the ration?	239		162	
just got enrolled/received only this month		2		4
yes, collected every month		90		93
skipped 1 month		7		3
skipped 2 or more months		1		0

\*p < .05

BMC= Birth mother/caretakers, CSB= Corn Soy Blend

### **BMC's Compliance with Supplementary Feeding Program Recommendations**

Table 4 presents the percentages of BMCs reporting/showing compliance with the recommendations for the consumption behaviors, hygiene behaviors, and one preparation behavior. Table 5 presents results for the remaining two preparation behaviors, which were measured as milliliters of ingredients used. The intervention group showed significantly greater compliance with program recommendations than the usual care group for five of the eight behaviors analyzed. For the three behaviors assessing preparation, BMCs in the intervention group reported/showed better compliance with recommended behaviors compared the usual care group. Statistical significance was observed for cooking time (79% compared with 51%,  $p < .01$ ), amount of CSB flour used (202ml compared with 292ml,  $p < .01$ ), and amount of oil used (37 compared to 30 ml,  $p < .01$ ) (Table 4, Table 5).

Two out of the three behaviors assessing consumption showed significantly more BMC compliance with recommendations in the intervention group compared to the usual care group. Statistical significance was observed for both questions assessing beneficiary child consumption of the porridge. For the question assessing who ate the porridge last time it was prepared, 50% of the BMCs in the intervention group reported that only the beneficiary child consumed the porridge compared to 20% of the usual care group ( $p < .01$ ) (Table 4). There were similar results with the item assessing who usually eats the porridge (54% in the intervention group reporting the recommended answer compared to 27% in the usual care group,  $p < .01$ ) (Table 4). There was no significant difference for the question assessing how many times per day the child usually consumes the porridge. There were no significant differences for either of the behavior questions assessing hygiene (Table 4).

Table 4. Questionnaire items assessing BMC's compliance with supplementary feeding program recommendations, in education intervention versus usual care groups, n = 402

Questionnaire Item	Response(s) Consistent with Protocol	Intervention Group (n = 239)	Usual Care Group (n = 163)	<i>P</i> value*
		% responded with recommended answer(s) only (n)	% responded with recommended answer(s) only (n)	
<b>Preparation behaviors</b>				
Last time you prepared the porridge, how long did you boil/cook it for?	30 minutes to less than 1 hour	79 (219)	51 (140)	< 0.01
<b>Consumption behaviors</b>				
Last time you prepared it, who consumed the porridge?	Only beneficiary child	50 (239)	19 (162)	< 0.01
Who in your household usually eats the porridge?	Only beneficiary child	54 (237)	26 (160)	< 0.01
How many times per day does your child normally consume CSB porridge?	Two times a day, Three times a day	94 (239)	96 (162)	0.33
<b>Hygiene behaviors</b>				
Can I see where you store your CSB?	Off the floor, closed/sealed hanging, closed/sealed	41 (239)	45 (162)	0.52
Can I see where you store your oil?	Off the floor, closed/sealed hanging, closed/sealed	51 (239)	51 (162)	1.00

BMC= Birth mother/caretakers, CSB= Corn Soy Blend

\*test of proportions

Table 5. Questionnaire items assessing BMCs compliance with supplementary feeding recommendations, in education intervention versus usual care groups, n = 402

Survey Item	Amount Consistent with Protocol	Intervention Group			Usual Care Group			<i>P</i> value*
		<i>n</i>	<i>Mean (ml)</i>	<i>SD</i>	<i>n</i>	<i>Mean (ml)</i>	<i>SD</i>	
<b>Preparation behaviors</b>								
Show me how much CSB flour you used	182 mL	239	202.17	58.46	162	292.01	127.70	p < .01
Show me how much oil you used	36 mL	235	36.76	9.38	159	30.30	14.75	p < .01

BMC= Birth mother/caretakers, CSB= Corn Soy Blend

\**t*-test

## Discussion

This study examined the food preparation and delivery behaviors of BMCs enrolled in a supplementary feeding program for their malnourished child. It compared compliance with supplementary feeding program recommendations among a group receiving an educational intervention with a usual care group. For five of the eight behaviors analyzed, BMCs in the intervention group reported/showed significantly higher rates of recommended feeding practices than did BMCs in the usual care group. These results are consistent with other studies that have shown similar improvements in recommended feeding behaviors within a supplementary feeding program in a group that received an educational intervention (Bonvecchio et al., 2007; Roy et al. 2005).

Although the intervention and usual care group were comparable for most characteristics assessing their exposure to the food distribution point, there were some slight differences that could have affected the final results. Slightly more BMCs in the intervention group than the usual care group had beneficiary children who had previously been enrolled in the supplementary feeding program. Of those children who had been enrolled, in the intervention

group more children had been enrolled three or more times, while in the usual care group more had been enrolled just one time. BMCs who had been in the supplementary feeding program before may have had more knowledge about the recommendations, and may have been exposed to more education, which could cause their answers to the behavior questions to be skewed towards the hypothesis. However, any education the BMCs received during previous enrollments in the feeding program was likely much less intense than the education intervention they received in this study because the intervention was designed to be more intensive than previous education.

Additionally, 95% of the BMCs in the intervention group reported that the mothers went to the food distribution point to collect the ration, compared to 89% of the usual care group. It is unclear whether the other 11% in the usual care group were the beneficiary child's primary caretakers. This difference is particularly important because the person collecting the child's ration was also who usually fed the child and much of the education about feeding practices occurred at the food distribution point. If fewer BMCs in the usual care group were receiving education at the food distribution points, it could skew the study findings towards the hypothesis. Although these differences in exposure to the food distribution point and education are significant, and make it more likely that the intervention group BMCs received more exposure to education, the discrepancies between the two groups are small (all of them are about a seven percentage point difference). The significant differences between the intervention and usual care group for the behavior questions are larger; about a 30 percentage point difference for three of the behavior questions and large differences in amounts of ingredients used. While the differences in exposure to education and the food distribution point may have contributed to the

BMCs in the intervention group reporting and showing more recommended behaviors, they likely do not account for all of the large significant differences between the two groups.

### **Supplementary Food Preparation Behaviors**

There were three behavior questions analyzed that assessed preparation of the supplementary food, all of which showed significant improvements in compliance in the intervention group. The items assessing porridge cook time, amount of CSB used, and amount of oil used all showed a significant increase in compliance within the intervention group. These differences were expected because the recipe and preparation instructions were heavily stressed in the behavior change communication piece of the intervention.

For the demonstration of ingredient amounts, the BMCs in the intervention group used less CSB and more oil than the usual care group (Table 5). A main goal of the intervention was to ensure that BMCs were using a ratio of 30 g of FVO to 100 g of CSB, a recipe that included more oil than was customary for the BMCs. The intervention group on average used 31g FVO to 111g CSB, which is closer to the recommended ratio than the usual care group average ratio (25g FVO to 160g CSB). It is encouraging to see that the intervention group used more FVO and less CSB than the usual care group, and suggests that they were changing their behavior by adopting the new recipe stressed in the intervention. The phase I intervention of the parent study also provided additional FVO to the intervention group BMCs. Therefore, for the questions assessing amounts of CSB and FVO used, it cannot be concluded that the improvements are the result of only the behavior change intervention. However, it is likely the improvements resulted from the additional oil and education together. Bonvecchio et al. (2007) also assessed preparation of supplementary food according to a specific recipe, and found a similar increase of 42.9% in compliance ( $p < .05$ ) in the intervention group compared to the control group.

### **Consumption Behaviors**

There were two behavior questions assessing who consumed the supplementary food; they asked about who ate the porridge last time it was prepared, and who usually eats it. For both questions, the intervention group had a significantly higher rate of compliance with the recommendation to target the food to the beneficiary child only. This suggests that the intervention group BMCs learned the concept that only the beneficiary child should consume the porridge, which was stressed very heavily in the intervention, and applied it to their behavior. These results are consistent with those from a similar study conducted in Mexico, which assessed an educational intervention within a supplementary feeding program. Researchers found that after the intervention, the mother's reported behavior of targeting the supplementary food only to the malnourished child increased significantly from 52% to 91% in one of their districts, and showed a modest but not significant increase from 21% to 33% in their other district (Bonvecchio et al., 2007).

There were no significant differences between groups for the item assessing how many times per day the child consumed the porridge. Answers of two times per day and three times per day were correct, and 94% of the intervention group and 96% of the usual care group reported one of these answers. The lack of a significant difference between groups is likely because such a high percentage of mothers were following the recommendation already. It seems from this data that it is common for mothers in Malawi to feed their child two or three times a day, and therefore a high percentage of mothers will do it with or without education.

### **Hygiene Behaviors**

Neither of the behavior questions assessing hygiene and storage of the CSB and FVO showed any significant differences between groups. This is likely due to the fact that the intervention did not emphasize storage and hygiene behaviors as much as preparation and



consumption behaviors. Additionally, these questions could be a function of financial resources. Not all the BMCs might have had the ability to store the CSB and FVO off the ground or hanging and in a sealed container because of their household condition or financial situation. Lastly, these questions were observations by the research assistant, while most of the other questions are reported by the BMCs. The observations could have been subject to bias by the Research Assistant, because they were not blinded to the group assignments of the BMCs.

### **Strengths and Limitations of this Study**

The most significant limitation of this thesis is that the exact extent and context of the educational messages received by the usual care group are not known. While no BMCs in the usual care group received the behavior change educational intervention, they did receive some education from the private voluntary organizations operating the supplementary feeding programs. Additionally, there are different private voluntary organizations in each district, and they may have provided varied education. This makes it difficult to quantify the amount of education received by the usual care group. However, it is known that the educational intervention was much more intensive than the usual care group education. Additionally, if the usual care group received more education than expected, it would skew the results towards the null hypothesis that the behavior change intervention was not successful at increasing compliance. Therefore, this study would be an underestimate of the impact of the intervention. Even if the usual care group got very little education, the results of this study still suggest that the behavior change intervention resulted in some improvement in compliance in the intervention group compared to the usual care group.

Another limitation is that some of the behavioral questions ask the mothers to self-report their behaviors, which creates the potential for social desirability bias. The participants may feel pressured to say what they think the interviewer wants to hear, even if it is not the actual

behavior they exhibit (Grim, 2010). It is difficult to assess behavior change if the mothers do not report their true behaviors. For example, a main component of the behavior change education the mothers received was to discourage them from selling the food outside the household, and they were asked about it in the interview. However, those questions were not included in this analysis because in both the intervention and usual care groups, none of the mothers admitted to selling the food. It is likely that this was not truthful, because in the formative research there was evidence of the food being sold, and it is not likely that this behavior disappeared completely in both groups (Kumwenda et al., 2014). However, this limitation is minimized because the eight questions chosen for the analyses conducted here assess behaviors that are less obviously “incorrect” in the eyes of the BMCs, than the question about selling the food. Therefore, there was not much motivation for the BMCs to be untruthful when answering the questions chosen for analysis.

A third limitation is that knowledge and behavior are separate entities, and just because the BMCs may have acquired knowledge about feeding practices they should adopt, does not mean they actually adopted them. The BMCs may have reported what they knew they were supposed to do, instead of what they actually do. However, previous studies of supplementary feeding practices have found very strong concordance between mother’s reported and observed behaviors (Bonvecchio et al., 2007).

Despite the limitations, this thesis also has significant strengths. First, questions that assessed factors relating to the BMC’s exposure to the food distribution point and education were presented in addition to comparing the demographics of the groups. This rules out other factors that could be creating variability between the groups. Second, the parent study educational intervention was very thorough, based on formative research, and was well documented. Third,

data was collected from a usual care group for comparison to the intervention group, and that group was geographically separate from the intervention group, which likely prevented sharing of information.

This study is unique and fills a gap in the literature. While many studies have shown the effects of supplementary feeding programs on growth outcomes, few existing studies have collected evidence about mothers' compliance with the recommendations of the programs (Patel et al., 2005; Matilsky et al., 2009). Here, a potentially successful behavior change intervention was described and assessed that can address common issues with compliance in preparation and feeding behaviors in supplementary feeding programs and improve the efficacy of current programs.

### **Implications and Conclusion**

This study suggests that behavior change communication interventions, combined with distribution of specific amounts of supplementary food ingredients, can have a significant effect on mother's behaviors and compliance with supplementary feeding program recommendations. It provides evidence that behavior change communication education should be a key part of any supplementary feeding program. This study is valuable because it suggests that the educational intervention in the parent study was successful and may have promoted behavior change of BMCs that could lead to improved nutritional outcomes of beneficiary children. The conclusions of this thesis, along with the larger conclusions of the parent study, will be specifically used to improve the education component of the USAID Title II Supplementary Feeding Program in Malawi, but can be extended to inform other supplementary feeding programs.

Although this study suggests that the behavior change communication education led to behavior change among BMCs, more research is needed to assess the extent of this relationship. Future randomized and prospective studies need to be conducted to look at behavior before and

after the intervention, to assess relevant behavior changes, and to assess sustainability of positive behavior changes. Future studies should collect data about growth outcomes to see how mother's behavior change can contribute to child recovery from malnutrition.

It can be concluded from the findings of this study that behavior change communication, along with provision of specific amounts of supplementary food ingredients, can be a valuable tool in reducing issues of compliance with program recommendations in supplementary feeding programs. This could make supplementary feeding programs much more effective at treating the global problem of malnutrition, and should be implemented in current and future programs.

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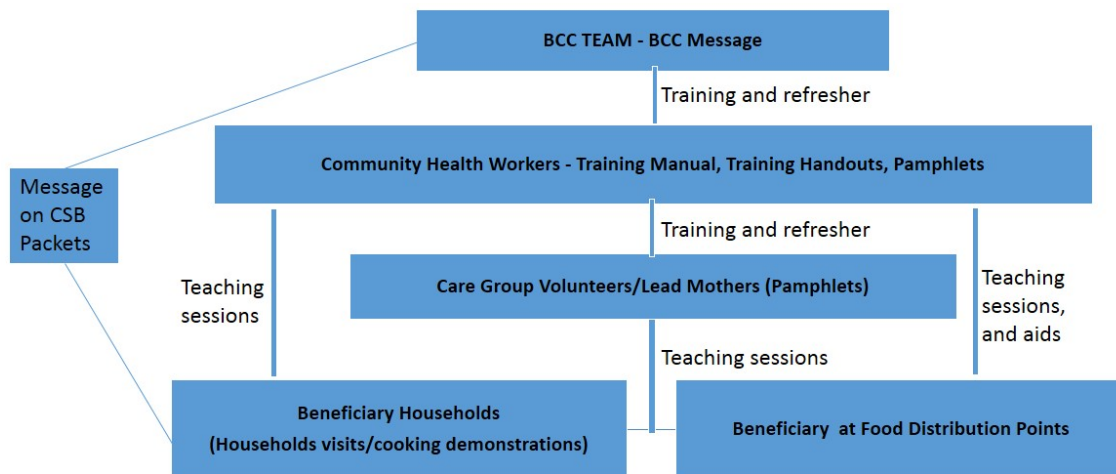
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## Appendix A. Acronyms

BMC Beneficiary mother/caretaker  
CSB Corn-Soy Blend  
FVO Fortified vegetable oil  
MAM Moderate Acute Malnutrition  
USAID United States Agency for International Development

## Appendix B. Overview of Information Flow in the Educational Intervention



From the Malawi Behavior Change Communication Team Report (Kumwenda, G., Nhlema, B., & Maganga, G, 2014)

## Appendix C. Items used from the Questionnaire for Beneficiary Mothers of Under 5 Children

### Descriptive Characteristic Items

4. Before this time was the child ever enrolled?
- 1. Yes
  - 2. No **[Go to Question 6 ]**
5. How many times before this time was the child enrolled to receive the ration?
- 0. Never before/Only this time
  - 1. One time
  - 2. Two times
  - 3. 3 times
  - 4. More than 3 times
9. Who usually collects the ration for the child?
- 1. Mother of the beneficiary child
  - 2. Father of the beneficiary child
  - 3. Other family member within the household
  - 4. Caretaker/Relative not within the household
  - 9. Other (Specify)\_\_\_\_\_
10. When was the last time you received CSB and Oil ration for the child?
- 1. 0-30 days ago
  - 2. 31-60 days ago
  - 3. 61-90 days ago
  - 4. More than 90 days ago
  - 99. Don't know/ Can't remember
15. Since your child was enrolled this time, have you or someone gone every month to collect the ration or missed a month?
- 1. Just got enrolled/ received only this month
  - 2. Yes, collected every month
  - 3. Skipped 1 month
  - 4. Skipped 2 months
  - 5. Skipped more than 2 months
  - 99. Don't know/ can't remember

### Behavior Items

20. Who in your household eats the CSB porridge? **[CHECK ALL THAT APPLY][PROBE: ANYONE ELSE?][IF ONLY OPTION NO. 1 IS MENTIONED GO TO QUESTION 22]**

- 1. Beneficiary child[GO TO QUESTION 22]
- 2. Other under five years children in the household
- 3. Other over five years children in the household
- 4. Other children outside the household
- 5. The mother of beneficiary child
- 6. The father if the beneficiary child
- 7. Other household members
- 8. Anyone who is sick.
- 9. Any other person (specify)\_\_\_\_\_
- 99. Don't know/ Can't remember

### DEMONSTRATIONS

WE HAVE BEEN TALKING ABOUT THE INSTRUCTIONS YOU RECEIVED. **NOW I WOULD LIKE TO ASK YOU ABOUT THE LAST TIME YOU PREPARED CSB PORRIDGE.** I WOULD LIKE YOU TO **SHOW ME HOW YOU PREPARED IT USING YOUR OWN CUPS, SPOONS, PLATES, BOWLS AND POTS.**

**INSTRUCTION: PLEASE JUST GIVE THEM THE INGREDIENTS THAT THEY HAVE LISTED AND MEASURE.**

80. Show me how much CSB flour you used?  
\_\_\_\_\_ ml

81. Show me how much oil you used?  
\_\_\_\_\_ ml

83. How long did you boil/cook the porridge for?

- 1. Less than 15 minutes
- 2. 15 minutes to less than 30 minutes
- 3. 30min to less than 1 hour
- 4. 1 hour to less than 2 hours
- 5. More than 2 hours
- 99. Don't know/can't remember

85. Who consumed the porridge? **[DO NOT READ OPTIONS. CHECK ALL THAT APPLY]**

- 1. Beneficiary child
- 2. Other under five years children in the household
- 3. Other over five years children in the household
- 4. Other children outside the household
- 5. The Mother of beneficiary child
- 6. The father if the beneficiary child
- 7. Other household members
- 8. Anyone who is sick.
- 9. Any other person (specify)\_\_\_\_\_
- 99. Don't know/ Can't remember

92. How many times per day did the beneficiary child consume the porridge?

- 1. Not every day
- 2. Once a day
- 3. Twice a day
- 4. Three times a day
- 5. More than 3 times a day
- 99. Don't know/can't remember

**OBSERVER ASK QUESTIONS IN PAST TENSE IF COMMODITY USED-UP:**

95. Can I see where you store your CSB **[OBSERVE][MORE THAN ONE RESPONSE IS POSSIBLE]**?

- 1. Off the floor, open/unsealed
- 2. Off the floor, closed/sealed
- 3. On the floor, open/unsealed
- 4. On the floor, closed/sealed
- 5. hanging, open/unsealed
- 6. hanging, closed/sealed
- 9. Other (specify) \_\_\_\_\_

97. Can I see where you store your oil **[OBSERVE) MORE THAN ONE RESPONSE IS POSSIBLE]**

- 1. Off the floor, open/unsealed
- 2. Off the floor, closed/sealed
- 3. On the floor, open/unsealed
- 4. On the floor, closed/sealed
- 5. hanging, open/unsealed
- 6. hanging, closed/sealed
- 9. Other (specify) \_\_\_\_\_

## Appendix D. IRB Certification



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<http://tnemcirb.tufts.edu>

### Health Sciences Campus Institutional Review Board

16 September 2014

Jennifer Allen  
Community Health Program  
Tufts University  
Boston, MA 02111

Re: Data for Senior Thesis

Dr. Allen,

On 11 September 2014, your correspondence was received in the Institutional Review Board (IRB) office of Tufts Medical Center and Tufts University Health Sciences regarding the above-referenced project.

On 16 September 2014, the submitted materials were reviewed by IRB Vice-Chair Mary Ann Volpe, MD. As described, BA student, Elena Hemler, will be conducting secondary analysis of de-identified data from a Tufts IRB approved study. Based on the information you submitted, it was determined that, per federal guidance, the activity described does not constitute human subject research at Tufts Medical Center/Tufts University.

Thank you for submitting the information to the IRB for review.

Regards,

A handwritten signature in black ink, appearing to read "Monica Cheng".

Monica Cheng  
Assistant IRB Coordinator

***THIS NOTICE MUST BE RETAINED WITH YOUR RESEARCH FILES.***